Dominion Nuclear Connecticut, Inc.
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Web Address: www.dom.com

November 27, 2007

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20852-2738

Serial No. 07-0775
MPS Lic/WDB R2
Docket No. 50-336
License No. DPR-65

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING INSTRUMENTATION TECHNICAL SPECIFICATION CHANGES

Dominion Nuclear Connecticut, Inc. (DNC) submitted a proposed license amendment to modify the Technical Specification Action and Surveillance Requirements for instrumentation identified in Millstone Power Station Unit 2 Technical Specifications 3.3.1 and 3.3.2 on November 8, 2006 (Serial No. 06-0841). DNC responded to requests for additional information (RAIs) regarding this proposed change on May 4, 2007 and October 4, 2007 (Serial Nos. 06-0841A and 06-0841B). The NRC sent an additional RAI on November 15, 2007.

The response to the RAI is provided in Attachment 1 of this letter. Attachment 2 to the letter contains a revised calculation that was discussed in a November 2, 2007 conference call and in our RAI response. The signatures of the individuals who prepared, reviewed, and approved the calculation have been removed for this docketed submittal.

The additional information provided in this letter does not affect the conclusions of the significant hazards consideration discussion in DNC's original submittal dated November 8, 2006.

In accordance with 10 CFR 50.91(b), a copy of this response is being provided to the State of Connecticut.

Should you have any questions about the information provided or require additional information, please contact Ms. Margaret A. Earle at (804) 273-2768.

Sincerely,

Gerald T. Bischof
Vice President – Nuclear Engineering

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Gerald T. Bischof, who is Vice President – Nuclear Engineering, of Dominion Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 27th day of November, 2007.

My Commission Expires: August 31, 2008.

MARGARET B. BENNETT
Notary Public 354302
Commonwealth of Virginia
My Commission Expires Aug 31, 2008

Margaret B. Bennett
Notary Public

Attachments:
1. Response to Request for Additional Information
2. Calculation ZPM_Drift-0426012, Rev 1, dated 11/7/07, "Zero Power Mode Drift Analysis in Support of LBDCR 06-MP2-036"

Commitments made in this letter: None.

cc: U.S. Nuclear Regulatory Commission
Region I Regional Administrator
475 Allendale Road
King of Prussia, PA 19406-1415

C. J. Sanders
NRC Project Manager Millstone Units 2 and 3
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
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Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

Director
Bureau of Air Management
Monitoring & Radiation Division
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

ATTACHMENT 1

INSTRUMENTATION TECHNICAL SPECIFICATION CHANGES

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

During a conference call on November 2, 2007, the NRC requested additional information (RAI) from Dominion Nuclear Connecticut, Inc. (DNC) regarding a proposed change to the Millstone Power Station Unit 2 (MPS2) instrumentation technical specifications. The requested information is necessary in order for the NRC staff to complete its review.

The information requested is provided below.

NRC Question No. 1.

By letter dated November 8, 2006, supplemented by letters dated May 4, 2007, and October 4, 2007, Dominion Nuclear Connecticut (the licensee) proposed a License Amendment Request for Millstone Power Station, Unit 2, to modify the Technical Specifications (TS) Action and Surveillance Requirements for instrumentation identified in TS Table 2.2-1, TS 3.3.1 and TS 3.3.2.

By letter dated October 4, 2007, the licensee provided Calculation ZPM_Drift-0426012, "Zero Power Mode Drift Analysis in Support of LBDCR 06-MP2-036," Rev 0, dated 9/14/07. The EICB has reviewed the calculation and determined that the following information is required to complete EICB's review:

> Most of the calculations in ZPM_Drift-0426012 are performed using values in decades instead of real numbers. Specifically, the Total Expected Uncertainty, $SV_{error,}$ has been calculated in Section 6.8, Setpoint Derivation, by taking the square root of the sum of the squares of applicable individual uncertainties in decades. Later in section 6.8, it is explained that a decade number is the logarithm (log) of a real number, e.g. $Log(10^2)$ is equal to 2 decades and $Log (10^{-8})$ is equal to -8 decades. It is explained in Section 6.8 that the related instruments have a percentage span of 10 decades corresponding to the range from 10^{-8} to 10^2.
>
> When two numbers in decades are added (+), the result in decades is equal to the log of the product (x) of the two real numbers:
>
> For example: 2 decades + 3 decades is = 5 decades, which is equivalent to log (10^5) or equivalent to 10^5 in real numbers or 10,000.
>
> Doing similar addition in real numbers results in 100 (2 decades) + 1000 (3 decades) = 1100.
>
> When two numbers in decades are subtracted (-), the result in decades is equal to the log of the division between the two real numbers:

For example: 3 decades - 2 decades is = 1 decades, which is equivalent to $\log(10^1)$ or equivalent to 10 in real numbers or equal to 1000 ÷ 100.

Doing corresponding subtraction in real numbers is 1000 (3 decades) - 100 (2 decades) = 900.

Similarly, squaring a number in decade gives much different number from squaring the equivalent real numbers:

For example: (3 decades)^2 = 9 decades or 10^9, while $(1000)^2 = 10^6$.

Most of the formulae used in ZPM_Drift-0426012, specifically for calculating SV_{error}, are valid for real numbers. ISA-RP67.04.02-2000 has addressed similar consideration in Clause 2.3 of Example Calculation - Radiation Trip.

Provide justifications for performing all calculations in ZPM_Drift-0426012, specifically calculation of drift, SV_{error}, As-found, As-left, and trip setpoint band using numbers in decades instead of real numbers.

DNC Response

DNC Calculation ZPM_Drift-0426012, Rev 1, dated 11/7/07, "Zero Power Mode Drift Analysis in Support of LBDCR 06-MP2-036," is provided as Attachment 2. Revision 1 updated this calculation to utilize the methodology prescribed within Instrument Society of America (ISA) Standard ISA-RP67.04.02-2000 "Methodologies for the Determination of Setpoints for Nuclear Safety Related Instrumentation." The ISA standard uses units of percent Equivalent Linear Full Scale (ELFS). The use of ELFS does not change the conclusions of the calculation. This calculation confirms that the wide range neutron flux instrument rack drift occurring over the period of extended surveillance test interval (STI) will not cause the Zero Power Mode (ZPM) operating bypass channel setpoint value to exceed the allowable value. Accordingly, the wide range neutron flux ZPM bypass bistable trip upper limit will be set at less than or equal to 7.413E-05%. This calculation concludes that the change of the CHANNEL FUNCTIONAL TEST frequency for the ZPM operating bypass channels from monthly to 92 days prior to each reactor startup is acceptable.

