Duke Energy®

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July 19, 2011

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

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station, Units 1, 2 and 3
Docket Number 50-269, 50-270 and 50-287;
Response to Request for Additional Information Regarding License Amendment Request to Change Technical Specification Surveillance Requirement Frequencies to Support 24-Month Fuel Cycles
License Amendment Request (LAR) No. 2010-001, Supplement 3

On May 6, 2010, Duke Energy Carolinas, LLC (Duke Energy) submitted a LAR requesting Nuclear Regulatory Commission (NRC) approval to extend Oconee Nuclear Station (ONS) Technical Specification 18-month Surveillance Requirement frequencies to 24 months in accordance with the guidance of Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle." Duke Energy provided responses to NRC Request for Additional Information (RAI) by letters dated February 11, 2011 and April 28, 2011. The NRC electronically transmitted another RAI on June 10, 2011. The enclosures to this letter provide the requested information.

If there are any questions regarding this submittal, please contact Boyd Shingleton of the Oconee Regulatory Compliance Group at (864) 873-4716.

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 19, 2011.

Sincerely,

TPGillespie

T. Preston Gillespie, Jr., Vice President
Oconee Nuclear Station

Enclosures:

1. Duke Energy Response to NRC Request for Additional Information

A001
NRR

cc w/Enclosure:

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ENCLOSURE 1

Duke Energy Response to NRC Request for Additional Information

Enclosure 1
Duke Energy Response to NRC Request for Additional Information (RAI)

By letter dated April 28, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML 11124A126), the licensee responded to our letter dated February 11, 2011, Accession No. ML 110480489, for additional information (RAI).The licensee, also, provided the following documents with the letter dated April 28, 2011:

1. OSC 8828, Rev. 3, Digital RPS Pressure & Temperature Trip Function Uncertainties and Variable Low RCS Pressure Safety Limit

2. OSC 9771, Rev. 1, Drift Analysis for the RPS Reactor Coolant (RC) System Pressure.

The staff has reviewed the licensee's responses to the staff RAIs dated February 2011, and concluded that following additional information is required to complete the staff's evaluation of the licensee amendment request (LAR):

RAI 1

Response to RAI 1, Justifications to demonstrate why the new RPS/ESFS Digital System is suitable for extending calibration intervals to 24 months:

The licensee stated that the AREVA Document NO. 51-9004194-001, "Clarification of Accuracy Specifications for TELEPERM XS Modules SAAI, SNVI, and S466," provides additional details on the specifications for the TXS modules. Provide the AREVA Document No. 51-9004194-001 or applicable additional information from this document to justify 24 month fuel cycle extension.

Duke Energy Response to RAI 1

AREVA Document NO. 51-9004194-002, "Clarification of Accuracy Specifications for TELEPERM XS Modules SAAI, SNVI, and S466", has been provided on the sharepoint for review. Note this is revision 2 of the document.

From section 4.0 "Conclusions and Results" of this document:

"The 95/95 Analysis also confirmed that with all environmental and power supply variables held constant, there was no evidence of time dependent drift. Since the modules are not adjustable, the test results are consistent with manufacturer's representations that the magnitude of errors do NOT increase over time due to drift; therefore, no drift error component is specified for these modules (e.g. Drift Effect = 0)."

From section 4.1.1 "SAA1 95/95 Analysis Results":

"<u>SAA1 Drift Effects</u> - The analysis concluded that there are no significant indicators that errors increase over time (i.e. no time dependent drift). Therefore considering the manufacturer's specifications and representations that drift is zero (0), the test results substantiate their claims. This conclusion is also reasonable considering that the module cannot be calibrated or adjusted and must be replaced if observed errors exceed specified tolerances. The SAA1 published failure rates at 40°C of 214 Failure in Time (FIT) per channel with overall failure rate of 428 FIT are low, which also supports the conclusion that errors do not increase over time and remain bounded by specified error limits." Note: FIT is in units of 10^{-9}/hr.

From section 4.2.1 "SNV1 95/95 Analysis Results":

"SNV1 Drift Effects - The analysis concluded that there are no strong indicators that errors increase over time (i.e. no time dependent drift). Therefore considering the manufacturer's specifications and representations that drift is zero (0), the test results substantiate their claims. This conclusion is reasonable considering that the module cannot be calibrated or adjusted and must be replaced if observed errors exceed specified tolerances. The SNV1 published failure rates of 405 FIT at 28°C and 573 FIT at 40°C are low, which also supports the conclusion that errors do not increase over time and remain bounded by specified error limits."

From section 4.3.1 "S466 95/95 Analysis Results":

S466 Drift Effects - The analysis concluded that there are no strong indicators that errors increase over time (i.e. no time dependent drift). Therefore considering the manufacturer's specifications and representations that drift is zero (0), the test results substantiate their claims. This conclusion is reasonable considering that the module cannot be calibrated or adjusted and must be replaced if observed errors exceed specified tolerances. The S466 published failure rates of 1100 FIT at 28°C and 2500 FIT at 40°C are low, which also supports the conclusion that errors do not increase over time and remain bounded by specified error limits."

RAI 2

Response to RAI 2, As-left calibration settings:

Licensee's response indicates for the most instrument loops the as-left and as-found calibration settings are equal to each other and are direct additions of reference accuracies while for RPS/ESPS digital system they are SRSS combination of reference accuracies and M&TE uncertainties. Explain why these two different methods are used.

Duke Energy Response to RAI 2

The direct addition of reference accuracies to determine as-left and as-found calibration settings was chosen as a standard approach when first developing instrument calibration procedures for Oconee Nuclear Station (ONS). Most of the detailed uncertainty/setpoint calculations for ONS were developed subsequent to the instrument calibration procedures. Based on operating experience, the calibration tolerances established using the direct addition of reference accuracies were proven to be reasonable and were therefore included in the uncertainty/setpoint calculations as the calibration tolerance effect term. Therefore, the uncertainty/setpoint calculations and instrument procedures were in alignment with regard to calibration setting tolerances.

The implementation of the digital Reactor Protection System (RPS)/Engineered Safeguards Protective System (ESPS) required a complete revision of the instrument uncertainty/setpoint calculations and the creation of new instrument calibration procedures. The development of TSTF-493 "Clarify Application of Setpoint Methodology for LSSS Functions" was underway in parallel with the RPS/ESPS digital upgrade project. Since the focus of TSTF-493 was on the establishment of calculated as-found and as-left tolerances using a SRSS combination of terms, a decision was made to use this approach in establishing the setting tolerances for the digital system. Including the M&TE uncertainty in the calibration tolerance setting was also considered more significant for the digital system given the improved reference accuracies of the new instrumentation.

RAI 3

The staff reviewed the as-found tolerance calculation (OSC 8828 Section 7.11) and calibration procedure (IP/0/A/0305/001 M) for pressurizer pressure and determined that the calculated as-found tolerance value was not used as the Engineering notification limit within the calibration procedure. For example, the staff finds:

> Calculated As-Found Tolerance = 0.274 mA (This value is not used in the calibration procedure.)
>
> As Found / As Left Tolerance = 0.04 mA (Step 10.12.4 in IP/0/A/0305/001 M)
>
> Engineering Notification Limit = 2% of span = 0.32 mA (Step 10.12.5 in IP/0/A/0305/001 M)
>
> Explain and justify why the calculated As-Found tolerances are not being incorporated into the associated calibration procedures as described in the previous RAI response.

