Lewis Sumner
Vice President
Hatch Project Support

Southern Nuclear Operating Company, Inc.
40 Inverness Parkway
Post Office Box 1295
Birmingham, Alabama 35201

Tel 205.992.7279
Fax 205.992.0341

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March 27, 2002

Docket Nos. 50-321
50-366

HL-6215

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Edwin I. Hatch Nuclear Plant
Response to Request for Additional Information
Relative to
Request to Revise Technical Specifications:
18- to 24-Month Fuel Cycle Extension

Ladies and Gentlemen:

By letter dated September 20, 2001, Southern Nuclear Operating Company (SNC) submitted to the NRC proposed Technical Specifications (TS) changes to support the implementation of a 24-month fuel cycle. On January 29, 2002, the NRC/NRR Hatch Project Manager forwarded to SNC a Request for Additional Information containing NRC Staff review requests related to SNC's September 20, 2001, submittal. Enclosure 1 provides documentation of the NRC's requests followed by SNC's responses. Enclosure 2 contains SNC's Evaluation of the NRC Status Report on the Staff Review of EPRI Technical Report 103335, "Guidelines for Instrument Calibration Extension/Reduction Programs," which is referenced in Enclosure 1. Enclosure 3 contains revisions to Unit 1 and Unit 2 TS Table 3.3.1.1-1, Surveillance Requirement (SR) 3.3.5.1, and SR 3.3.5.2 transmitted in SNC's original amendment request dated September 20, 2001. The Enclosure 3 revisions are in response to NRC Request Nos. 13 and 14 provided in Enclosure 1. The revised Unit 1 and Unit 2 TS pages supersede the corresponding pages contained in Enclosure 7 of the original submittal. Enclosure 4 contains the associated marked-up TS pages that supersede the corresponding pages contained in Enclosure 8 of the original submittal. Enclosures 1 through 6 of the original submittal are unchanged.

Should you have any questions in this regard, please contact this office.

Respectfully submitted,

Lewis Sumner

H. L. Sumner, Jr.

TWL/sp

Enclosures:
1. Response to Request for Additional Information
2. SNC's Evaluation of the NRC Status Report on the Staff Review of EPRI Technical Report 103335, "Guidelines for Instrument Calibration Extension/Reduction Programs"
3. Revised Proposed Technical Specifications Pages
4. Marked-Up Revised Proposed Technical Specifications Pages

A001

cc: Southern Nuclear Operating Company
Mr. P. H. Wells, Nuclear Plant General Manager
SNC Document Management (R-Type A02.001)

U.S. Nuclear Regulatory Commission, Washington, D.C.
Mr. L. N. Olshan, Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. J. T. Munday, Senior Resident Inspector - Hatch

Enclosure 1

Edwin I. Hatch Nuclear Plant
Response to Request for Additional Information
Technical Specifications 18- to 24-Month Fuel Cycle Extension

NRC Request No. 1

Page E1-6, Second paragraph. Please list any and all conservative assumptions that were made in the various analyses.

SNC Response:

Specifically, the cited paragraph states:

> The HNP design guide utilizes the as-found/as-left (AFAL) analysis methodology to statistically determine drift for current calibration intervals. Using recommendations from the EPRI TR-103335 and NRC review comments to the TR, the time dependence of the current drift was evaluated, where possible, and conservative assumptions were made in extrapolating current drift values to new drift values to be used for a 24-month fuel cycle.

Table 1 is a listing of drift studies supporting the Plant Hatch 24-Month Fuel Cycle Extension Project, where conservative assumptions were used for extrapolation purposes.

NRC Request No. 2

Page E3.2 [sic], *Paragraph 3.2. "Statistical test* [sic] *not covered by this design may be utilized provided..." Please indicate whether and where such tests were actually used.*

SNC Response:

The cited passage states:

> Statistical tests not covered by this design guide may be utilized providing the Engineer performing the analysis adequately justifies the use of the tests.

No such tests were used in support of the Plant Hatch 24-Month Fuel Cycle Extension Project. Enclosure 3 of SNC's original submittal is an overall methodology for drift studies at Plant Hatch, and although the document was generated for use on this project, it is not intended to be limited in use to this project.

NRC Request No. 3

Page E3-5, Section 3.4.2. We agree that the smaller the sample pool, the larger is the (statistical) penalty. However, a minimum sample size needs to be address [sic]. *Also please tabulate the sample size used for the various analyses/function. Staff has accepted the minimum sample size of 30 previously. If a sample size of less than 30 is used for Hatch then please provide the justification for that case.*

SNC Response:

There were only two instances where the drift data population for a drift study was < 30 data points. In each case, no outliers were removed. The justifications for performing the analysis in each of the drift studies, which are copied directly from the engineering judgments within the drift studies, are provided below.

1. SNC-009 — Rosemount 1153 Series B or D Pressure Transmitters, with Range Code 9

   Justification: This analysis was performed with a total number of 24 analyzed drift values. In most cases, statistically, a data set is not considered valid unless at least 30 data values are used. However, in this case, all data possible was analyzed from these transmitters from 1990 until the present time. Cursory analysis of the data within the Outliers page shows the data to be relatively consistent. This is evidence that the data distribution is likely to be reasonably accurate as analyzed. Additionally, the method of determining the analyzed drift value for 24 data values uses a very high Normality Adjustment Factor (NAF) and Tolerance Interval Factor (TIF) for 95/95 confidence, providing the required conservatism for use in setpoint calculations. A similar plant, which recently submitted for a 24-month fuel cycle, showed significantly smaller Analyzed Drift values, in a much larger data set, which addressed this instrument type. Therefore, although this study only analyzes 24 drift data points, the results are conservative for the application.

2. SNC-011 — Rosemount 1153 Series B or D Differential Pressure Transmitters, with Range Codes 4-8

   Justification: This analysis was performed with a total number of 22 analyzed drift values. In most cases, statistically, a data set is not considered valid unless at least 30 data values are used. However, in this case, all data possible was analyzed from these transmitters from 1990 until the present time. Cursory analysis of the data within the Outliers page shows the data to be relatively consistent, and the W-Test results show that the data is likely from a normal distribution. These facts are evidence that the data distribution is likely to be reasonably accurate as analyzed. Additionally, the method of determining the analyzed drift value for 22 data values uses a very high Tolerance Interval Factor (TIF) for 95/95 confidence, providing the required conservatism for use in setpoint calculations. Another similar plant, which recently submitted for a 24-month fuel cycle, showed significantly smaller Analyzed Drift values, in a much larger data set, which addressed this instrument type. Therefore, although this calculation only analyzes 22 drift data points, the analysis results are considered conservative for the application.

NRC Request No. 4:

Page E3-5, Table 1: 95/95 Tolerance Interval Factors. Table values are slightly smaller than those given in the general literature (cf., Robert Odeh and Donald Owen, "Tables for Normal Tolerance Limits," Marcel Dekker, Inc, New York, 1980.) Please identify the source of your table entries.