ATTACHMENT 2

INSTRUMENTATION TECHNICAL SPECIFICATION CHANGES

CALCULATION ZPM DRIFT-0426012, REV 1, DATED 11/7/07
ZERO POWER MODE DRIFT ANALYSIS IN SUPPORT OF LBDCR 06-MP2-036

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 2

Approved 11/17/03 Effective 11/21/03

CALCULATION TITLE PAGE

Total Number of Pages: 21

TITLE

ZPM_DRIFT-0426012	1	Zero Power Mode Drift Analysis in Support of LBDCR 06-MP2-036
CALCULATION No.	Revision No.	
NA	N/A	
VENDOR CALCULATION No.	Revision No.	
N/A		
VENDOR NAME		

REC'D 11/8/07
ON HOLD 11/7/07
PROCESSED
RM

NUCLEAR INDICATOR:	50.59 Evaluation or Screen Attached	Calc. Supports DCR/MMOD/EE?	Calc. Supports Other Process?
☒CAT1 ☐RWQA ☐SBOQA ☐FPQA ☐ATWSQA ☐NON-QA	☐YES ☒NO	☐YES ☒NO	☒YES ☐NO
		↓	↓
			LBDCR 06-MP2-036
		Ref. No.	Reference

INCORPORATES:
CCN NO: AGAINST REV.

ORIGINAL

Executive Summary

LBDCR 06-MP2-036 is proposing extending the surveillance requirement for the auto removal of the Zero Power Mode Bypass function from a monthly interval to once within 92 days of a reactor startup. To support the proposed surveillance extension for the auto removal of the Zero Power Mode Bypass function, a detailed drift analysis is required to be performed. Existing Calculation PA79-219-00767GE used a drift value of 0.08 decades for an assumed calibration interval of 24 months. The drift analysis will verify that extending the existing monthly functional check to once within 92 days of a reactor startup will not result in actual equipment drift beyond the assumed values within Calculation PA79-219-00767GE. Also, this calculation determined the upper trip setpoint limit for the auto removal of the Zero Power Mode Bypass function. Revision 1 updated this calculation to utilize the methodology prescribed within Instrument Society of America Standard ISA-RP67.04.02-2000 *"Methodologies for the Determination of Setpoints for Nuclear Safety Related Instrumentation"*. The ISA standard uses units of % Equivalent Linear Full Scale (ELFS). The use of ELFS does not change the conclusions of the calculation.

Approvals (Print & Sign Name)		
Preparer: [redacted]		Date: 11/7/07
Interdiscipline Reviewer: N/A	Discipline:	Date:
Interdiscipline Reviewer : N/A	Discipline:	Date:
Independent Reviewer: [redacted]		Date: 11/7/07
Engineering Approver: [redacted]		Date: 11/7/07

Installation Verification

☐ Calculation represents the installed configuration and approved licensing condition (Calculation of Record)

☐ N/A does not affect plant configuration (e.g., study, hypothetical analysis, etc.)

Preparer/Designer Engineer: (Print and Sign) Date:

Approved 9/22/04 Effective 9/27/04

PassPort DATABASE INPUTs

Calculation Number: ZPM_DRIFT-04260I2 Revision: 1

Vendor Calculation Number/Other: N/A Revision: N/A

CCN # N/A Calc Voided: ☐ Yes ☒ No

Superseded By: N/A Supersedes Calc: N/A

Discipline (Up to 10) I, N

Unit (M1, M2, M3)	Project Reference (EWA, DCR or MMOD)	Component Id	Computer Code	Rev. No./ Level No.
M2	N/A	WR-LOG-A	Microsoft Excel	9.0
		WR-LOG-B		
		WR-LOG-C		
		WR-LOG-D		

MEL CODES*

Structure	System	Component	Reference Calculation	Rev No.	CCN
AB	RPS	LOP	PA79-219-00767GE	1	N/A

*The codes required must be alpha codes designed for structure, system and component.

NOTE: Avoid multiple item references on a line, e.g., LT 1210 A-D requires four separate lines.

Reference Drawing	Sheet	Rev. No.
N/A		

Comments:

Referenced By Calculation	Impact Y	Impact N	AR Reference/Calc Change Ref.
N/A			

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this calculation is to estimate 92 day drift values for the auto removal of the Zero Power Mode Bypass function. LBDCR 06-MP2-036 is proposing extending the surveillance requirement for the auto removal of the Zero Power Mode Bypass function from a monthly interval to once within 92 days of a plant startup. To support the proposed surveillance extension for the auto removal of the Zero Power Mode Bypass function, a detailed drift analysis is required to be performed. Existing calculation PA79-219-00767GE used a drift value of .08 decades for an assumed calibration interval of 24 months. The drift analysis will verify that extending the existing monthly functional check to once within 92 days of a plant startup will not result in actual equipment drift beyond the assumed values within calculation PA79-219-00767GE. This calculation shall also determine the upper trip setpoint limit for the auto removal of the Zero Power Mode Bypass function.

Revision 1 of this calculation expressed error terms in % ELFS instead of decades. This was done to be consistent with ISA Standard ISA-RP67.04.02-2000 *"Methodologies for the Determination of Setpoints for Nuclear Safety Related Instrumentation"*

2.0 SUMMARY OF RESULTS

The bounding values of drift for a 92 day surveillance requirement, derived from historical calibration data for Wide Range Nuclear Instrumentation WR-LOG-A, WR-LOG-B, WR-LOG-C and WR-LOG-D is

Bound = ± 0.269% Equivalent Linear Full Scale (ELFS)

This value is less than the drift term used in Calculation PA79-219-00767GE Revision 1. Calculation PA79-219-00767GE Revision 1 determined electronic drift to be ± 0.79 milli-volts. Based on a 10 volt signal, this equates to ±0.8% ELFS. However, Calculation PA79-219-00767GE Revision 1 converted all error terms to units of decades because the device provides a linear output signal with respect to decades. Based on a 10 linear decade scale, the ± 0.8% ELFS drift error was converted to ± 0.08 decades error. Reference to decades within Calculation PA79-219-00767GE only refers to units and not a logarithmic value.