Duke Energy Response to RAI 3

Calculation OSC-8828 is applicable to the digital RPS/ESPS system whereas procedure IP/0/A/0305/001M is applicable to the analog RPS/ESPS system. The analogous procedure for the digital system is IP/1/A/0315/031A. As can be seen from Table 2 (attached) the calculated as-found tolerance of 0.274 madc is specified in IP/1/A/0315/031A. The instrument calibration procedures referenced in Table 2 for the digital system have been provided on the sharepoint for review.

RAI 4

Provide documentation to show that the calculated As-Found tolerance values were evaluated against the Engineering Notification Limits in the surveillance procedures and that either no changes were required for these engineering notification limits or that the engineering notification limits were adjusted to account for the new As-Found tolerance values. A summary table that includes the old and new calculated AF values as well as the Engineering notification limits (before and after) for each loop would serve to allow the staff to confirm the results of this evaluation.

Duke Energy Response to RAI 4

Table 1 (attached) provides a summary of the calibration setting tolerances and engineering notification limits specified in the instrument procedures, and the associated as-found calibration limits supported by the uncertainty/setpoint calculation, for the analog RPS and ESPS. Information for both the on-line channel functional test (CFT), which verifies plant trip setpoints are within Technical Specification Allowable Values, and the 18 month calibration surveillance is provided. The calibration setting tolerances (CTE) and engineering notification limits provided for the 18 month calibration surveillance are applicable to the current Unit 2 and 3 instrument procedures for a nominal 18 month calibration frequency. All uncertainty/setpoint calculations have been reviewed and updated as necessary to reflect the analyzed drift determined for 24 month cycles. The as-found limit provided is based on a nominal 24 month calibration frequency as documented in the referenced uncertainty/setpoint calculation. Therefore, verifying that the engineering notification limits in the current procedures are less than or equal to the as-found limits ensures the currently specified engineering notification limits are acceptable.

Table 2 (attached) provides a summary of the calibration setting tolerances and engineering notification limits specified in the instrument procedures, and the associated as-found calibration limits supported by the uncertainty/setpoint calculation, for the digital RPS and ES systems. As noted in Table 2, for the digital system no calibrations are performed as part of the CFT. The calibration setting tolerances (CTE) and engineering notification limits provided for the 18 month calibration surveillance are applicable to the current Unit 1 instrument procedures for a nominal 18 month calibration frequency. All uncertainty/setpoint calculations have been reviewed and updated as necessary to reflect the analyzed drift determined for 24 month cycles. The as-found limit provided is based on a nominal 24 month calibration frequency as documented in the referenced uncertainty/setpoint calculation. Therefore, verifying that the engineering notification limits in the current procedures are less than or equal to the as-found limits ensures the currently specified engineering notification limits are acceptable.

RAI 5

Provide a summary of the Drift Analysis results, preferably in a tabular format indicating all changes in Drift Terms, As-found Limits, Engineering Notification Limits, and total loop uncertainties for the cases where the existing design allowance (AD_E) is less than the analyzed drift for 30 months (AL_{30}). Also provide representative calculation(s) of nominal trip setpoints and allowable values for the cases where AD_E is less than AL30.

Duke Energy Response to RAI 5

This is response is being provided in response to the question as clarified with the NRC Staff. Duke has used AD_E to designate the analyzed drift determined for a maximum calibration interval of 30 months and AL_{30} to designate the existing design allowance in the setpoint/uncertainty calculation. Refer to OSC-9719, "Instrument Drift Analysis Methodology in Support of 24-Month Surveillance Interval" and section 7.6 of the instrument drift calculations. With that in mind, Tables 1 and 2 (attached) provide a summary of the requested information for all the RPS and ES functions for the analog system and the digital system, respectively. For completeness, the tables also include the nominal trip setpoint, allowable value and analytical limit as they apply to each function.

As noted from the tables, the analyzed drift determined for 30 months exceeded the acceptable limit for the RCS pressure functions. Section B.2 "RCS High Pressure Trip Function" and Section B.3 "RCS Low Pressure Trip Function" in OSC-4048 verify the acceptability of the nominal trip setpoint and allowable value for these RPS functions on the analog system. OSC-4048 was previously provided on the sharepoint for reviewer information. Section 7.9.1

"RCS High Pressure Trip Function" and Section 7.9.2 "RCS Low Pressure Trip Function" in OSC-8828 verify the acceptability of the nominal trip setpoint and allowable value for these RPS functions on the digital system. OSC-8828 was previously provided for reviewer information in response to RAI 7 submitted April 22, 2011.

RAI 6

Response to RAI 7, Corrective Actions:

Provide PIP 09-4103, and PT/-/A0600/001 referred in response to RAI 7.

Duke Energy Response to RAI 6

PIP 09-4103 and PT/_/A/0600/001 have been provided on the sharepoint for review. Corrective actions 2 and 3 of the PIP are associated with RAI 7 of the April 28, 2011 response. Corrective action 2 was associated with revising instrument uncertainty calculations OSC-4048 (Analog RPS/ESPS system) and OSC-8828 (Digital RPS/ESPS system) to incorporate the analyzed drift determined for 30 months documented in OSC-9771 of +/- 11.1 psig random, +/- 2.6 psig bias. Refer to Note 1 of Section A.2.1 for incorporation of the analyzed drift in OSC-4048 and Section 7.3.1 for incorporation of the analyzed drift in OSC-8828. Corrective action 3 was associated with revising PT/_/A/0600/001 to update the channel check limit for RPS RC Narrow Range Pressure based on the results of the drift analysis. Refer to the "RPS Instrumentation RC Pressure Narrow Range" channel check in Enclosures 13.1, 13.2, 13.3 and 13.4 for incorporation of the revised channel check limit of +/- 22 psig.

RAI 7

Based upon the RAI responses and discussions with the licensee, the staff has made the following interpretation of how the As-Found, As-Left, and Engineering Notification Limits are being applied at ONS. Please provide confirmation that this interpretation is correct or provide clarifying feedback on this discussion.

Drift Analysis (DA) have been provided for sensor and buffer amplifier portions of the RPS/ESPS loops. These DA's were performed in accordance with the guidance provided by GL 91-04. Plant calibration data over the period of several surveillance intervals was collected and analyzed for observed drift. This observed drift was then projected out to the new surveillance intervals and new drift terms were calculated. The results of these calculations were then used to modify the loop uncertainty calculations in order to determine if the existing NTSP's and AV's need to be modified. No changes to NTSP's and AV's were deemed necessary for any of the instrument loops associated with the RPS/ESPS system as a result of the drift analysis calculations provided.

The licensee uses two terms that are labeled as "As Found Limit" within their procedures and calculations. The first is a calculated As Found (AF) value that is determined by accumulation of all uncertainties associated with the loop including loop component reference accuracies, M&TE accuracies, setting tolerances, and loop component drift factors. This AF value is used indirectly to establish an Engineering Notification limit - in the instrument calibration procedures. This Engineering Notification limit is used as criteria by technicians to determine if additional failure analysis is required following an instrument calibration activity. For the purpose of this evaluation this term will be referred to as the "AF" term.