SNC Response:

TIF values are from Table VII(a) of "Statistics for Nuclear Engineers and Scientists Part 1: Basic Statistical Inference," William J. Beggs; February 1981, which is Reference 7.3.7 of Enclosure 3 of

SNC's original submittal. In the research process to answer this question, the values were again verified to correctly match those in Reference 7.3.7.

NRC Request No. 5

Pages E3-10 and E-11, Outlier Analysis. Outlier analysis is served only to identify a single observation that may be considered for exclusion from the database. It does not provide a statistical license to exclude questionable data points without an appropriate engineering judgement. Also, even statistical procedures (at least those developed in the general literature) do not permit the exclusion of more than one point. Although SNC recognizes this limitation (page E3-11, line 14 from the bottom), it violates this rule as a special case (Page E3-11, line 5 from the bottom). Please identify data points that were considered outliers and whether these points were excluded from the analysis. Please justify the exclusion of more than one data point as outlier.

SNC Response:

Only 4 drift studies in support of the 24-Month Fuel Cycle Extension Project allowed the removal of more than 1 outlier. The justifications for these are given below.

A. Drift Studies SNC-002 and SNC-012 only removed 2 outliers each. These drift studies involve the 5-point calibrations of Barton 763 pressure transmitters and Rosemount 1154 Series gauge pressure transmitters. These studies each had large sample sizes (222 and 102, respectively), and they each involve a complicated calibration process. Because of the complexity of the calibrations performed on these instruments (and therefore the difficulty in specifically diagnosing calibration problems) and the large number of drift data points included, removal of only one outlier in this situation is considered overly restrictive, and not conducive to accurately representing the actual performance of the devices. Therefore, two drift data points were removed as outliers.

B. Drift study SNC-001 removed 3 outliers, based upon the same reasoning, but the data set was significantly larger (303 drift values). Once again, because of the complexity of the calibrations performed on these instruments (and therefore the difficulty in specifically diagnosing calibration problems) and the large number of drift data points included, removal of only one outlier in this situation is considered overly restrictive, and not conducive to accurately representing the actual performance of the devices. Therefore, three drift data points were removed as outliers.

C. Drift study SNC-004 removed 14 outliers. In this case, because of the extremely large size of the data set (1616 drift data points), removal of only one outlier is not appropriate, since the data could be significantly skewed by a very small percentage of the data points, shown as outliers. Of the 14 outliers, 8 are from 2U61-N105B, which was identified as a poor performer, and has since been replaced. The data from this poor performer, which should no longer exist, could significantly skew the data and give an unrealistic model of device performance to be observed after implementation of the 24-Month Fuel Cycle Extension Project. Therefore, the 14 outliers are removed from the data set.

Note that in all cases, the number of outliers removed is < 2% of the total data population, and in 3 of the 4 cases, the outliers represented are < 1%. Therefore, although the outliers removed are greater 1, the removal of the outliers is anticipated to more accurately reflect actual device performance after implementation of the 24-Month Fuel Cycle Extension Project. If the drift values derived do not encompass the observed drift following project implementation, the improved instrument-monitoring

program will detect this condition and appropriately initiate design action, maintenance action, or both to correct the problem.

NRC Request No. 6

Page E3-16, Table 3. The table considers both one and two standard deviations and characterizes the total percentage of the normal distribution between paired limits as 68.27% and 95.45%, respectively. The discussion that follows the table considers only the 2 standard deviation boundary. Please elaborate.

SNC Response:

The two limits shown in Table 3 are intended to help the user understand the expected distribution of data within a normal distribution; however, the only specific limit used as a criterion is the 2 standard deviation limit. SNC's experience with drift studies indicates that if the 2 standard deviation limit is met, the 1 standard deviation limit will either be met or extremely close to passing. The drift data is typically either normally distributed or conservatively treated as normally distributed. As is evident by this passage, the object is to establish a model for the drift error, which can be conservatively used in setpoint analysis. The process defined by this paragraph effectively establishes such a model.

NRC Request No. 7

Page E3-16, Paragraph 3.8. Please indicate where (and whether) binomial variables (pass/fail) were used at all and if so, where.

SNC Response:

Binomial variables were not used in support of the Plant Hatch 24-Month Fuel Cycle Extension Project.

NRC Request No. 8

Page E3-19, First paragraph. Regression Time Dependency Analytical Tests. SNC states that if R^2 (where R is the correlation coefficient) is greater than 0.3, the drift is linearly time dependent. Conversely, if R^2 is less than or equal to 0.3, the drift is treated as time independent. This criterion is arbitrary and unsupportable for several reasons:

- *If the population correlation coefficient is exactly zero (0.00), drift and time are independent only if both drift and time follow the normal distribution. Since time is fixed, time does not follow the normal distribution.*
- *If time and drift are independent, one could possibly test whether the sample correlation coefficients differ from zero significantly. This test, which is a function of the sample size, was not conducted by SNC. Be aware that the power of the statistical test in the determination of departure from zero correlation is a function of the sample size.*
- *The use of R^2, rather than R, is misleading. Note that if $R^2 = 0.3$ then $R = 0.55$, which, intuitively, is an unacceptably high correlation.*

Please provide the justification for using this criterion.

SNC Response:

The R^2 test is not intended to be supportable independently, but as one diverse check among several. Use of any specific criterion for this value could prove to be acceptable or unacceptable, based upon the perspective of the reviewer. Therefore, the use of:

- various statistical tests, with their own objective criteria, and
- graphical data to help in engineering judgment of the directionality and magnitude of the data over time

is the only defendable approach to the specific determination of time dependency. As shown by Enclosure 3 of SNC's original submittal, the F Test, the P Test, the R^2 test, and visual examinations of data within the regression plots, scatter plot, and binning plot are all used to determine the time dependency of drift data. The overall process of time dependency determination is anticipated to conservatively identify data sets that appear to have time-dependent attributes.

Even given all of the above arguments against the R^2 test, the test still provides a measure of the correlation of the drift data versus linear time dependency of drift data for a given device type. In other words, if the drift data for a given device type is 100% linearly time dependent and is repeatable from device to device, the R^2 value and, therefore, the R value will be equal to 1. An objective and nonrigorously determined criterion of 0.3 is used for the R^2 value at this time. It is fully anticipated that if the criterion is changed to a value more palatable for other reviewers, when the entire process is applied as stated, no changes in determination of time dependency will be realized for any analyzed devices.

In each drift study, the results of rigorous statistical determination methods were checked versus the intuitive indications from the scatter plots, binning plots, and regression plots to ensure a correct and conservative determination was made.

NRC Request No. 9

Page E3-20, second bullet. Significance of the F-Test. Why was the level of significance chosen at the 2.5% level?

SNC Response:

This comment highlights an error made in Enclosure 3 of SNC's original submittal. The manual was originally developed using the 2.5% level with an action item to confirm the significance level prior to production of drift calculations. Per a discussion with Mr. Dan Laury of the NRC and Mr. Kirk Melson of EXCEL Services on May 22, 2001, the correct level of significance to be used for the FINV function in the EXCEL spreadsheet is 5%. The 5% significance was used on all SNC drift studies; however, Enclosure 3 was inadvertently left at 2.5% after that conversation.