The calculated value of drift conservative given none of the four instruments required any readjustment during the period of time between January 2005 and July of 2007.

The upper trip setpoint limit is $7.413X10^{-5}$ % power. The setpoint must be left below this value based on the Technical Specification Allowable Value of $1.0X10^{-4}$ % power.

3.0 DESIGN INPUTS & REFERENCES

3.1 Design Inputs

3.1.1 SP-M2-EE-0003, Rev 0, *Guidelines for Impact Evaluation of 24-Month Fuel Cycle on Technical Specification Surveillances for Millstone Unit 2*

3.1.2 Surveillance Procedure SP2403GA *"RPS Channel "A" Bistable Trip Test"* Rev 2 Chg 5

3.1.3 Surveillance Procedure SP2403GB *"RPS Channel "B" Bistable Trip Test"* Rev 2 Chg 5

3.1.4 Surveillance Procedure SP2403GC *"RPS Channel "C" Bistable Trip Test"* Rev 2 Chg 6

3.1.5 Surveillance Procedure SP2403GD *"RPS Channel "D" Bistable Trip Test"* Rev 2 Chg 6

3.1.6 Surveillance Procedure SP2401BB1 *"Channel "A" Wide Range Monitor Start-up Functional Test"* Rev 1 Chg 3.

3.1.7 Surveillance Procedure SP2401BB2 *"Channel "B" Wide Range Monitor Start-up Functional Test"* Rev 1 Chg 4.

3.1.8 Surveillance Procedure SP2401BB3 *"Channel "C" Wide Range Monitor Start-up Functional Test"* Rev 1 Chg 4.

3.1.9 Surveillance Procedure SP2401BB4 *"Channel "D" Wide Range Monitor Start-up Functional Test"* Rev 1 Chg 5.

3.1.10 Surveillance Procedure SP2401BC1 *"Channel "A" Wide Range Monitor Calibration"* Rev 1 Chg 3.

3.1.11 Surveillance Procedure SP2401BC2 *"Channel "B" Wide Range Monitor Calibration"* Rev 1 Chg 4.

3.1.12 Surveillance Procedure SP2401BC3 *"Channel "C" Wide Range Monitor Calibration"* Rev 1 Chg 3.

3.1.13 Surveillance Procedure SP2401BC4 *"Channel "D" Wide Range Monitor Calibration"* Rev 1 Chg 6.

3.1.14 Calculation PA97-219-00676GE Rev 1, *Millstone Unit 2 Wide Range Neutron Flux Channel Loop Uncertainty.*

3.1.15 DOE Research and Development Report No. *WAPD-TM-1292, February 1981, Statistics for Nuclear Engineers and Scientists Part 1: Basic Statistical Inference.*

3.1.16 American National Standard N15.15-1974, *Assessment of the Assumption of Normality (Employing Individual Observed Values)*

3.1.17 ISA-RP67.04.02-2000 *"Methodologies for the Determination of Setpoints for Nuclear Safety Related Instrumentation"*

4.0 ASSUMPTIONS

4.1.1 The data derived from the surveillance procedures constitute a random sample of the population of possible values of drift from like instruments.

4.1.2 The electronics installed in the Wide Range Monitors are typical of all electronics of the same manufacturer and model numbers. Therefore, data may be pooled without further analysis.

4.1.3 It is important to note that none of the instruments required recalibration. In terms of real drift, none of the affected instrument channels drifted beyond 0.269 % ELFS from the period of January 2005 to July of 2007. However, for purposes of added conservatism, each successive calibration interval was assumed as a unique data point with no credit for non-adjustment of the instrument setpoint.

5.0 METHOD OF CALCULATION

In order to calculate bounding drift values for a 92 day surveillance interval, the methods of Reference 3.1.1 were employed. Plant historical data were tabulated and analyzed. Historical surveillance test and calibration data was collected for the applicable instrumentation and entered into an Excel™ spreadsheet. Statistical analysis of the data was performed using various functions within Excel™.

A linear regression analysis of the data was performed to determine if drift is time dependent. The data were tested for normality, and estimates of the bounding values of drift were determined using the methods for normal distributions. Scatter plots and histograms were prepared to assist in visualization of the data.

5.1 Instrument Block Diagram

Figure 1 is a diagram of a typical Wide Range Nuclear Instrumentation channel. The scope of drift analysis in this calculation pertains to the Zero Power Mode Bypass bistable. The current setpoint for the Zero Power Mode Bypass removal function is 9.4×10^{-5} % reactor power.