The second As Found Limit is the AF/AL limit that is used in surveillance calibration procedures by technicians to determine if adjustments need to be made for a particular instrument loop. For the purposes of this evaluation, this term will be referred to as the "AF/AL" term. The As Found and As Left (AF/AL) tolerances that are used in the ONS surveillance procedures do not include drift terms and are therefore not impacted by the drift analysis calculations.

The As Found AF term that is calculated within the loop uncertainty calculation does however include drift terms and this AF term is used to determine the engineering notification limits within the surveillance test procedures. The AF terms calculations were modified as a result of the uncertainty calculations.

As a rule of thumb, the licensee uses a value of two times the AF/AL limit for the engineering notification limit for each loop. As long as this two times AF/AL engineering notification limit is greater than the calculated AF term, it remains acceptable and is used within the surveillance procedures. The NRC expects the AF term to be much larger than two times AF/AL.

Duke Energy Response to RAI 7

First Paragraph
The interpretation is correct as stated with the following clarification. Drift analyses were not performed for the following RPS functions based on the sensor type and calibration methods (Nuclear Overpower, RCS High Outlet Temperature and Reactor Coolant Pump to Power). Justification for not performing a detailed drift analysis for these functions is provided in OSC-9852 which has been previously been made available on the sharepoint for review.

Second and Third Paragraph
The interpretation is correct as stated.

Fourth Paragraph
The interpretation is correct as stated with the following clarification. Only the uncertainty/setpoint calculations for the new digital RPS/ESPS contain an explicit calculation of the As Found AF term. For the uncertainty/setpoint calculations for the analog RPS/ESPS, the As Found AF term can be calculated by combining the applicable terms as noted in the second paragraph but these calculations do not contain an explicit determination or section for the As Found AF term.

Fifth Paragraph
The interpretation is correct as stated with the following clarification. In the second sentence, "greater than" should be replaced with "less than." In addition, it should be noted that for the new digital RPS/ESPS the two times the AF/AL limit for the engineering notification limit is not being used. Rather engineering notification limits are specified in engineering units less than or equal to the AF term. Also, for some of the calibration tolerances for the new digital system the AF term is not significantly larger than the AF/AL term.

RAI 8 - Additional Comments From NRC Statistician

Attachment 7, Detailed Evaluation Methods, to LAR dated May 6, 2010:

a. Page 3, section 1.1:

Define or describe what is meant by "rare" in phrase "except on rare occasions."

b. Page 18, section 4.7.2.2 (and other locations throughout the attachment):

Generally accepted statistical practices use $\bar{x}$ to denote the sample mean and s to denote the sample standard deviation. The population mean is denoted by μ and the population standard deviation is denoted by σ. This is important because use of σ implies that the population standard deviation is known and this determine whether normal or t-distribution varieties are used. This also affects the values used for confidence intervals and tolerance interval factors as well.

c. Page 18, section 4.7.2.4:

The use of critical t-values at the upper 1% significance level is a good idea; this will lead to more conservative results.

d. Page 19, section 4.7.3:

Care must be taken when designating values as "outliers" and removing them from calculations and analysis. Extreme care should be taken before removing more than one outlier, especially from small sample, since sometimes it is the outliers that provide the best information.

e. Page 45, section 5.3, formula for defining the sample mean:

The formula for the sample mean should use $\bar{x} = \sum_n D_n/n$ or $\bar{d} = \sum_n D_n/n$, not μ which is the parameter notation for the population mean.

f. Page 46, section 5.3, formula for the sample standard deviation:

The formula should use s instead of σ and $\bar{d}$ instead of μ since the Greek letters are parameters denoting population values, not sample statistics.

g. Page 53, definition of confidence interval.

A 95% confidence interval for the mean of a normal distribution with known population standard deviation σ is $\bar{x} \pm 1.96\frac{\sigma}{n}$,where n is the size of the sample on which $\bar{x}$ is based.

If the population standard deviation is unknown the confidence intervals are determined using the sample standard deviation and the t-distribution.

The definition given conflates the notion of a confidence interval and that of a tolerance interval.

A 95/95 tolerance interval is an interval for which there is 95% confidence that the interval contains 95% of the population (data values) for which the interval was determined.

In the case of a normal distribution with known mean μ and known ct interval containing 95% of the population values.

A tolerance interval based on a sample of data would be of the form $\bar{x} \pm$ (tif) s where tif is the tolerance interval factor based on the confidence, proportion of data covered, and the sample size.

A 95/95 tolerance interval based on a sample of size n = 30 would be $\bar{x} \pm 2.549 \cdot s$, as indicated in Table 4.2, on page 22 of this attachment. The tolerance interval factors decrease with increasing sample size, thus improving the precision of the estimate.

Calculation OSC-9809, Drift Analysis for ES Reactor Building High-High (TS SR 3.3.5.3):

Some comments may pertain to notation used even though calculations and descriptions are correct. This is done with the intent of reducing confusion and with the goal of having standard statistical notation used in the future.

a. Page 7: The expression (formula) for the sample mean is correct, but the notation is not typical. The sample mean is denoted by $\bar{x}$, not μ, which is the population mean..

b. Page 7: Similarly, the expression for the sample standard deviation is correct, but the notation is not. The sample standard deviation is denoted by s, not σ, which is used for the population standard deviation.

c. Page 24: Please provide the definition and derivation of the normality adjustment factor (NAF) — including relevant source material and tables.

d. Page 25: In section 7.4.1 it is stated that the once the bias portion of the Analyzed Drift (AD) is determined to be significant, it is always treated as being strongly time-dependent. Please justify this.

e. Page 25: Please explain why the analyzed Drift is treated as moderately time-dependent, but the AD bias is treated as strongly time-dependent.

f. Page 8: It is stated, "AF/AL data will be deemed to have failed the initial GL 91-04 constraint when more than 5% of the raw drift values exceed its Acceptable Limit." Provide justifications how the 5% number has been determined.

Duke Energy Response to RAI 8 - Additional Comments From NRC Statistician

Based on a review of this request, it is concluded that the following items are offered as comments only and do not affect any of the computational results of the drift analyses performed in support of transition to 24 month cycles. Therefore, these comments will be taken under advisement but do not require a specific response.

Attachment 7, Detailed Evaluation Methods, to LAR dated May 6, 2010:

b. Page 18, section 4.7.2.2 (and other locations throughout the attachment):

c. Page 18, section 4.7.2.4:

d. Page 19, section 4.7.3:

e. Page 45, section 5.3, formula for defining the sample mean:

f. Page 46, section 5.3, formula for the sample standard deviation:

g. Page 53, definition of confidence interval.

Calculation OSC-9809, Drift Analysis for ES Reactor Building High-High (TS SR 3.3.5.3):

a. Page 7: The expression (formula) for the sample mean is correct, but the notation is not typical. The sample mean is denoted by $\bar{x}$, not μ, which is used for the population of the mean.

b. Page 7: Similarly, the expression for the sample standard deviation is correct, but the notation is not. The sample standard deviation is denoted by s, not σ, which is used for the population standard deviation.