NRC Request No. 10

Page E3-24, Paragraph 4.1.1.9. Data exclusion by the responsible engineer. How many data points is he allowed to exclude?

SNC Response:

The responsible engineer is allowed to remove all invalid data values without numerical limits. If the responsible engineer notes that data values were taken on a specific Barton transmitter up to 1997, and the transmitter was replaced in 1997 with a Rosemount transmitter, all data prior to 1997 (no matter how many data points there are) is eliminated, because following implementation of the 24-Month Fuel Cycle Extension Project, Rosemount transmitters will always be used in this application. In the same way, where any situation causes the data taken to be invalid in representing the actual device performance, whatever the cause, the responsible engineer is allowed to remove the data without regard to the number of data points. If the data population dropped to unacceptably low levels, the standard drift study would not be performed, since an adequate volume of valid drift data was not available.

NRC Request No. 11

Page E3-27, first paragraph. Normality test. What level of significance was used in the statistical tests?

SNC Response:

The Chi-Square Tests are performed in accordance with EPRI TR-103335R1, "Statistical Analysis of Instrument Calibration Data - Guidelines for Instrument Calibration Extension/Reduction Programs," October 1998, which is Reference 7.1.1 of Enclosure 3 of SNC's original submittal. The Chi-Square Tests are performed at the 5% significance level.

The D Prime and W Tests are performed per ANSI N15.15-1974, "Assessment of the Assumption of Normality (Employing Individual Observed Values)," which is Reference 7.1.4 of Enclosure 3 of SNC's original submittal. The W Tests are performed at the 5% significance level, and the D Prime Tests (two sided) are performed at the 2.5% Significance level.

NRC Request No. 12

Page E1-6 states that HNP utilizes EPRI-103335 and NRC review comments to the TR. Please discuss how HNP methodology addresses each of the NRC's review comments on the EPRI document. Also Section 3.1 of the methodology does not reference NRC review comments.

SNC Response:

Enclosure 2 of this submittal lists the specific NRC comments to the EPRI TR-103335 and shows how each comment was considered in the development of the SNC drift methodology and the 24-Month Fuel Cycle Extension Project.

NRC Request No. 13

For some instrumentation channel functional test (CFT) duration has been increased form [sic] *3 months* [sic]*to 24 months. Compliance with GL 91-04 does not provide the basis for changing the duration from 3 months to 24 months. Therefore, these functions should either be removed form* [sic] *the request or*

other basis based on PRA and deterministic analysis should be provided for these functions. (Table 3.3-1-1-1 [sic] *function 7a, SR 3.3.5.1.3 and 3.3.5.2.3)*

SNC Response:

The request to change the 92-day Frequency of the CHANNEL FUNCTIONAL TEST [Technical Specifications (TS) Table 3.3.1.1-1, Function 7.a; SR 3.3.5.1.3; and SR 3.3.5.2.3 to a 24-month Frequency is being removed from the amendment request. The revised TS pages showing the changes are included in Enclosure 3 of this submittal, and the revised marked-up TS pages are included in Enclosure 4. These revised pages replace the corresponding pages provided in Enclosures 7 and 8 of SNC's original submittal dated September 20, 2001.

NRC Request No. 14

For some instrument [sic] *channel calibration requirement is changed to channel functional test. Again GL 91-04 does not provide the basis for this change. Therefore, either provide the basis for the request or remove the change for these functions. (Table 3.3.1-1-1* [sic], *function 7b, SR 3.3.5.1.3 and 3.3.5.2.3)*

SNC Response:

The request to change the CHANNEL CALIBRATION requirement of Table 3.3.1.1-1, Function 7.b; SR 3.3.5.1.3; and SR 3.3.5.2.3 to a CHANNEL FUNCTIONAL TEST requirement is being removed from the amendment request. The revised TS pages are included in Enclosure 3 of this submittal, and the revised marked-up TS pages are included in Enclosure 4. The revised TS pages showing the changes are included in Enclosure 3 of this submittal, and the revised marked-up TS pages are included in Enclosure 4. These revised pages replace the corresponding pages provided in Enclosures 7 and 8 of SNC's original submittal dated September 20, 2001.

TABLE 1
DRIFT STUDY CONSERVATIVE ASSUMPTIONS SUMMARY

Study No.	Device	Conservative Assumptions for Extrapolation
SNC-001	Barton 764 Differential Pressure Transmitters	1. Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of Square Root of the Sum of the Squares (SRSS). 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Abs Value of Mean], is applied across the entire instrument span.
SNC-002	Barton 763 Pressure Transmitters	1. Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Abs Value of Mean], is applied across the entire instrument span.
SNC-004	Transmation 3610DRA / 3620DRA Temperature Switches	Although there was only one valid time bin, the switches rarely had to be adjusted. Therefore, the drift is considered to be much smaller than originally anticipated. The extrapolation is performed as though drift was moderately time dependent, by means of SRSS.
SNC-007	Rosemount 1151DP4-8 Differential Pressure Transmitters	1. The binning analyses showed that only one time bin was populated significantly. Therefore, there was not enough time diverse information to make a solid conclusion about time dependency. For the purposes of extrapolation, the drift was conservatively treated as moderately time dependent per the methodology and extrapolated for the longer time interval by the SRSS method. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Absolute Value of Mean], is applied across the entire instrument span.
SNC-009	Rosemount 1153, Range 9 Pressure Transmitters	1. The binning analyses showed that only one time bin was populated significantly. Therefore, there was not enough time diverse information to make a solid conclusion about time dependency. For the purposes of extrapolation, the drift was conservatively treated as moderately time dependent per the methodology and extrapolated for the longer time interval by the SRSS method. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Absolute Value of Mean], is applied across the entire instrument span.

Study No.	Device	Conservative Assumptions for Extrapolation
SNC-010	Rosemount 1153 Range 4-8 Pressure Transmitters	1. Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Abs Value of Mean], is applied across the entire instrument span.
SNC-011	Rosemount 1153, Range 4-8 Differential Pressure Transmitters	1. The binning analyses showed that only one time bin was populated significantly. Therefore, there was not enough time diverse information to make a solid conclusion about time dependency. For the purposes of extrapolation, the drift was conservatively treated as moderately time dependent per the methodology and extrapolated for the longer time interval by the SRSS method. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Absolute Value of Mean], is applied across the entire instrument span.
SNC-012	Rosemount 1154, Range 4-8 Pressure Transmitters	1. The binning analyses showed that only one time bin was populated significantly. Therefore, there was not enough time diverse information to make a solid conclusion about time dependency. For the purposes of extrapolation, the drift was conservatively treated as moderately time dependent per the methodology and extrapolated for the longer time interval by the SRSS method. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Absolute Value of Mean], is applied across the entire instrument span.
SNC-013	Rosemount 1154, Range 4-8 Differential Pressure Transmitters	1. Although drift is characterized as only slightly time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Abs Value of Mean], is applied across the entire instrument span.
SNC-015	Agastat TR Time Delay Relays	The binning analyses showed that only one time bin was populated significantly. Therefore, there was not enough time diverse information to make a solid conclusion about time dependency. For the purposes of extrapolation, the drift was conservatively treated as moderately time dependent per the methodology and extrapolated for the longer time interval by the SRSS method.