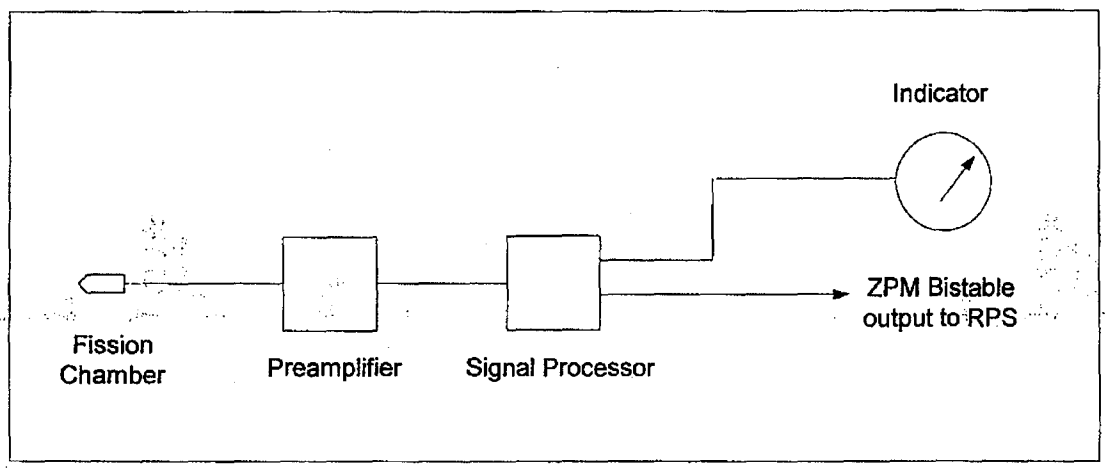

Figure 1: Wide Range Instrumentation Channel Block Diagram

5.2 Zero Power Mode Bistable Calibration/Functional Check

The identified surveillance procedures (References 3.1.2 through 3.1.13) verify the bistable trip setting of the Zero Power Mode Bypass. The setpoint is verified to fall within an acceptance range of 7.1×10^{-5} to 1.2×10^{-4} % reactor power.

From the completed surveillance tests, drift values can be typically obtained by subtracting "as-found" surveillance values from the "as-left" values from the preceding surveillance test. The drift values obtained are for the period of time between the two surveillance dates. The twelve surveillance procedures effectively verify the Zero Power

Mode Bypass bistable setting using the same methodology. As a result, the calibration interval for each channel will be based on the period of time between each successive instrument check, whether it was verified through the calibration surveillance, functional test surveillance or the bistable trip test surveillance procedure.

5.3 Input Data

The historical calibration data in the Appendix constitute the input data for this calculation. The data was derived from surveillance records which were completed over the period from January of 2005 to July of 2007. The associated workorders have been identified for each completed surveillance.

5.4 Spreadsheet Calculations

Microsoft Excel™, version 9.0, for Windows 2000 was used to perform the statistical calculations and prepare the scatter plots and histograms for this calculation. The function, AVERAGE, was used to calculate the sample mean, the function, STDEV, was used to calculated the sample standard deviation and the functions, SLOPE and INTERCEPT, were used to calculate the slope and intercept of the best-fit straight line for the regression analyses.

The computations performed to the full precision of Excel™ are presented in this calculation rounded to two decimal places in most cases. Verification by hand calculator using the rounded values may result in slightly different results due to round-off errors.

6.0 BODY OF CALCULATION

6.1 Drift Analysis

The identified surveillance procedures simulate an input signal through operation of a potentiometer on the Wide Range Nuclear Instrumentation drawers. The "as-found" and "as-left" were observed on the displays and recorded. The loop drift was then determined by subtracting the "as-left" values from the "as-found" values.

6.2 Historical Data Compilation

No	Days	Drift % ELFS	No	Days	Drift % ELFS	No	Days	Drift % ELFS	No	Days	Drift % ELFS
1	1	-0.269	39	15	0.000	77	28	0.000	115	36	0.000
2	3	-0.269	40	15	0.000	78	28	0.000	116	37	0.000
3	4	-0.269	41	15	0.000	79	28	0.000	117	37	0.000
4	7	-0.269	42	16	0.000	80	28	0.000	118	38	0.000
5	9	-0.269	43	17	0.000	81	28	0.000	119	38	0.000
6	13	-0.269	44	17	0.000	82	28	0.000	120	38	0.000
7	15	-0.269	45	17	0.000	83	28	0.000	121	38	0.000
8	15	-0.269	46	17	0.000	84	28	0.000	122	38	0.000
9	15	-0.269	47	19	0.000	85	28	0.000	123	38	0.000
10	19	-0.269	48	19	0.000	86	28	0.000	124	38	0.000
11	25	-0.269	49	19	0.000	87	28	0.000	125	42	0.000
12	28	-0.269	50	19	0.000	88	28	0.000	126	42	0.000
13	28	-0.269	51	19	0.000	89	28	0.000	127	42	0.000
14	34	-0.269	52	19	0.000	90	28	0.000	128	42	0.000
15	0	0.000	53	19	0.000	91	28	0.000	129	51	0.000
16	1	0.000	54	19	0.000	92	28	0.000	130	51	0.000
17	1	0.000	55	19	0.000	93	29	0.000	131	51	0.000
18	1	0.000	56	20	0.000	94	29	0.000	132	55	0.000
19	1	0.000	57	21	0.000	95	29	0.000	133	64	0.000
20	1	0.000	58	21	0.000	96	31	0.000	134	64	0.000
21	2	0.000	59	21	0.000	97	31	0.000	135	64	0.000
22	2	0.000	60	21	0.000	98	31	0.000	136	64	0.000
23	3	0.000	61	22	0.000	99	31	0.000	137	1	0.269
24	4	0.000	62	22	0.000	100	31	0.000	138	4	0.269
25	7	0.000	63	23	0.000	101	31	0.000	139	7	0.269
26	7	0.000	64	23	0.000	102	31	0.000	140	15	0.269
27	7	0.000	65	23	0.000	103	31	0.000	141	18	0.269
28	7	0.000	66	23	0.000	104	31	0.000	142	20	0.269
29	9	0.000	67	25	0.000	105	31	0.000	143	21	0.269
30	11	0.000	68	27	0.000	106	31	0.000	144	28	0.269
31	11	0.000	69	27	0.000	107	33	0.000	145	28	0.269
32	11	0.000	70	27	0.000	108	33	0.000	146	33	0.269
33	13	0.000	71	27	0.000	109	33	0.000	147	33	0.269
34	15	0.000	72	27	0.000	110	33	0.000	148	37	0.269
35	15	0.000	73	27	0.000	111	33	0.000	149	37	0.269
36	15	0.000	74	27	0.000	112	34	0.000	150	41	0.269
37	15	0.000	75	28	0.000	113	34	0.000			
38	15	0.000	76	28	0.000	114	34	0.000			

Table 1: WR-Log A/D Drift Data

Table 1 presents the results of the drift determination, described above. The drift data are in order of increasing values of drift.

6.3 Tests for Outliers

There were no suspected outliers in the results. Therefore, this test was not performed and no data points were removed from the sample population.