The Duke Energy response to the remaining items is given below.

RAI 8(1)a

Attachment 7, Detailed Evaluation Methods, to LAR dated May 6, 2010:

a. Page 3, section 1.1:

Define or describe what is meant by “rare” in phrase “except on rare occasions.”

Duke Energy Response to RAI 8(1)a

The phrase, "except on rare occasions", is used in Question 1 of Enclosure 2 of NRC GL 91-04 as follows:

"Confirm that instrument drift as determined by as-found and as-left calibration data from surveillance and maintenance records has not, **except on rare occasions**, exceeded acceptable limits for a calibration interval. The surveillance and maintenance history for instrument channels should demonstrate that most problems affecting instrument operability are found as a result of surveillance tests other than the instrument calibration. If the calibration data show that instrument drift is beyond acceptable limits on other than **rare occasions**, the calibration interval should not be increased because instrument drift would pose a greater safety problem in the future."

Neither GL 91-04 or EPRI TR-103335 provide a definition of "rare" as used in the above question. Based on this and the wording of the question, it is apparent that the intent is to ensure the instrumentation has been performing within the as-found limits documented in the setpoint/uncertainty calculation for the majority of the calibration surveillances. From this viewpoint, as noted in Section 5.10 "Acceptable Limits" of OSC-9719 (Attachment 7, Detailed Evaluation Methods) the Duke Energy drift analysis methodology allows a maximum of 5% AF/AL data point Acceptable Limit failures to be considered as "rare", that is 95% of the AF/AL data will NOT fail the Acceptable Limit test. This implies that no more than 2 out of 40 data points will fail the Acceptable Limit test. This level of confidence is consistent with industry standards in regard to instrumentation performance.

RAI 8(2)c

Calculation OSC-9809, Drift Analysis for ES Reactor Building High-High (TS SR 3.3.5.3):

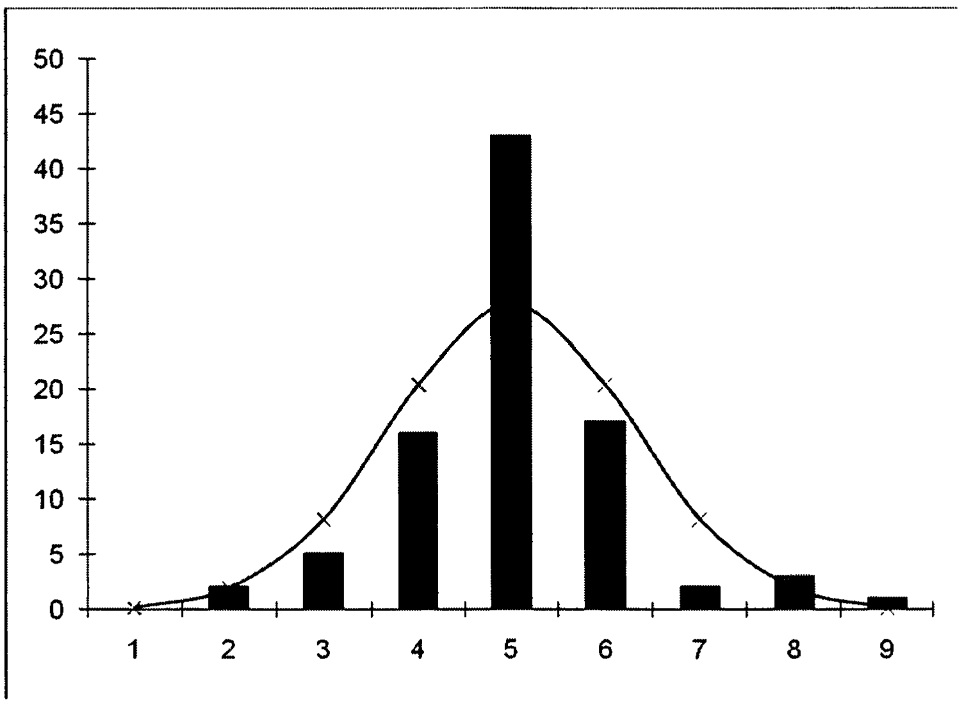
c. Page 24: Please provide the definition and derivation of the normality adjustment factor (NAF) — including relevant source material and tables.

Duke Energy Response to RAI 8(2)c

The normality adjustment factor is a multiplier whose magnitude is determined iteratively in order to increase the standard deviation of the sample data such that a minimum of 97.5% of the data is within the final tolerance interval established. This multiplier produces a normal distribution model for the drift, which shows adequate data population from the final data set within the $\pm 2\sigma$ bands of the model.

The term is an invented term based on the use of coverage analysis as discussed in EPRI TR-l03335-Rl, "Guidelines for Instrument Calibration Extension/Reduction Statistical Analysis of Instrument Calibration Data", Final Report, October 1998 (Reference 8.1.2 of OSC-9719). The concept of coverage analysis is discussed in Section C.5 of the EPRI document and stems from the fact that instrument calibration data often has such a high kurtosis (i.e.; a high centered peak distribution) that the data will fail a normality test. The coverage analysis involves the use of a histogram of the data set, overlaid with the equivalent probability distribution curve for the normal distribution, based on the data sample's mean and standard deviation. Visual examination of the plot is used, and the kurtosis is analyzed to determine if the distribution of the data is near normal. If the data is near normal, then a normal distribution model which adequately covers the set of drift data as observed is derived using the NAF. This normal distribution is then used as the model for the drift of the component or loop. Coverage analysis is discussed in detail in Section 4.8.3.3 of OSC-9719.

Instrument drift calculation OSC-9809 is an example where a NAF was applied to the drift data. Below is the histogram for this data set indicating the high kurtosis and near normal distribution of the data. This result is typical for those instrument loops where the final data set failed the normality test and therefore supports the use of coverage analysis as described in the EPRI document.



RAI 8(2)d

d. Page 25: In section 7.4.1 it is stated that the once the bias portion of the Analyzed Drift (AD) is determined to be significant, it is always treated as being strongly time-dependent. Please justify this.

Duke Energy Response to RAI 8(2)d

As noted in Section 4.10 of OSC-9719, the bias determination is made by comparison of the sample mean to the maximum value of the non-biased mean based on the sample standard deviation and the normal deviate, t (at 95% confidence). When the absolute value of the calculated mean for a given sample exceeds the maximum value for the sample size and the calculated standard deviation (Reference Table 4.5 in Section 4.10 of OSC-9719), the mean is conservatively treated as a bias to the drift term. Otherwise it is considered negligible in determining the Analyzed Drift for the 18 month calibration interval. This is the method used to determine if there is a bias in the 18 month AF/AL calibration data. As expected, the majority of the applications reviewed were found not to contain a bias. Due to the nature of biases and to ensure they are treated conservatively with regard to calibration extension to support 24 month cycles, the methodology dictates linear extrapolation to determine the bias for the extended calibration interval of 30 months. Linear extrapolation of random or bias drift terms is considered synonymous with "strongly time-dependent" in OSC-9719.

RAI 8(2)e

e. Page 25: Please explain why the analyzed Drift is treated as moderately time-dependent, but the AD bias is treated as strongly time-dependent.