Study No.	Device	Conservative Assumptions for Extrapolation
SNC-016	Agastat 7000 Series Time Delay Relays	Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS.
SNC-018	ASCO 214A261 (Undervoltage Function)	Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS.
SNC-019	ASCO 214A262 (Underfrequency Function)	Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS.
SNC-021	GE 184C5988G2 TUs – Voltage Outputs	1. The binning analyses showed that only one time bin was populated significantly. Therefore, there was not enough time diverse information to make a solid conclusion about time dependency. For the purposes of extrapolation, the drift was conservatively treated as moderately time dependent per the methodology and extrapolated for the longer time interval by the SRSS method. 2. The worst case data point for drift, as determined by a comparison of the value, [2 x Standard Deviation + Absolute Value of Mean], is applied across the entire instrument span.
SNC-025	Struth Dunn 236ABX135NE Time Delay Relays	The binning analyses showed that only one time bin was populated significantly. Therefore, there was not enough time diverse information to make a solid conclusion about time dependency. For the purposes of extrapolation, the drift was conservatively treated as moderately time dependent per the methodology and extrapolated for the longer time interval by the SRSS method.
SNC-032	ASCO 214A261 (Time Delay Function)	Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS.
SNC-033	ASCO 214A262 (Time Delay Function)	Although drift is characterized as time independent, the extrapolation is conservatively performed as though drift was moderately time dependent, by means of SRSS.

Enclosure 2

Edwin. I. Hatch Nuclear Plant
SNC's Evaluation of the NRC Status Report on the Staff Review of
EPRI Technical Report-103335,
"Guidelines for Instrument Calibration Extension/Reduction Programs"

Enclosure 2

Edwin. I. Hatch Nuclear Plant
Evaluation of the NRC Status Report on the Staff Review of EPRI Technical Report-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs"

The following are excerpts or paraphrases from the NRC Status Report on the Staff review of EPRI Technical Report (TR)-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs," dated March 1994. These excerpts are followed by Southern Nuclear Operating Company's (SNC's) interpretation of EPRI TR-103335. SNC's interpretations were used in the development of the Design Guide for instrument drift studies contained in Enclosure 3 of SNC's Technical Specifications (TS) original amendment request dated September 20, 2001. These interpretations were also used in the development of the 24-Month Fuel Cycle Extension Project for Plant Hatch.

STATUS REPORT

Item 4.1, Section 1, "Introduction," Second Paragraph:

The staff has issued guidance on the second objective (evaluating extended surveillance intervals in support of longer fuel cycles) only for 18-month to 24-month refueling cycle extensions (GL 91-04). Significant unresolved issues remain concerning the applicability of 18 month (or less) historical calibration data to extended intervals longer than 24 months (maximum 30 months), and instrument failure modes or conditions that may be present in instruments that are unattended for periods longer than 24 months.

HNP EVALUATION

Extensions for longer than 24 months were not requested for any instrument calibrations or other surveillance requirements in this submittal.

STATUS REPORT

Item 4.2, Section 2, "Principles of Calibration Data Analysis," First Paragraph:

This section describes the general relation between the as-found and as-left calibration values, and instrument drift. The term 'time dependent drift' is used. This should be clarified to mean time dependence of drift uncertainty, or in other words, time dependence of the standard deviation of drift of a sample or a population of instruments.

HNP EVALUATION

Both EPRI TR Revisions 0 and 1 failed to adequately determine whether a relationship between the magnitude of drift and the time interval between the calibration process existed. The drift analysis performed for HNP looked at the time-to-magnitude relationship using several different statistical and non-statistical methods. First, during the evaluation of data for grouping, data was grouped for the same or similar manufacturer, model number, and application combinations even though the t' statistical test

may have shown that the groups were not necessarily from the same population if the groups were performed on significantly different frequencies. This test grouping was made to ensure the analysis did not cover up a significant time dependent bias or random element magnitude shift.

After the standard deviation and other simple statistics are calculated, the data is evaluated for the time to magnitude relationship. If adequately time-diverse data is available, a time-binning analysis is performed on the data. Data is divided into time bins, based upon the time between calibrations. Statistics are computed for those bins, such as mean and standard deviation. These values are then plotted to expose any significant increases in the magnitude of the mean or standard deviation over time.

A regression analysis is performed, based upon the scatter of the raw "drift" values and a second regression analysis is performed on the absolute values of the "drift." For each of these regression analyses, statistical tests are performed to determine if time dependency is evident. These statistical tests are the R^2, F, and P value tests.

Finally, visual examination of the plots generated as a result of the scatter plot, binning analysis, regression analysis of drift, and the regression analysis of the absolute value of drift are used to make a final judgment on whether or not the random or mean values of drift are time dependent. Therefore, the mean and random aspects of drift are evaluated for time dependency.

STATUS REPORT

Item 4.2, Section 2, "Principles of Calibration Data Analysis," Second Paragraph:

Drift is defined as as-found – as-left. As mentioned in the TR this quantity unavoidably contains uncertainty contributions from sources other than drift. These uncertainties account for variability in calibration equipment and personnel, instrument accuracy, and environmental effects. It may be difficult to separate these influences from drift uncertainty when attempting to estimate drift uncertainty but this is not sufficient reason to group these allowances with a drift allowance. Their purpose is to provide sufficient margin to account for differences between the instrument calibration environment and its operating environment see Section 4.7 of this report for a discussion of combining other uncertainties into a "drift" term.

HNP EVALUATION

The drift determined by analysis was compared to the equivalent set of variables in the setpoint calculation. Per Section 4.6.6 of Enclosure 3, Drift Analysis Design Guide, the Analyzed Drift Value is not comprised of drift alone; this value also contains errors from M&TE and device Reference Accuracy. It could also include other effects, but it is conservative to assume the other effects are not included, since they cannot be quantified and are not expected to fully contribute to the errors observed.

The errors associated with the environment were not considered in the comparison of the Analyzed Drift values to the setpoint calculation values. The environmental effects are considered separately from the Analyzed Drift term, within the setpoint calculation.

STATUS REPORT

Item 4.2, Section 2, "Principles of Calibration Data Analysis," Third Paragraph:

The guidance of Section 2 is acceptable provided that time dependency of drift for a sample or population is understood to be time dependent [sic] of the uncertainty statistic describing the sample or population; e.g., the standard deviation of drift. A combination of other uncertainties with drift uncertainty may obscure any existing time dependency of drift uncertainty, and should not be done before time-dependency analysis is done.