6.4 Data Plots

The scatter plots and histograms, Figures 2 and 3, provide a graphical presentation of the drift data. These graphs were created using Excel™.

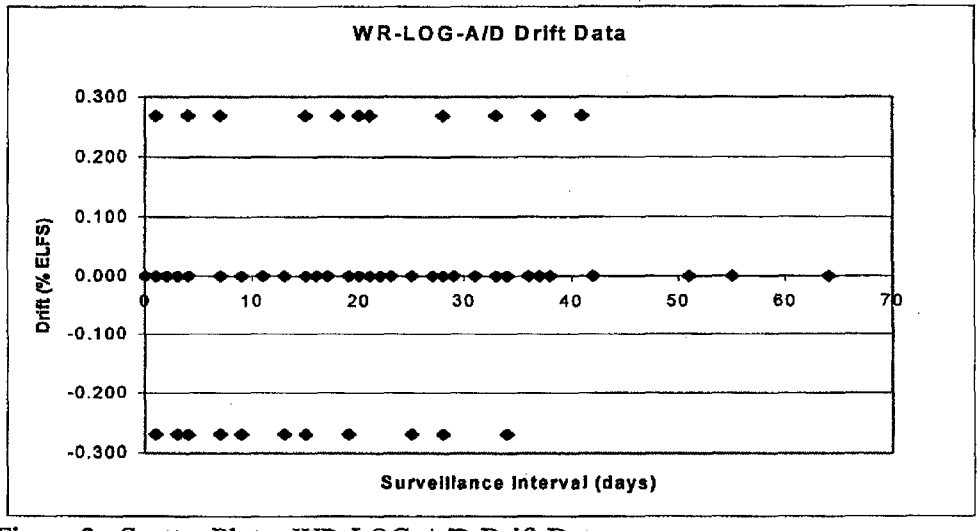

Figure 2: Scatter Plot – WR-LOG-A/D Drift Data

A visual inspection of the scatter plot indicates no apparent connection between the magnitude and the duration of the surveillance interval. A linear regression analysis of the data will confirm or deny the visual observation that the magnitude of drift is not dependent on the duration between surveillances.

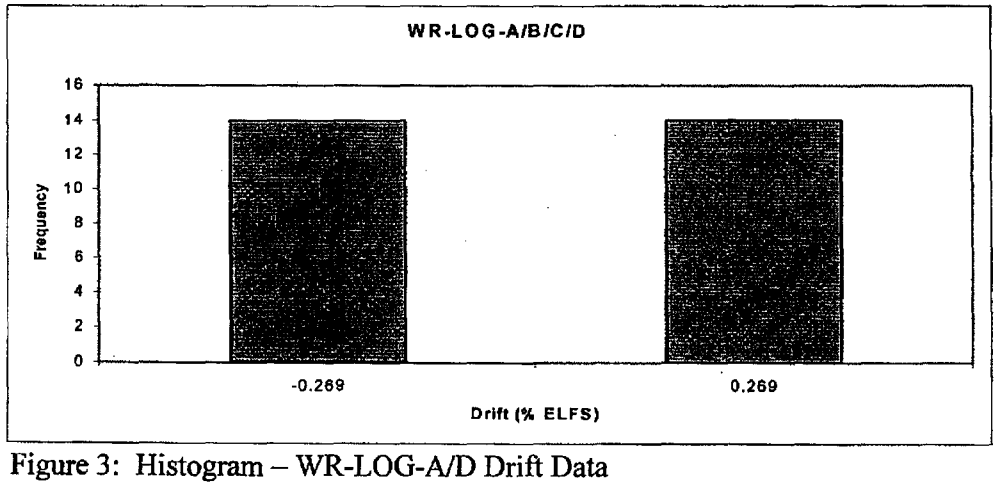

Figure 3: Histogram – WR-LOG-A/D Drift Data

The histogram does not appear to be from a normal distribution. A D' Test shall confirm or deny the normality of the drift data.

6.5 Tests for Normality

Due to the sample population being greater than 50 data points, the D' Test was performed. (Reference 3.1.16).

D' Test

First, T was computed using the following formula:

$$T = \sum_{i=1}^{n} \left[i - \frac{n+1}{2} \right] x_i$$

where:

n is the number of values in the sample

x_i represents the values in the sample arranged in increasing order

Then the D' test statistic was calculated:

$$D' = \frac{T}{S}$$

where:

$S^2 = (n-1)s^2$ and s^2 is the unbiased estimate of the population variance

The mean and standard deviation calculate as follows:

Mean $\overline{X} = \frac{\sum x_i}{n}$ Standard deviation = $s = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \overline{X})^2}$

where:

x_i represents the values in the sample arranged in increasing order

n is the number of values in the sample

Using Excel, the standard deviation, s, calculates to 0.116 and the mean is 0.0.

Therefore, the variance s^2 calculates to 0.0135.

Using the above formula, with n is equal to150 data samples,

$S^2 = (150-1).0135 = 2.0$

The test statistic, D' was then compared to the critical values from Table 5 of Reference 3.1.16 at a significance level, $\alpha = 0.02$ (P = 0.01 and 0.99).

The T results, calculated by Excel™, are:

T = 512.2

Therefore, $D' = \frac{512.2}{\sqrt{2.0}} = 362.2$

From Reference 3.1.16, the critical values are 505.6 at P = 0.01 and 526.4 at P = 0.99. The test statistic, D', does not lie between the critical values, so the hypothesis of a normal distribution is rejected at $\alpha = 0.02$.

6.6 Bounding Values of Drift

For a non-normal distribution, the proportion of the population exceeding assumed bounds can be determined from Reference 3.1.1.

$$p_u = \frac{(x+1)F_{\alpha/2;2(x+1),2(n-x)}}{(n-x)+(x+1)F_{\alpha/2;2(x+1),2(n-x)}}$$

Assumed upper and lower bounds (pass/fail criterion) are selected as ± 0.269 % ELFS. Then, X = 0, and the above equation becomes:

$$p_u = \frac{F_{0.025;2,150}}{150+F_{0.025;2,300}} = \frac{3.781}{150+3.781} = 0.025$$

Thus, 97.5% of the population will lie within a bound of ± 0.269 % ELFS.