Duke Energy Response to RAI 8(2)e

As discussed in item d above, since a drift bias (bias of the mean) was found in the 18 month AF/AL calibration data the bias value for the extended 30 month calibration interval was conservatively determined by linear extrapolation of the 18 month bias value. Per Section 4.11.1 of OSC-9719, if the sample random portion of the Analyzed Drift (standard deviation) is verified as moderately time-dependent by comparing multi-cycle versus single cycle data, the drift uncertainty for the extended calibration interval is extrapolated by using the square root of the ratio of the average multi-cycle data calibration interval and the average one-cycle data calibration interval. As described in Section 7.4.1 of OSC-9809, the ratio of the multi-cycle standard deviation to the single cycle standard deviation supports the assumption of moderate time dependency for this application. Therefore SRSS extrapolation of the random drift term is performed.

RAI 8(2)f

f. Page 8: It is stated, "AFAL data will be deemed to have failed the initial GL 91-04 constraint when more than 5% of the raw drift values exceed its Acceptable Limit." Provide justifications how the 5% number has been determined.

Duke Energy Response to RAI 8(2)f

Refer to the previous response (for RAI 8(1)a) for the comment on Attachment 7 item a., define or describe what is meant by "rare" in phrase "except on rare occasions."

Table 1 - Analog RPS/ESPS

SR 3.3.1.7 ANALOG RPS

Table 3.3.1-1	Reactor Protective System Instrumentation	Acceptable Limit (AL_{30})[1]	Analyzed Drift (AD_E)[2]	Analytical Limit[3]	Total Loop Uncertainty[4]	Allowable Value[5]	Nominal Trip Setpoint[6]
Item 1)	a. Nuclear Overpower - High Setpoint	not applicable		112% FP	± 5.0% FP	≤ 105.5% RTP[11]	104.75% FP
	b. Nuclear Overpower - Low Setpoint	not applicable		T/S AV is the only requirement.	No uncertainties applied.	≤ 5% RTP	4% FP
2)	RCS High Outlet Temperature	not applicable		620 °F	± 1.28 °F	≤ 618 °F	617 °F
3)	RCS High Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	2392 psig	± 20.2 psig	≤ 2355 psig	2345 psig
4)	RCS Low Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	1766.3 psig	± 20.2 psig	≥ 1800 psig	1810 psig
5)	RCS Variable Low Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	AV + 30 psig	± 25.3 psig	Per COLR	Varies
6)	Reactor Building High Pressure	± 0.24 psig	± 0.27 psig	Not credited in Safety Analysis	(+ 0.54 psig, - 0.37 psig)	≤ 4 psig	3.5 psig
7)	Reactor Coolant Pump to Power	not applicable		RCP's either on or off.	± 5.15% FP	> 2% RTP with ≤ 2 pumps operating	1.5% FP with ≤ 2 pumps operating
8)	Nuclear Overpower Flux/Flow Imbalance	± 0.93% span	± 0.89% random; – 0.07% bias span	109.4% FP[19]	2.2% FP	Per COLR	Varies
9)	Main Turbine Trip (Hydraulic Fluid Pressure)	± 17.0 psig	± 27.5 psig	Not credited in Safety Analysis	± 36.5 psig	≥ 800 psig	850 psig
10)	Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	± 1.7 psig	± 6.5 psig	68 psig[15]	± 8.2 psig	≥ 75 psig	85 psig
11)	Shutdown Bypass RCS High Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	2392 psig	± 20.2 psig	≤ 1720 psig	1710 psig

SR 3.3.5.4 ANALOG ES

Table 3.3.5-1	Engineered Safeguards System Instrumentation	Acceptable Limit (AL_{30})[1]	Analyzed Drift (AD_E)[2]	Analytical Limit[3]	Total Loop Uncertainty[4]	Allowable Value[5]	Nominal Trip Setpoint[6]
Item 1)	Reactor Coolant System Pressure - Low	± 0.87% span, ± 21.8 psig	± 0.54% span, ± 13.5 psig	1400 psig	+ 198.1 psi / – 120.4 psi	≥ 1590 psig	1600 psig
2)	Reactor Coolant System Pressure - Low Low	± 0.87% span, ± 21.8 psig	± 0.54% span, ± 13.5 psig	200 psig	+ 206.6 psi / – 120.4 psi	≥ 500 psig	550 psig
3)	Reactor Building (RB) Pressure - High	± 1.74% span	± 0.54% span	9 psig	± 0.6 psi (Barton); ± 0.4 psi (Rsmt)	≤ 4 psig	3 psig
4)	Reactor Building Pressure - High High	± 0.267 psi	± 0.291 psi random; ± 0.027 psi bias	20 psig	(+ 0.84 psig, - 0.50 psig)	≤ 15 psig	10 psig

SR 3.3.1.7 ANALOG RPS

		For On-Line Channel Functional Test (CFT)			For Channel 18/24 Month Calibration		
Table 3.3.1-1	Reactor Protective System Instrumentation	Calibration Setting Tolerance (CTE)[7,8]	Engineering Notification Limit[10]	As-Found Limit	Calibration Setting Tolerance (CTE)[8,16]	Engineering Notification Limit[10]	As-Found Limit[9]
Item 1)	a. Nuclear Overpower - High Setpoint	± 0.5625% FP	≥ 2 x CTE or ≥ 105.5% FP[11,12]	Not Affected by 24 Month Cycles[13]	± 0.5% FP (summer output)	≥ 2 x CTE	± 0.99% FP
	b. Nuclear Overpower - Low Setpoint	± 0.5% FP	≥ 2 x CTE or ≥ 5% FP[11]	Not Affected by 24 Month Cycles[13]	± 0.5% FP (summer output)	≥ 2 x CTE	± 0.99% FP
2)	RCS High Outlet Temperature	± 0.7 °F	≥ 2 x CTE or ≥ 618 °F[11,12]	Not Affected by 24 Month Cycles[13]	± 0.1% RTD Bridge, ± 0.35% signal converter	≥ 2 x CTE	± 0.58% Bridge, ± 0.74% SC
3)	RCS High Pressure	±0.45% of span, ±3.6 psig	≥ 2 x CTE	Not Affected by 24 Month Cycles[13]	± 0.04 vdc, ± 3.2 psig (transmitter thru buffer amp)	≥ 2 x CTE	± 11.1 psig
4)	RCS Low Pressure	±0.45% of span, ±3.6 psig	≥ 2 x CTE	Not Affected by 24 Month Cycles[13]	± 0.04 vdc, ± 3.2 psig (transmitter thru buffer amp)	≥ 2 x CTE	± 11.1 psig
5)	RCS Variable Low Pressure	± 4 psig	≥ 2 x CTE	Not Affected by 24 Month Cycles[13]	± 0.04 vdc, ± 3.2 psig (transmitter thru buffer amp)	≥ 2 x CTE	± 11.1 psig
6)	Reactor Building High Pressure	Not Applicable[20]	Not Applicable[20]	Not Affected by 24 Month Cycles[13]	± 1.0% of span, ± 0.1 psig (pressure switch)	> 2% of span (± 0.17 psig)	± 0.29 psig
7)	Reactor Coolant Pump to Power	± 0.375% FP	≥ 2 x CTE[12]	Not Affected by 24 Month Cycles[13]	± 0.375% FP (contact monitor thru bistable)	≥ 2 x CTE	± 0.91% FP
8)	Nuclear Overpower Flux/Flow Imbalance	± 0.54% flow	≥ 2 x CTE	Not Affected by 24 Month Cycles[13]	± 0.25% of span, ± 0.04 madc (transmitter)	≥ 2 x CTE	± 0.96% of span
9)	Main Turbine Trip (Hydraulic Fluid Pressure)	Not Applicable[20]	Not Applicable[20]	Not Affected by 24 Month Cycles[13]	± 3.43% of span, ± 24 psig (pressure switch)	≥ 2 x CTE[18]	Not Applicable [14]
10)	Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	Not Applicable[20]	Not Applicable[20]	Not Affected by 24 Month Cycles[13]	± 1.45% of span, ± 5 psig (pressure switch)	≥ 2 x CTE[18]	Not Applicable [17]
11)	Shutdown Bypass RCS High Pressure	±0.38% of span, ±3.0 psig	≥ 2 x CTE	Not Affected by 24 Month Cycles[13]	± 0.04 vdc, ± 3.2 psig (transmitter thru buffer amp)	≥ 2 x CTE	± 11.1 psig