HNP EVALUATION

Time dependency evaluations were performed on the basic as-left/as-found data. Obviously other error contributors are contained in this data, but it is impossible to separate the contribution due to drift from the contribution due to Measurement and Test Equipment and Reference Accuracy. All of these terms will fully contribute to the observed errors. Using the raw values appears to give the most reliable interpretation of the time dependency for the calibration process, which is the true value of interest. No other uncertainties are combined with the basic as-left/as-found data for time dependency determination.

STATUS REPORT

Item 4.3, Section 3, "Calibration Data Collection," Second Paragraph:

When grouping instruments, as well as manufacturer make and model, care should be taken to group only instruments that experience similar environments and process effects. Also, changes in manufacturing method, sensor element design, or the quality assurance program under which the instrument was manufactured should be considered as reasons for separating instruments into different groups. Instrument groups may be divided into subgroups on the basis of instrument age, for the purpose of investigating whether instrument age is a factor in drift uncertainty.

HNP EVALUATION

Instruments were originally grouped based upon manufacturer make, model number, and specific range of setpoint or operation. The groups were then evaluated, and combined based upon Section 3.5.4 of the design guide. The appropriateness of the grouping was then tested based upon a t-Test (two samples assuming unequal variances). The t-Test defines the probability, associated with a Student's t-Test, that two samples are likely to have come from the same underlying population. Instrument groups were not divided into subgroups based upon age.

STATUS REPORT

Item 4.3, Section 3, "Calibration Data Collection," Second Paragraph (continued):

Instrument groups should also be evaluated for historical instrument anomalies or failure modes that may not be evident in a simple compilation of calibration data. This evaluation should confirm that almost all instruments in a group performed reliably and almost all required only calibration attendance.

HNP EVALUATION

A separate surveillance test failure evaluation was performed for the procedures implementing the surveillance requirements. This evaluation identified calibration-related and noncalibration-related failures for single instruments, and groups of instruments supporting a specific function. After all relevant device and multiple device failures were identified, a cross-check of failures across manufacturer make and model number was also performed to determine if common mode failures could present a problem for the cycle extension. This evaluation confirmed that almost all instruments in a group (associated with extended TS line items) performed reliably and most failures were detected by more frequent testing.

STATUS REPORT

Item 4.3, Section 3, "Calibration Data Collection," Third Paragraph:

Instruments within a group should be investigated for factors that may cause correlation between calibrations. Common factors may cause data to be correlated, including common calibration equipment, same personnel performing calibrations, and calibrations occurring in the same conditions. The group, not individual instruments within the group, should be tested for trends.

HNP EVALUATION

Instruments were only investigated for correlation factors where multiple instruments appeared to have been driven out of tolerance by a single factor. Correlation may exist between the specific type of test equipment (e.g., Fluke 863 on the 0-200 mV range) and the personnel performing calibrations for each plant. This correlation would only affect the measurement if it caused the instrument performance to be outside expected boundaries, e.g., where additional errors should be considered in the setpoint analysis or where it showed a defined bias. Because Measurement and Test Equipment (M&TE) is calibrated more frequently than most process components being monitored, the effect of test equipment between calibrations is considered to be negligible and random. The setting tolerance, readability, and other factors which are more personnel based, would only affect the performance if there was a predisposition to leave or read settings in a particular direction (e.g., always in the more conservative direction). Plant training and evaluation programs are designed to eliminate this type of predisposition. Therefore, the correlation between M&TE and instrument performance, or between personnel and instrument performance has not been evaluated. Observed as-found values outside the allowable tolerance [Leave-As-Is-Zone (LAIZ) or Allowable Value] were evaluated to determine if a common cause existed as a part of the data entry evaluation.

STATUS REPORT

Item 4.3, Section 3, "Calibration Data Collection," Fourth Paragraph:

TR-103335, Section 3.3, advises that older data may be excluded from analysis. It should be emphasized that when selecting data for drift uncertainty time dependency analysis it is unacceptable to exclude data simply because it is old data. When selecting data for drift uncertainty time dependency analysis, the objective should be to include data for time spans at least as long as the proposed extended calibration interval, and preferably, several times as long, including calibration intervals as long as the proposed interval. For limited extensions (e.g., a GL 91-04 extension), acceptable ways to obtain this longer interval data include obtaining data from other nuclear-plants or from other industries for identical or

close-to-identical instruments, or combining intervals between which the instrument was not reset or adjusted. If data from other sources is used, the source should be analyzed for similarity to the target plant in procedures, process, environment methodology, test equipment, maintenance schedules and personnel training. An appropriate conclusion of the data collection process may be that there is insufficient data of appropriate time span for a sufficient number of instruments to support statistical analysis of drift uncertainty time dependency.

HNP EVALUATION

Data was selected for the last 90 months (5 cycles). This data allowed for the evaluation of data with various different calibration spans over several calibration intervals to provide representative information for each type of instrument. Data from outside the HNP data set was not used to provide longer interval data. In most cases the time dependency determination was based upon calibrations performed at or near 18 months and data performed at shorter intervals (monthly, quarterly, or semiannually). There did not appear to be any time based factors that would be present from 18 to 24 months that would not have been present between 1, 3, 6, or 12 and 18 months. In some cases, it was determined that there was insufficient data to support statistical analysis of drift time dependency. For these cases, a correlation between drift magnitude and time was assumed and the calculation reflects time dependent drift values.

STATUS REPORT

Item 4.3, Section 3, "Calibration Data Collection," Fifth Paragraph:

TR-103335, Section 3.3 provides guidance on the amount of data to collect. As a general rule, it is unacceptable to reject applicable data, because biases in the data selection process may introduce biases in the calculated statistics. There are only two acceptable reasons for reducing the amount of data selected: enormity, and statistical dependence. When the number of data points is so enormous that the data acquisition task would be prohibitively expensive, a randomized selection process, not dependent upon engineering judgment, should be used. This selection process should have three steps. In the first step, all data is screened for applicability, meaning that all data for the chosen instrument grouping is selected, regardless of the age of the data. In the second step, a proportion of the applicable data is chosen by automated random selection, ensuring that the data records for single instruments are complete, and enough individual instruments are included to constitute a statistically diverse sample. In the third step, the first two steps are documented. Data points should be combined when there is indication that they are statistically dependent on each other, although alternate approaches may be acceptable. See Section 4.5, below, on "combined point" data selection and Section 4.4.1 on '0%, 25%, 50%, 75%, and 100% calibration span points'.

HNP EVALUATION

A time interval of 90 months was selected as representative based upon HNP operating history. No data points were rejected from this time interval, and no sampling techniques were used.

STATUS REPORT

Item 4.4, Section 4, "Analysis of Calibration Data":

Sub-item, 4.4.1, Sections 4.3 and 4.4, Data Setup and Spreadsheet Statistics, First Paragraph:

The use of spreadsheets, databases, or other commercial software is acceptable for data analysis provided that the software, and the operating system used on the analysis computer, is under effective configuration control. Care should be exercised in the use of Windows or similar operating systems because of the dependence on shared libraries. Installation of other application software on the analysis machine can overwrite shared libraries with older versions or versions that are inconsistent with the software being used for analysis.