It is important to note here that none of the instruments required recalibration. Therefore, in terms of real drift, none of the affected instrument channels drifted beyond 0.269 % ELFS from the period of January 2005 to July of 2007. However, for purposes of added conservatism, each successive calibration interval was assumed as a unique data point with no credit for non-adjustment of the instrument setpoint.

6.7 Linear Regression Analysis of Drift

As stated earlier, examination of the scatter plot shows no apparent time dependency in the drift. Linear regression analyses of the absolute values of the data, performed by Excel™ using the SLOPE and INTERCEPT functions, provide the slope and intercept of the best-fit straight line.

Slope = -1.453×10^{-3}

Intercept = 0.086

The negative slope of the regression line for the drift data confirm that the drift does not increase with time. This is further supported by the fact that the instrument channels in question did not require any readjustment for the identified surveillances from January 2005 to July 2007. Further, the Zero Power Mode Bypass auto removal setpoint for

instrument channels WR-LOG-C and WR-LOG-D did not move at all from the period of in question.

Therefore, based on the above results, the bounding values of drift for a 92 day surveillance interval for the Zero Power Mode bypass auto removal function is ± 0.269 % ELFS.

Bound = ± 0.269 % ELFS

This value is less than the ± 0.8 % ELFS drift term assumed in calculation PA79-219-00767GE Revision 1 (Reference 3.1.14).

Calculation PA79-219-00767GE Revision 1 converted error terms from % of full scale(ELFS) to decades. This was done by simply taking the % full scale error and multiplying by the total number of decades for the instrument. This instrument has 10 decades. A drift term of ± 0.08 decades equates to an error term of .08/10*100 % = 0.8 % ELFS. It is important to note that references to decades within Calculation PA79-219-00767GE Revision 1 do not refer to an actual logarithmic number but that of units. The Wide Range Nuclear Instrumentation provides a linear output signal in terms of decades, with an indicated scale of 10 full decades. The vendor does provide error terms in % ELFS, however, Calculation PA79-219-00767GE Revision 1 converted % ELFS to units of decades because the indication is in terms of decades.

6.8 Setpoint Derivation

The $1X10^{-4}$ % reactor power Tech Spec value is considered an allowable value and not an analytical limit. The Zero Power Mode bypass setpoint is not modeled in the plant safety analysis and is not considered an analytical limit. For purposes of this calculation, the upper trip setpoint limit shall be calculated by subtracting from the allowable value of $1.0X10^{-4}$ % reactor power the root of the sum of the squares of the expected errors which would be seen during the calibration process. The expected uncertainty terms include: Rack Drift (RD), Rack Calibration Accuracy (RCA_{ZP}) associated with the Zero Power Mode Function and Measurement and Test Equipment (MTE). These terms have been derived from Calculation PA79-219-00767GE Revision 1 (Reference 3.1.14). They are as follow:

RCA_{ZP} = ± 0.10 decades

RD = ± 0.08 decades It is important to note this drift value is much more conservative than the expected drift term calculated within this calculation.

MTE = ± 0.01 decades

Converting the above terms to ELFS yields the following:

RCA_{ZP} = ± 0.01 % ELFS RD =± 0.008 % ELFS MTE = ± 0.001 % ELFS

Total Expected Uncertainty during performance of the Zero Power Mode Bypass function surveillance (Surveillance Error = SV_{error}) would be calculated as follows:

$$SV_{error} = \pm\sqrt{(RCA_{ZP})^2 + (RD)^2 + (MTE)^2}$$

$$SV_{error} = \pm\sqrt{(.01)^2 + (.008)^2 + (.001)^2} = \pm 0.013\ \%\ ELFS$$

The Allowable Value (AV) for the Zero Power Mode Bypass function is again $1.0X10^{-4}$ % reactor power. Reference 3.17 provides an accepted method for converting between process units (% reactor power) and % ELFS.

$$FACTOR = 10^{\pm[\%ELFS)(total\ decades)]}$$

$$FACTOR = 10^{\pm[.013)(10)]} = 10^{\pm 0.13}$$

$$Max\ Factor = 10^{+0.13} = 1.349$$

$$Min\ Factor = 10^{-0.13} = 0.7413$$

The expected error around a $1.0X10^{-4}$ allowable value is as follows:

Plus Error = (AV)(Max Factor) = $(1.0X10^{-4})(1.3490) = 1.349X10^{-4}$ %

Minus Error = (AV)(Min Factor) = $(1.0X10^{-4})(0.7413) = 7.413X10^{-5}$ %

Because the setpoint must occur below the allowable value of $1.0X10^{-4}$, the setpoint needs to be set below 7.413X10-5.

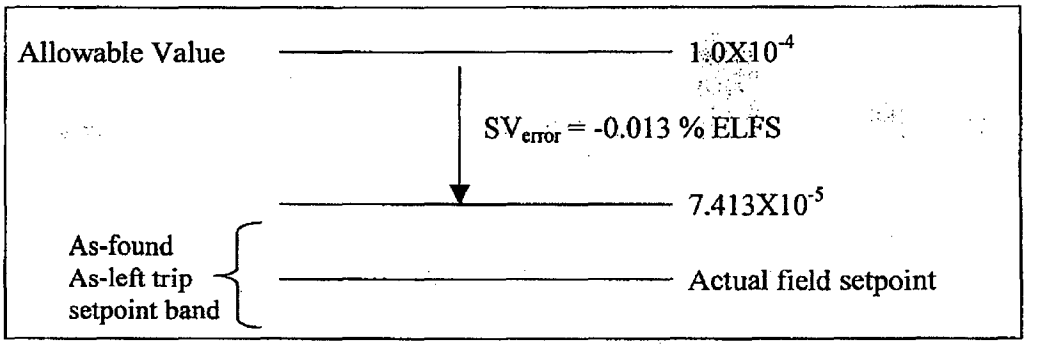

Figure 4: Upper Trip Setpoint Derivation

7.0 DESIGN VERIFICATION

Design verification was done by means of a full design review in accordance with Design Control Manual, Chapters 4 and 5. A copy of the Calculation Review Comment and Resolution Form is included as an attachment.