SR 3.3.5.4 ANALOG ES

Table 3.3.5-1	Engineered Safeguards System Instrumentation	Calibration Setting Tolerance (CTE)[7,8]	Engineering Notification Limit[10]	As-Found Limit	Calibration Setting Tolerance (CTE)[8,16]	Engineering Notification Limit[10]	As-Found Limit[9]
Item 1)	Reactor Coolant System Pressure - Low	± 7.5 psi	≥ 2 x CTE[12]	Not Affected by 24 Month Cycles[13]	± 0.35% of span, ± 0.035 vdc (transmitter thru buffer amp)	≥ 2 x CTE	± 0.87% of span
2)	Reactor Coolant System Pressure - Low Low	± 7.5 psi	≥ 2 x CTE	Not Affected by 24 Month Cycles[13]	± 0.35% of span, ± 0.035 vdc (transmitter thru buffer amp)	≥ 2 x CTE	± 0.87% of span
3)	Reactor Building (RB) Pressure - High	± 0.09 psi	≥ 2 x CTE	Not Affected by 24 Month Cycles[13]	± 0.60% of span, ± 0.06 vdc (transmitter thru buffer amp)	≥ 2 x CTE	± 1.74% of span
4)	Reactor Building Pressure - High High	Not Applicable[20]	Not Applicable[20]	Not Affected by 24 Month Cycles[13]	± 0.50% of span, ± 0.085 psig (pressure switch)	≥ 2 x CTE	± 0.33 psig

SR 3.3.1.7	ANALOG RPS	References			
Table 3.3.1-1	Reactor Protective System Instrumentation	Drift Calculation	Uncertainty/Setpoint Calculation	Calibration Procedure for On-Line CFT	Calibration Procedure for 18 Month Channel Calibration
Item 1)	a. Nuclear Overpower - High Setpoint	OSC-9852, Section 6.1	OSC-7237	IP/1,2,3/0305/003 A, B, C, D	IP/1,2,3/0305/003 A, B, C, D and IP/1,2,3/A/0301/003E, F, G, H
	b. Nuclear Overpower - Low Setpoint	OSC-9852, Section 6.2	OSC-7237	IP/1,2,3/0305/003 A, B, C, D	IP/1,2,3/0305/003 A, B, C, D and IP/1,2,3/A/0301/003E, F, G, H
2)	RCS High Outlet Temperature	OSC-9852, Section 6.3	OSC-2729, OSC-4048	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/001E, F, G, H
3)	RCS High Pressure	OSC-9771	OSC-4048	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/001M, N, O, P
4)	RCS Low Pressure	OSC-9771	OSC-4048	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/001M, N, O, P
5)	RCS Variable Low Pressure	OSC-9771	OSC-4048	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/001E, F, G, H
6)	Reactor Building High Pressure	OSC-9819	OSC-3446	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/005A, B, C, D
7)	Reactor Coolant Pump to Power	OSC-9852, Section 6.4	OSC-7237	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/001A, B, C, D and IP/0/A/3955/001
8)	Nuclear Overpower Flux/Flow Imbalance	OSC-9793	OSC-3416	IP/1,2,3/0305/003 A, B, C, D; IP/0/A/0305/018	IP/1,2,3/A/0305/001I, J, K, L
9)	Main Turbine Trip (Hydraulic Fluid Pressure)	OSC-9792	OSC-3395	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/009, 10, 11, 12
10)	Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	OSC-9792	OSC-3395	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/009, 10, 11, 12
11)	Shutdown Bypass RCS High Pressure	OSC-9771	OSC-4048	IP/1,2,3/0305/003 A, B, C, D	IP/0/A/0305/001M, N, O, P

SR 3.3.5.4	ANALOG ES				
Table 3.3.5-1	Engineered Safeguards System Instrumentation	Drift Calculation	Uncertainty/Setpoint Calculation	Calibration Procedure for On-Line CFT	Calibration Procedure for 18 month Channel Calibration
Item 1)	Reactor Coolant System Pressure - Low	OSC-9752	OSC-2759	IP/0/A/0310/014A, B, C	IP/0/A/0310/003B, 4B, 5B
2)	Reactor Coolant System Pressure - Low Low	OSC-9752	OSC-2759	IP/0/A/0310/014A, B, C	IP/0/A/0310/003B, 4B, 5B
3)	Reactor Building (RB) Pressure - High	OSC-9720	OSC-2495	IP/0/A/0310/014A, B, C	IP/0/A/0310/003C, 4C, 5C
4)	Reactor Building Pressure - High High	OSC-9809	OSC-3446	IP/0/A/0310/014A, B, C	IP/0/A/0310/003D, 4D, 5D

TABLE 1 NOTES:

1) The acceptable limit for "drift" included in the uncertainty/setpoint calculation used to compare to the analyzed drift (A_D) determined by the drift analysis. Since the majority of ONS uncertainty/setpoint calculations utilize vendor specifications that support a maximum calibration interval of 30 months, this value is represented by AL_{30}.
2) The analyzed drift determined for the extended cycle from the drift calculation.
3) An Analytical Limit (AL) is defined by EDM-102 as "Limit of a measured or calculated variable established by the Safety Analyses to ensure that a Safety Limit is not exceeded".
4) Total Loop Uncertainty (TLU) as determined in the uncertainty/setpoint calculation.
5) Allowable Value (AV) as specified in Table 3.3.1-1 (RPS) or Table 3.3.5-1 (ES) of ONS Technical Specifications. As stated in TS Bases for RPS and ES, the AV is applicable to the channel functional test calibration activity which is performed on-line.
6) Nominal Trips Setpoint (NTSP), which is the value actually calibrated to in the instrument procedures (IP's).
7) Device or rack string setting tolerance (CTE). In this case, the rack setting tolerance consists only of the bistable.
8) The setting tolerance (CTE) is equal to the As-Found Tolerance (AFT). At Oconee, it is also equal to the As-Left Tolerance (ALT).
9) The as-found calibration limit supported by the uncertainty/setpoint calculation for 24 month cycles (Note as-found limits were calculated using the applicable terms from the uncertainty/setpoint calculation).
10) The limit specified in the calibration procedure for as-found readings that requires engineering notification to evaluate the out of tolerance condition.
11) Rated Thermal Power (RTP) = Full Power (FP)
12) The engineering notification limits were identified as non-conservative relative to the TS Allowable Value in PIP 11-01566 on 2/10/11. Corrective actions have been initiated to revise the affected instrument procedures as needed.
13) Since Channel Functional tests are performed on-line, transition to 24 month cycles has no impact on as-found limits.
14) The Main turbine trip on loss of EHC oil pressure is not credited in the Safety Analysis, therefore no specific as-found limit is detemined in the uncertainty/setpoint calculation.
15) The safety analysis limit is based on a one second time delay between loss of feedwater pumps to reactor trip. The analytical limit of 68 psig is based on an error of 20% of setting which supports the one second requirement with margin.
16) The instrument calibration setting tolerance for the 18 month channel calibration (includes the process sensor as applicable).
17) The referenced uncertainty/setpoint calculation does not specifically calculate an as-found limit due to excessive margin between the setpoint and analytical limit.
18) Although no specific as-found limits are specified, the engineering notification limit was identified as non-conservative to the calculated total loop uncertainty in PIP 11-07988. Corrective actions have been initiated to revise the affected instrument procedures as needed.
19) As specified in the COLR.
20) Pressure switch applications. No calibration tolerances are applicable to the CFT. CFT consists of simulation of pressure switch contact change at cabinet and verification of proper response.

Table 2 - Digital RPS/ESPS

SR 3.3.1.7 DIGITAL RPS

Table 3.3.1-1	Reactor Protective System Instrumentation	Acceptable Limit (AL_{30})[1]	Analyzed Drift (AD_E)[2]	Analytical Limit[3]	Total Loop Uncertainty[4]	Allowable Value[5]	Nominal Trip Setpoint[6]
Item	1) a. Nuclear Overpower - High Setpoint	not applicable		112% FP	± 2.32% FP	≤ 105.5% RTP[11]	104.75% FP
	b. Nuclear Overpower - Low Setpoint	not applicable		T/S AV is the only requirement.	No uncertainties applied.	≤ 5% RTP	4% FP
	2) RCS High Outlet Temperature	not applicable		620 °F	± 1.583 °F	≤ 618 °F	617 °F
	3) RCS High Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	2392 psig	± 20.49 psig	≤ 2355 psig	2345 psig
	4) RCS Low Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	1766.3 psig	± 20.49 psig	≥ 1800 psig	1810 psig
	5) RCS Variable Low Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	AV + 30 psig	± 27.797 psig	Per COLR	Varies
	6) Reactor Building High Pressure	± 0.24 psig	± 0.27 psig	Not credited in Safety Analysis	(+ 0.54 psig, - 0.37 psig)	≤ 4 psig	3.5 psig
	7) Reactor Coolant Pump to Power	not applicable		RCP's either on or off.	± 2.32% FP	> 2% RTP with ≤ 2 pumps operating	1.5% FP with ≤ 2 pumps operating
	8) Nuclear Overpower Flux/Flow Imbalance	± 0.93% span	± 0.89% random; – 0.07% bias	109.4% FP[18]	3.606% FP	Per COLR	Varies
	9) Main Turbine Trip (Hydraulic Fluid Pressure)	± 17.0 psig	± 27.5 psig	Not credited in Safety Analysis	± 36.5 psig	≥ 800 psig	850 psig
	10) Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	± 1.7 psig	± 6.5 psig	68 psig[15]	± 8.2 psig	≥ 75 psig	85 psig
	11) Shutdown Bypass RCS High Pressure	± 9.6 psig	± 11.1 psig random; ± 2.6 psig bias	2392 psig	± 20.49 psig	≤ 1720 psig	1710 psig

SR 3.3.5.4 DIGITAL ES

Table 3.3.5-1	Engineered Safeguards System Instrumentation	Acceptable Limit (AL_{30})[1]	Analyzed Drift (AD_E)[2]	Analytical Limit[3]	Total Loop Uncertainty[4]	Allowable Value[5]	Nominal Trip Setpoint[6]
Item	1) Reactor Coolant System Pressure - Low	± 0.87% span, ± 21.8 psig	± 0.54% span, ± 13.5 psig	1400 psig	+ 190.39 psi / – 173.51psi	≥ 1590 psig	1600 psig
	2) Reactor Coolant System Pressure - Low Low	± 0.87% span, ± 21.8 psig	± 0.54% span, ± 13.5 psig	200 psig	+ 190.39 psi / – 173.51psi	≥ 500 psig	550 psig
	3) Reactor Building (RB) Pressure - High	± 1.74% span	± 0.54% span	9 psig	± 0.6 psi (Barton); ± 0.4 psi (Rsmt)	≤ 4 psig	3 psig
	4) Reactor Building Pressure - High High	± 0.267 psi	± 0.291 psi random; ± 0.027 psi bias	20 psig	(+ 0.84 psig, - 0.50 psig)	≤ 15 psig	10 psig

SR 3.3.1.7 DIGITAL RPS

		For On-Line Channel Functional Test (CFT)			For Channel 18/24 Month Calibration		
Table 3.3.1-1	Reactor Protective System Instrumentation	Calibration Setting Tolerance (CTE)[7,8]	Engineering Notification Limit[10]	As-Found Limit	Calibration Setting Tolerance (CTE)[8,13]	Engineering Notification Limit[10]	As-Found Limit[9]
Item	1) a. Nuclear Overpower - High Setpoint	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.42 % FP	± 0.42 % FP	± 0.42 % FP
	b. Nuclear Overpower - Low Setpoint	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.42 % FP	± 0.42 % FP	± 0.42 % FP
	2) RCS High Outlet Temperature	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (temp trans), ± 0.36 F (string)	± 0.07 madc (temp trans), ± 0.51 F (string)	± 0.07 madc (temp trans), ± 0.51 F
	3) RCS High Pressure	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (press trans), ± 7.7 psig (string)	± 0.274 madc (press trans), ± 11.5 psig (string)	± 0.274 madc (press trans), ± 11.5
	4) RCS Low Pressure	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (press trans), ± 7.7 psig (string)	± 0.274 madc (press trans), ± 11.5 psig (string)	± 0.274 madc (press trans), ± 11.5
	5) RCS Variable Low Pressure	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (press trans), ± 7.7 psig (string)	± 0.274 madc (press trans), ± 11.5 psig (string)	± 0.274 madc (press trans), ± 11.5
	6) Reactor Building High Pressure	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 1.0% of span, ± 0.1 psig	≥ ± 0.2 psig	± 0.29 psig
	7) Reactor Coolant Pump to Power	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.42%	± 0.42%	± 0.42%
	8) Nuclear Overpower Flux/Flow Imbalance	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (flows trans), ± 0.5% (string)	± 0.08 madc (press trans), ± 0.78% (string)	± 0.1072 madc (press trans), ±
	9) Main Turbine Trip (Hydraulic Fluid Pressure)	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 3.43% of span, ± 24 psig	≥ 48 psig[16]	Not Applicable[14]
	10) Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 1.45% of span, ± 5 psig	≥ 10 psig[16]	Not Applicable[17]
	11) Shutdown Bypass RCS High Pressure	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (press trans), ± 7.7 psig (string)	± 0.274 madc (press trans), ± 11.5 psig (string)	± 0.274 madc (press trans), ± 11.5