HNP EVALUATION

The project used the Microsoft® EXCEL spreadsheets to perform the drift analysis. This software was not treated as QA software. Therefore, computations were verified using hand verification and alternate software on different computers, such as EPRI Instrument Performance Analysis Software System (IPASS), Revision 2, and Lotus® 1-2-3 spreadsheets.

STATUS REPORT

Item 4.4, Section 4, "Analysis of Calibration Data":

Sub-item, 4.4.1, Sections 4.3 and 4.4, Data Setup and Spreadsheet Statistics, Second Paragraph:

Using either engineering units or per-unit (percent of span) quantities is acceptable. The simple statistic calculations (mean, sample standard deviation, sample size) are acceptable. Data should be examined for correlation or dependence to eliminate over-optimistic tolerance interval estimates. For example, if the standard deviation of drift can be fitted with a regression line through the 0%, 25%, 50%, 75%, and 100% calibration span points, there is reason to believe that drift uncertainty is correlated over the five (or nine, if the data includes a repeatability sweep) calibration data points. An example is shown in TR-103335, Figure 5.4, and a related discussion is given in TR-103335 Section 5.1.3. Confidence/tolerance estimates are based on (a) an assumption of normality (b) the number of points in the data set, and (c) the standard deviation of the sample. Increasing the number of points (utilizing each calibration span point) when data is statistically dependent decreases the tolerance factor k, which may falsely enhance the confidence in the predicted tolerance interval. To retain the information, but achieve a reasonable point count for confidence/tolerance estimates, the statistically dependent data points should be combined into a composite data point. This retains the information but cuts the point count. For drift uncertainty estimates with data similar to that in the TR example, an acceptable method requires that the number of independent data points should be one-fifth (or one ninth) of the total number of data points in the example and a combined data point for each set of five span points should be selected that is representative of instrument performance at or near the span point most important to the purpose of the analysis (i.e., trip or normal operation point).

HNP EVALUATION

The analysis for HNP used either engineering units or percent of calibrated span as appropriate to the calibration process. As an example, for switches that do not have a realistic span value, the engineering

units were used in the analyses; for analog devices, normally percent of span is used. The data was evaluated for dependence, normally dependence was found between points (0%, 25%, 50%, 75%, and 100%) for a single calibration. However, due to the changes in M&TE and personnel performing the calibrations, independence was found between calibrations of the same component on different dates. To ensure conservatism, the most conservative simple statistic values for the points closest to the point of interest were selected, or the most conservative values for any data point were selected. The multiplier was determined based upon the number of actual calibrations associated with the worst-case value selected. Selection of the actual number of calibrations is equivalent to the determination of independent points (e.g., one fifth or one ninth of the total data point count). Selection of the worst-case point is also more conservative than the development of a combined data point.

STATUS REPORT

Item 4.4, Section 4, "Analysis of Calibration Data":

Sub-item 4.4.2, Section 4.5, "Outlier Analysis":

Rejection of outliers is acceptable only if a specific, direct reason can be documented for each outlier rejected. For example, a documented tester failure would be cause for rejecting a calibration point taken with the tester when it had failed. It is not acceptable to reject outliers on the basis of statistical tests alone. Multiple passes of outlier statistical criterion are not acceptable. An outlier test should only be used to direct attention to data points, which are then investigated for cause. Five acceptable reasons for outlier rejection provided that they can be demonstrated, are given in the TR: data transcription errors, calibration errors, calibration equipment errors, failed instruments, and design deficiencies. Scaling or setpoint changes that are not annotated in the data record indicate unreliable data, and detection of unreliable data is not cause for outlier rejection, but may be cause for rejection of the entire data set and the filing of a licensee event report. The usual engineering technique of annotating the raw data record with the reason for rejecting it, but not obliterating the value, should be followed. The rejection of outliers typically has cosmetic effects: if sufficient data exists, it makes the results look slightly better; if insufficient data exists, it may mask a real trend. Consequently, rejection of outliers should be done with extreme caution and should be viewed with considerable suspicion by a reviewer.

HNP EVALUATION

As stated in earlier questions about the HNP TS submittal, it is acceptable to remove one outlier from an analysis based upon statistical means, other than those using the engineering judgments mentioned in the EPRI document. The Design Guide is written with this as a general rule, but does allow up to 2.5% data removal, as an exception. This does not reduce the amount of scrutiny that the preparer and reviewer use in the entry and evaluation of the calibration data. The intent is to properly model device performance after completion of this project. As a general rule, no more than one outlier was removed from the drift population on the basis of being outliers. The few exceptions are justified in the response to RAI Question No. 5. The Design Guide was prepared with the exception of up to 2.5% to allow for appropriate engineering judgment in the analysis of instrumentation and the calibration thereof. Given very large sample sizes or complicated calibration processes, specific diagnosis of problems when reviewing procedure data is sometimes not possible. However, the data can contain errors which are very likely to be unrelated to drift or device performance, which should be removed, given an appropriate consideration from both the preparer and reviewer. For this project, rejection of outliers was performed with extreme caution and was viewed with considerable suspicion by the reviewer.

Significant conservatisms exist in the assumptions for extrapolation of drift values as computed per this Design Guide, which provide additional margin for the devices to drift. Additionally, if the removal of the data reduced the computed extrapolated drift to a value that is not consistent with the capability of the device, the improved drift-monitoring program will detect the problem and implement design activity, maintenance activity, or both to correct the problem.

STATUS REPORT

Item 4.4, Section 4, "Analysis of Calibration Data":

Sub-item 4.4.3, Section 4.6, "Verifying the Assumption of Normality":

The methods described are acceptable in that they are used to demonstrate that calibration data or results are calculated as if the calibration data were a sample of a normally distributed random variable. For example, a tolerance interval which states that there is a 95% probability that 95% of a sample drawn from a population will fall within tolerance bounds is based on an assumption of normality, or that the population distribution is a normal distribution. Because the unwarranted removal of outliers can have a significant effect on the normality test, removal of significant numbers of, or sometimes any (in small populations), outliers may invalidate this test.

HNP EVALUATION

The methods that were found acceptable were used for the HNP analysis. As previously addressed, in only one case did the number of outliers removed exceed one percent of the data population, and it was less than 2%. In three other cases, more than one outlier was removed, but those removed were less than one percent of the population. Finally, all other drift studies involved the removal of one or less outliers. Therefore, the normality tests are still valid. Coverage analysis was used where the normality tests did not confirm the assumption of normality. This produces a conservative model of the drift data by expanding the standard deviation to provide adequate coverage.