Appendix A

Historical Surveillance Data

WR-LOG-A, WR-LOG-B, WR-LOG-C & WR-LOG-D

Surveillance Procedure	Work Order	Completion Date	AS FOUND % Power	AS LEFT % Power	DRIFT Real	Factor	DRIFT % ELFS	DAYS	Absoulte Drift
SP2401GA	M20702383	07/19/2007	1.00E-04	1.00E-04					
SP2401BC1	M20600025	07/16/2007	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	3	0.269
SP2401GA	M20701671	06/28/2007	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	18	0.269
SP2401GA	M20700842	06/07/2007	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	21	0.000
SP2401GA	M20700061	05/04/2007	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	34	0.000
SP2401GA	M20609438	03/27/2007	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	38	0.000
SP2401GA	M20607927	02/27/2007	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	28	0.000
SP2401GA	M20607014	02/02/2007	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	25	0.000
SP2401GA	M20606247	01/16/2007	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	17	0.000
SP2401GA	M20605502	12/05/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	42	0.000
SP2401BB1	M20504175	11/16/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	19	0.000
SP2401GA	M20604755	11/15/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	1	0.000
SP2401GA	M20603026	09/12/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	64	0.000
SP2401GA	M20602006	08/15/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	28	0.000
SP2401GA	M20601062	07/18/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	28	0.000
SP2401GA	M20600096	06/20/2006	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	28	0.269
SP2401GA	M20512070	06/05/2006	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	15	0.269
SP2401GA	M20511380	05/08/2006	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	28	0.269
SP2401BB1	M20602053	04/05/2006	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	33	0.269
SP2401GA	M20510621	03/29/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	7	0.000
SP2401GA	M20509769	03/06/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	23	0.000
SP2401BB1	M20402580	02/23/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	11	0.000
SP2401BC1	M20406730	02/14/2006	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	9	0.269
SP2401GA	M20509024	02/07/2006	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	7	0.269
SP2401GA	M20508223	01/05/2006	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	33	0.000
SP2401GA	M20507476	12/09/2005	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	27	0.000
SP2401GA	M20506707	11/08/2005	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	31	0.000
SP2401GA	M20505140	10/20/2005	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	19	0.269
SP2401GA	M20503476	09/13/2005	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	37	0.269
SP2401GA	M20502597	08/29/2005	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	15	0.269
SP2401GA	M20501552	08/01/2005	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	28	0.269
SP2401GA	M20500102	06/24/2005	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	38	0.000
SP2401GA	M20412412	05/24/2005	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	31	0.000
SP2401GA	M20411407	05/23/2005	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	1	0.269
SP2401BB1	M20314121	05/19/2005	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	4	0.269
SP2401GA	M20410435	03/29/2005	1.00E-04	1.00E-04	0.00E+00	1.0000	0.000	51	0.000
SP2401GA	M20409365	03/14/2005	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	15	0.269
SP2401GA	M20408330	02/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GA	M20407340	01/04/2005	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	41	0.269

WR-LOG-B Surveillance Data

Surveillance Procedure	Work Order	Completion Date	AS FOUND % Power	AS LEFT % Power	DRIFT Real	Factor	DRIFT % ELFS	DAYS	Absoulte Drift
SP2401GB	M20702384	07/19/2007	9.40E-05	9.40E-05					
SP2401BC2	M20512632	06/28/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	21	0.000
SP2401GB	M20701672	06/28/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	0	0.000
SP2401GB	M20700843	06/07/2007	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	21	0.269
SP2401GB	M20700062	05/04/2007	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	34	0.269
SP2401GB	M20609439	03/27/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	38	0.000
SP2401GB	M20607928	02/27/2007	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	28	0.269
SP2401GB	M20607015	02/02/2007	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	25	0.269
SP2401GB	M20606248	01/16/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	17	0.000
SP2401GB	M20605503	12/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	42	0.000
SP2401BB2	M20504176	11/16/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GB	M20604756	11/15/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	1	0.000
SP2401GB	M20603027	09/12/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	64	0.000
SP2401GB	M20602007	08/15/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GB	M20601063	07/18/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GB	M20600097	06/20/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GB	M20512071	06/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GB	M20511381	05/08/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401BB2	M20602052	04/05/2006	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	33	0.269
SP2401GB	M20510622	03/29/2006	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	7	0.269
SP2401GB	M20509770	03/06/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	23	0.000
SP2401BB2	M20402581	02/23/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	11	0.000
SP2401GB	M20509025	02/07/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	16	0.000
SP2401BC2	M20406595	01/18/2006	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	20	0.269
SP2401GB	M20508224	01/05/2006	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	13	0.269
SP2401GB	M20507477	12/09/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	27	0.000
SP2401GB	M20506708	11/08/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000
SP2401GB	M20505141	10/20/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GB	M20503477	09/13/2005	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	37	0.269
SP2401GB	M20502598	08/29/2005	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	15	0.269
SP2401GB	M20501553	08/01/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GB	M20500103	06/29/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	33	0.000
SP2401GB	M20412413	05/24/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	36	0.000
SP2401GB	M20411408	05/23/2005	1.00E-04	1.00E-04	6.00E-06	1.0638	0.269	1	0.269
SP2401BB2	M20314122	05/19/2005	9.40E-05	9.40E-05	-6.00E-06	0.9400	-0.269	4	0.269
SP2401GB	M20410436	03/29/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	51	0.000
SP2401GB	M20409366	03/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GB	M20408331	02/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GB	M20407341	01/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000