SR 3.3.5.4 DIGITAL ES

Table 3.3.5-1	Engineered Safeguards System Instrumentation	Calibration Setting Tolerance (CTE)[7,8]	Engineering Notification Limit[10]	As-Found Limit	Calibration Setting Tolerance (CTE)[8,13]	Engineering Notification Limit[10]	As-Found Limit[9]
Item	1) Reactor Coolant System Pressure - Low	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (press trans), ± 12 psig (string)	± 0.07 madc (press trans), ± 14 psig (string)	± 0.07 madc (press trans), ± 14.10
	2) Reactor Coolant System Pressure - Low Low	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.04 madc (press trans), ± 12 psig (string)	± 0.07 madc (press trans), ± 14 psig (string)	± 0.07 madc (press trans), ± 14.10
	3) Reactor Building (RB) Pressure - High	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	*± 0.04 madc (Rosemount press trans), ± 0.202 psig (string)*	*± 0.08 madc (Rosemount press trans), ± 0.209 psig (string)*	*± 0.11 madc (Rosemount press*
	4) Reactor Building Pressure - High High	Not Applicable[12]	Not Applicable[12]	Not Applicable[12]	± 0.50% of span, ± 0.085 psig	≥ 0.17 psig	± 0.33 psig

SR 3.3.1.7	DIGITAL RPS	References			
Table 3.3.1-1	Reactor Protective System Instrumentation	Drift Calculation	Uncertainty/Setpoint Calculation	Calibration Procedure for On-Line CFT	Calibration Procedure for 18 Month Channel Calibration
Item 1)	a. Nuclear Overpower - High Setpoint	OSC-9852, Section 6.1	OSC-8856	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/011A, B, C, D
	b. Nuclear Overpower - Low Setpoint	OSC-9852, Section 6.2	not applicable	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/011A, B, C, D
2)	RCS High Outlet Temperature	OSC-9852, Section 6.3	OSC-8828	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/010A, B, C, D
3)	RCS High Pressure	OSC-9771	OSC-8828	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/031A, B, C, D
4)	RCS Low Pressure	OSC-9771	OSC-8828	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/031A, B, C, D
5)	RCS Variable Low Pressure	OSC-9771	OSC-8828	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/031A, B, C, D
6)	Reactor Building High Pressure	OSC-9819	OSC-3446	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/033A, B, C, D
7)	Reactor Coolant Pump to Power	OSC-9852, Section 6.4	OSC-8856	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/030A, B, C, D; IP/1/A/0315/011A, B, C, D
8)	*Nuclear Overpower Flux/Flow Imbalance*	OSC-9793	OSC-8857	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/032A, B, C, D
9)	Main Turbine Trip (Hydraulic Fluid Pressure)	OSC-9792	OSC-3395	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/034A, B, C, D
10)	Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)	OSC-9792	OSC-3395	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/034A, B, C, D
11)	Shutdown Bypass RCS High Pressure	OSC-9771	OSC-8828	IP/1/A/0315/020A, B, C, D; IP/1/A/0315/009	IP/1/A/0315/031A, B, C, D

SR 3.3.5.4	DIGITAL ES				
Table 3.3.5-1	Engineered Safeguards System Instrumentation	Drift Calculation	Uncertainty/Setpoint Calculation	Calibration Procedure for On-Line CFT	Calibration Procedure for 18 month Channel Calibration
Item 1)	Reactor Coolant System Pressure - Low	OSC-9752	OSC-8829	IP/1/A/0315/020E, F, G; IP/1/A/0315/009	IP/1/A/0315/070A, B, C
2)	Reactor Coolant System Pressure - Low Low	OSC-9752	OSC-8829	IP/1/A/0315/020E, F, G; IP/1/A/0315/009	IP/1/A/0315/070A, B, C
3)	Reactor Building (RB) Pressure - High	OSC-9720	OSC-2495	IP/1/A/0315/020E, F, G; IP/1/A/0315/009	IP/1/A/0315/071A, B, C
4)	Reactor Building Pressure - High High	OSC-9809	OSC-3446	IP/1/A/0315/020E, F, G; IP/1/A/0315/009	IP/1/A/0315/071A, B, C

TABLE 2 NOTES:

1) The acceptable limit for "drift" included in the uncertainty/setpoint calculation used to compare to the analyzed drift (AQ) determined by the drift analysis. Since the majority of ONS uncertainty/setpoint calculations utilize vendor specifications that support a maximum calibration interval of 30 months, this value is represented by AL_{30}.
2) The analyzed drift determined for the extended cycle from the drift calculation.
3) An Analytical Limit (AL) is defined by EDM-102 as "Limit of a measured or calculated variable established by the Safety Analyses to ensure that a Safety Limit is not exceeded".
4) Total Loop Uncertainty (TLU) as determined in the uncertainty/setpoint calculation.
5) Allowable Value (AV) as specified in Table 3.3.1-1 (RPS) or Table 3.3.5-1 (ES) of ONS Technical Specifications. As stated in the TS Bases for RPS and ES, the actual trip setpoint entered into the processor ouput trip device is more conservative than the AV.
6) Nominal Trips Setpoint (NTSP), which is the value actually calibrated to in the instrument procedures (IP's).
7) The device or rack string calibration setting tolerance (CTE) from the referenced instrument calibration procedure.
8) The setting tolerance (CTE) is equal to the As-Found Tolerance (AFT). At Oconee, it is also equal to the As-Left Tolerance (ALT).
9) *The as-found calibration limit supported by the uncertainty/setpoint calculation for 24 month cycles (Note the string as-found limits were calculated using the applicable terms from the uncertainty/setpoint calculation).*
10) The limit specified in the calibration procedure for as-found readings that requires engineering notification to evaluate the out of tolerance condition.
11) Rated Thermal Power (RTP) = Full Power (FP)
12) CFTs are performed by using the Graphic Service Monitor to retrieve the setpoint values used by the safety function processors and manually verify that the software setpoints match the required values. No calibrations are performed.
13) The instrument calibration setting tolerance for the 18 month channel calbration (Includes the process sensor as applicable).
14) The Main Turbine trip on loss of EHC oil pressure is not credited in the Safety Analysis, therefore no specific as-found limit is determined in the uncertainty/setpoint calculation.
15) The safety analysis limit is based on a one second time delay between loss of feedwater pumps to reactor trip. The analytical limit of 68 psig is based on an error of 20% of setting which supports the one second requirement with margin.
16) Although no specific as-found limits are specified, the engineering notification limit was identified as non-conservative to the calculated total loop uncertainty in PIP 11-07988. Corrective actions have been initiated to revise the affected instrument procedures as needed.
17) The referenced uncertainty/setpoint calculation does not specifically calculate as as-found limit due to excessive margin bewteen the setpoint and analytical limit.
18) As specified in the COLR.