STATUS REPORT

Item 4.4, Section 4, "Analysis of Calibration Data":

Sub-item 4.4.4, Section 4.7, "Time-Dependent Drift Considerations," First through Ninth Paragraphs:

This section of the TR discusses a number of methods for detecting a time dependency in drift data, and one method of evaluating drift uncertainty time dependency. None of the methods uses a formal statistical model for instrument drift uncertainty, and all but one of them focus on drift rather than drift uncertainty. Two conclusions are inescapable: regression analysis cannot distinguish drift uncertainty time dependency, and the slope and intercept of regression lines may be artifacts of sample size, rather than being statistically significant. Using the results of a regression analysis to rule out time dependency of drift uncertainty is circular reasoning: i.e., regression analysis eliminates time dependency of uncertainty; no time dependency is found; therefore, there is no time dependency.

HNP EVALUATION

Several different methods of evaluation for time dependency of the data were used for the analysis. One method, the binning analysis, was to evaluate the standard deviations at different calibration intervals. This analysis technique is the most recommended method of determining time-dependent tendencies in a given sample pool. The test consists simply of segregating the drift data into different groups (bins) corresponding to different ranges of calibration or surveillance intervals, and comparing the standard deviations for the data in the various groups. The purpose of this type of analysis is to determine if the standard deviation or mean tends to become larger as the time between calibration increases. Simple regression lines, regression of the absolute value of drift, as well as R^2, F, and P tests were generated and reviewed. Finally visual examinations of the scatter plot, binning plot, and both regression plots were used to assess or corroborate results. Where there was not sufficient data to perform the detailed evaluation, the data was assumed moderately time dependent. Whenever extrapolation of the drift value was required, in all cases, drift was assumed to be at least moderately time dependent for the purposes of extrapolation, even though many of the test results showed that the drift was time independent.

STATUS REPORT

Item 4.4, Section 4, "Analysis of Calibration Data":

Sub-item 4.4.4, Section 4.7, "Time-Dependent Drift Considerations," Thirteenth and Fourteenth Paragraphs:

A model can be used either to bound or project future values for the quantity in question (drift uncertainty) for extended intervals. An acceptable method would use standard statistical methods to show that a hypothesis (that the instruments under study have drift uncertainties bounded by the drift uncertainty predicted by a chosen model) is true with high probability. Ideally, the method should use data that include instruments that were un-reset for at least as long as the intended extended interval, or similar data from other sources for instruments of like construction and environmental usage. The use of data of appropriate time span is preferable; however, if this data is unavailable, model projection may be used provided the total projected interval is no greater than 30 months and the use of the model is justified. A follow-up program of drift monitoring should confirm that model projections of uncertainty bounded the actual estimated uncertainty. If it is necessary to use generic instrument data or constructed intervals, the chosen data should be grouped with similar grouping criteria as are applied to instruments of the plant in question, and Student's "t" test should be used to verify that the generic or constructed data mean appears to come from the same population. The "F" test should be used on the estimate of sample variance. For a target surveillance interval constructed of shorter intervals where instrument reset did not occur, the longer intervals are statistically dependent upon the shorter intervals; hence, either the constructed longer-interval data or the shorter-interval data should be used, but not both. In a constructed interval, drift = as-left$_{(0)}$ – as found$_{(LAST)}$, the intermediate values are not used.

When using samples acquired from generic instrument drift analyses or constructed intervals, the variances are not simply summed, but are combined weighted by the degrees of freedom in each sample.

HNP EVALUATION

The General Electric interval extension process was used because the General Electric setpoint methodology was used for most RPS/ECCS setpoints.. Where the drift could be proven to be time independent for the analysis period, or shown to be only slightly time dependent, or just moderately time

dependent, the calculated drift value was extended based upon the formula:

$$Drift_{30} = \text{Drift calculated} * (30/\text{calculated drift time interval})^{1/2}.$$

Where there is a strong indication of time dependent drift, the following formula is used:

$$Drift_{30} = \text{Drift calculated} * (30/\text{calculated drift time interval}).$$

STATUS REPORT

Item 4.4, Section 4, "Analysis of Calibration Data":

Sub-item 4.4.5, Section 4.8, "Shelf Life of Analysis Results":

The TR gives guidance on how long analysis results remain valid. The guidance given is acceptable with the addition that once adequate analysis and documentation is presented and the calibration interval extended, a strong feedback loop must be put into place to ensure drift, tolerance and operability of affected components are not negatively impacted. An analysis should be re-performed if its predictions turn out to exceed predetermined limits set during the calibration interval extension study. A goal during the re-performance should be to discover why the analysis results were incorrect The establishment of a review and monitoring program, as indicated in GL 91-04, Enclosure 2, Item 7 is crucial to determining that the assumptions made during the calibration interval extension study were true. The methodology for obtaining reasonable and timely feedback must be documented.

HNP EVALUATION

As discussed in the submittal documents the plant is committed to establish a trending program to provide feedback on the acceptability of the drift error extension. This program will evaluate any as-found condition outside the Leave-As-Is-Zone (LAIZ) and perform a detailed analysis of as-found values outside the Allowable Value. The drift analysis will be reperformed when the root cause analysis indicates drift is a probable cause for the performance problems.

STATUS REPORT

Item 4.5, Section 5, "Alternative Methods of Data Collection and Analysis":

Section 5 discusses two alternatives to as-found/as-left (AFAL) analysis, combining the 0%, 25%, 50%, 75% and 100% span calibration points, and the EPRI Instrument Calibration Reduction Program (ICRP).

Two alternatives to AFAL are mentioned: as-found/setpoint (AFSP) analysis and worse case as-found/as-left (WCAFAL). Both AFSP and WCAFAL are more conservative than the AFAL method because they produce higher estimates of drift. Therefore, they are acceptable alternatives to AFAL drift estimation.

The combined-point method is acceptable, and in some cases preferable, if the combined value of interest is taken at the point important to the purpose of the analysis. That is, if the instrument being evaluated is used to control the plant in an operating range, the instrument should be evaluated near its operating point. If the instrument being evaluated is employed to trip the reactor, the instrument should be

evaluated near the trip point. The combined-point method should be used if the statistic of interest shows a correlation between calibration span points, thus inflating the apparent number of data points and causing an overstatement of confidence in the results. The method by which the points are combined (e.g., nearest point interpolation, averaging) should be justified and documented.

HNP EVALUATION

The worst-case as-found/as-left method was used to verify manufacturer drift specifications, or to establish drift, where there was insufficient data to perform a rigorous drift analysis. The WCAFAL were evaluated against current allowances and manufacturer specifications. If the observed drift values were bounded, manufacturer specifications or current drift allowances were extrapolated to a surveillance interval of 30 months.