WR-LOG-C Surveillance Data

Surveillance Procedure	Work Order	Completion Date	AS FOUND % Power	AS LEFT % Power	DRIFT Real	Factor	DRIFT % ELFS	DAYS	Absoulte Drift
SP2401GC	M20702385	07/19/2007	9.40E-05	9.40E-05					
SP2401BC3	M20600413	07/17/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	2	0.000
SP2401GC	M20701673	06/28/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GC	M20700844	06/07/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	21	0.000
SP2401GC	M20700063	05/04/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	34	0.000
SP2401GC	M20609440	03/27/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	38	0.000
SP2401GC	M20607929	03/05/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	22	0.000
SP2401GC	M20607016	02/02/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000
SP2401GC	M20606249	01/16/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	17	0.000
SP2401GC	M20605504	12/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	42	0.000
SP2401BB3	M20504177	11/16/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GC	M20604757	11/15/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	1	0.000
SP2401GC	M20603028	09/12/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	64	0.000
SP2401GC	M20602008	08/14/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	29	0.000
SP2401GC	M20601064	07/18/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	27	0.000
SP2401GC	M20600098	06/20/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GC	M20512072	06/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GC	M20511382	05/08/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401BB3	M20602051	04/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	33	0.000
SP2401GC	M20510623	03/29/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	7	0.000
SP2401GC	M20509771	03/06/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	23	0.000
SP2401BB3	M20402582	02/23/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	11	0.000
SP2401BC3	M20407114	02/14/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	9	0.000
SP2401GC	M20509026	02/07/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	7	0.000
SP2401GC	M20508225	01/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	33	0.000
SP2401GC	M20507478	12/09/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	27	0.000
SP2401GC	M20506709	11/08/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000
SP2401GC	M20505142	10/20/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GC	M20503478	09/13/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	37	0.000
SP2401GC	M20502599	08/29/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GC	M20501554	08/01/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GC	M20500104	06/24/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	38	0.000
SP2401GC	M20412414	05/24/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000
SP2401GC	M20411409	05/23/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	1	0.000
SP2401BB3	M20314123	05/19/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	4	0.000
SP2401GC	M20410437	03/29/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	51	0.000
SP2401GC	M20409367	03/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GC	M20408332	02/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GC	M20407342	01/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000

WR-LOG-D Surveillance Data

Surveillance Procedure	Work Order	Completion Date	AS FOUND % Power	AS LEFT % Power	DRIFT Real	Factor	DRIFT % ELFS	DAYS	Absoulte Drift
SP2401GD	M20702386	07/19/2007	9.40E-05	9.40E-05					
SP2401GD	M20701674	06/28/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	21	0.000
SP2401BC4	M20512601	06/26/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	2	0.000
SP2401GD	M20700845	06/07/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GD	M20700064	05/04/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	34	0.000
SP2401GD	M20611796	03/27/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	38	0.000
SP2401GD	M20610679	03/05/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	22	0.000
SP2401GD	M20609441	02/02/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000
SP2401GD	M20607930	01/16/2007	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	17	0.000
SP2401GD	M20607017	12/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	42	0.000
SP2401BB4	M20504178	11/16/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GD	M20606250	11/15/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	1	0.000
SP2401GD	M20604758	09/12/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	64	0.000
SP2401GD	M20603946	08/14/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	29	0.000
SP2401GD	M20603029	07/18/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	27	0.000
SP2401GD	M20602009	06/20/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GD	M20601065	06/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GD	M20600099	05/08/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401BB4	M20602049	04/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	33	0.000
SP2401GD	M20512073	03/29/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	7	0.000
SP2401GD	M20511383	03/06/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	23	0.000
SP2401GD	M20510624	02/07/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	27	0.000
SP2401BC4	M20406567	01/18/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	20	0.000
SP2401GD	M20509772	01/05/2006	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	13	0.000
SP2401GD	M20509027	12/09/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	27	0.000
SP2401GD	M20508226	11/08/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000
SP2401GD	M20505143	10/20/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	19	0.000
SP2401GD	M20503479	09/13/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	37	0.000
SP2401GD	M20502600	08/29/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GD	M20501555	08/01/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GD	M20500105	06/24/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	38	0.000
SP2401GD	M20412415	05/26/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	29	0.000
SP2401GD	M20411410	05/23/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	3	0.000
SP2401GD	M20410438	03/29/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	55	0.000
SP2401GD	M20409368	03/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	15	0.000
SP2401GD	M20408333	02/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	28	0.000
SP2401GD	M20407343	01/14/2005	9.40E-05	9.40E-05	0.00E+00	1.0000	0.000	31	0.000

Calculation Review Comment and Resolution Form

(Sheet 1 of)

Calculation Number: ZPM-DRIFT-04260I2 Revision: 1 CCN 0 11/7/07 N/A

Calculation Title: Zero Power Mode Drift Analysis in Support of LBDCR 06-MP2-036

Calc. Originator: [redacted] Reviewer (PRINT): [redacted]

This form is intended to document significant comments and their resolutions. Typographical errors and other editorial recommendations may be marked up in the calculation text and presented to the originator

Review Type ☐ **Interdiscipline** ☒ **Independent**

Reviewer (SIGN) [redacted] Date: 11/7/07

(signature signifies all comments have been resolved to your satisfaction)

Item	Page/Section	Comments	Response
1	1/Executive Summary	Add specific reason for use of ISA Standard.	Added
2	4/1.0	Explain that purpose of Revision 1 is to express drift in %ELFS instead of decades.	Added
3	4/2.0	2nd paragraph—add: This value is less than the ± 0.8% ELFS drift term...	Added
4	11/6.5	Under D' Test: x_i should be X_i. Formula for standard deviation is not correct. Check statistics formula reference. s^2 = 0.135 according to my calculations.	Normal convention is to use x_i, not X_i, therefore, X_i was changed to x_i. Corrected standard deviation formula. S^2 calculates to 0.013456. Rounded up for conservatism.
5	12/6.5	S^2: correct s^2 used. T = 512.2 according to my calculations. D' = 362.2 accordingly.	These are precision errors between hand calculations and Excel. Numbers changed as requested.
6	13/6.7	3rd paragraph: Change decades to %ELFS in first sentence. Add: Note, Calculation... to second sentence.	Incorporated
7	13/6.8	Define SV.	Added
8	14/6.8	Add AV after Allowable Value. MAX FACTOR = 1.349^{+1}; MIN FACTOR = 1.349^{-1} = 0.7413. Use parenthesis in lieu of asterisks.	Incorporated