STATUS REPORT

Item 4.6, Section 6, "Guidelines for Calibration and Surveillance Interval Extension Programs":

This section presents an example analysis in support of extending the surveillance interval of reactor trip bistables from monthly to quarterly. Because these bistables exhibit little or no bias, and very small drift, the analysis example does not challenge the methodology presented in TR-103335 Section 4, and thus raises no acceptability issues related to drift analysis that have not already been covered. The bistables are also rack instruments, and thus not representative of process instruments, for which drift is a greater concern. Bistables do not produce a variable output signal that can be compared to redundant device readings by operations personnel, or during trending programs, and cannot be compared during channel checks, as redundant process instruments are. For these reasons the data presented in Section 6 have very little relationship to use in the TR methodology for calibration interval extensions for process instruments. The binomial pass/fail methodology of Section 6.3 is acceptable as a method of complying with GL 91-04, Enclosure 2, item 1 for bistables, "Confirm that acceptable limiting values of drift have not been exceeded except in rare instances." This method provides guidance for the definition of "rare" instances by describing how to compute expected numbers of exceedances for an assumed instrument confidence / tolerance criterion (e.g., 95/95) for a large set of bistable data. There are other methods that would be acceptable, in particular, the X^2 *test for significance.*

This test can be used to determine if the exceedance-of-allowable-limits frequency in the sample is probably due to chance or probably not due to chance, for a given nominal frequency (e.g., 95% of drifts do not exceed allowable limits). This provides an acceptable method of complying with GL 91-04, Enclosure 2, item 1 in the general case.

HNP EVALUATION

This specific HNP submittal did not extend any bistables from monthly to quarterly. Therefore, this section was not evaluated for the 24-Month Fuel Cycle Extension Project. However, a separate TS change request that requests an extension of functional testing for various instrumentation from quarterly to semiannually was submitted for NRC review. Failure analysis was performed for the procedures involved to ensure that these tests normally pass their surveillances at the current frequency. Additionally, the drift was measured by as-found/as-left data analysis in the same manner as for process instrumentation and was considered in the applicable setpoint analyses. The approach taken with this extension request exceeds the requirements shown in the comments above, since rigorous drift analysis was performed for the bistables, instead of the X^2 test for significance.

STATUS REPORT

Item 4.7, Section 7, "Application to Instrument Setpoint Programs":

Section 7 is a short tutorial on combining uncertainties in instrument Setpoint calculations. Figure 7-1 of this section is inconsistent with ANSI/ISA-S67.04-1994, Part 1, Figure 1. Rack uncertainty is not combined with sensor uncertainty in the computation of the allowable value in the standard. The purpose of the allowable value is to set a limit beyond which there is reasonable probability that the assumptions used in the setpoint calculation were in error. For channel functional tests, these assumptions normally do not include an allowance for sensor uncertainty (quarterly interval, sensor normally excluded). If a few instruments exceed the allowable value, this is probably due to instrument malfunction. If it happens frequently, the assumptions in the setpoint analysis may be wrong. Since the terminology used in Figure 7-1 is inconsistent with ANSI/ISA-S67.04-1994, Part I, Figure 1, the following correspondences are suggested: the 'Nominal Trip Setpoint' is the ANSI/ISA trip setpoint; ANSI/ISA value 'A' is the difference between TR 'Analytical Limit' and 'Nominal Trip Setpoint' [sic]*; 'Sensor Uncertainty' is generally not included in the 'Allowable Value Uncertainty' and would require justification, the difference between 'Allowable Value' and 'Nominal Trip Setpoint' is ANSI/ISA value 'B'; the 'Leave-As-Is-Zone' is equivalent to the ANSI/ISA value 'E' and the difference between 'System Shutdown' and 'Nominal Trip Setpoint' is the ANSI/ISA value 'D'. Equation 7-5 (page 7-7 of the TR) combines a number of uncertainties into a drift term, D. If this is done, the reasons and the method of combination should be justified and documented. The justification should include an analysis of the differences between operational and calibration environments, including accident environments in which the instrument is expected to perform.*

HNP EVALUATION

Application of the drift values to plant setpoints was performed in accordance with the GE setpoint methodology for most RPS/ECCS setpoints. The Allowable Value defined for the GE setpoint methodology is defined as the operability limit when performing the channel calibration. No environmental terms are considered to be included in the drift term. Environmental effects and accuracy are included between the Analytical Limit and the Allowable Value. The difference between the setpoint and the Allowable Value are the drift (AFAL) and calibration tolerance. The HELB environment is used for setpoints of equipment required to remain operable during a HELB, but the effect is considered in the calculation of the Allowable Value.

STATUS REPORT

Item 4.8, Section 8, "Guidelines for Fuel Cycle Extensions":

The TR repeats the provisions of Enclosure 2, GL 91-04, and provides direct guidance, by reference to preceding sections of the TR, on some of them.

HNP EVALUATION

A discussion of how the Plant Hatch evaluations meet the guidance of GL 91-04 is provided in the original TS amendment request (18- to 24-Month Fuel Cycle Extension) dated September 20, 2001.

Enclosure 3

Edwin I. Hatch Nuclear Plant
Response to Request for Additional Information
Technical Specifications 24-Month Fuel Cycle Extension Request

Revised Proposed Technical Specifications Pages

Unit 1

3.3-8
3.3-40
3.3-49

Unit 2

3.3-8
3.3-41
3.3-50

Table 3.3.1.1-1 (page 2 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitor (continued)					
e. Two-out-of-Four Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.10 SR 3.3.1.1.15 SR 3.3.1.1.16	NA
f. OPRM Upscale	1	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.17	NA
3. Reactor Vessel Steam Dome Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 1085 psig
4. Reactor Vessel Water Level – Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≥ 0 inches
5. Main Steam Isolation Valve – Closure	1	8	F	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 10% closed
6. Drywell Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 1.92 psig
7. Scram Discharge Volume Water Level – High					
a. Resistance Temperature Detector	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 71 gallons
	5(a)	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 71 gallons
b. Float Switch	1,2	2	G	SR 3.3.1.1.12 SR 3.3.1.1.15	≤ 71 gallons
	5(a)	2	H	SR 3.3.1.1.12 SR 3.3.1.1.15	≤ 71 gallons

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(c) Each APRM channel provides inputs to both trip systems.

SURVEILLANCE REQUIREMENTS

-----NOTES-----

1. Refer to Table 3.3.5.1-1 to determine which SRs apply for each ECCS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 3.c and 3.f; and (b) for up to 6 hours for Functions other than 3.c and 3.f provided the associated Function or the redundant Function maintains initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.1.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.1.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.1.4	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.5.1.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months

SURVEILLANCE REQUIREMENTS

---NOTES---

1. Refer to Table 3.3.5.2-1 to determine which SRs apply for each RCIC Function.
2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Function 2; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.2.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.2.4	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.5.2.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months

Table 3.3.1.1-1 (page 2 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitor (continued)					
e. Two-out-of-Four Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.10 SR 3.3.1.1.15 SR 3.3.1.1.16	NA
f. OPRM Upscale	1	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.17	NA
3. Reactor Vessel Steam Dome Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16	≤ 1085 psig
4. Reactor Vessel Water Level – Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16	≥ 0 inches
5. Main Steam Isolation Valve – Closure	1	8	F	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16	≤ 10% closed
6. Drywell Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 1.92 psig
7. Scram Discharge Volume Water Level – High					
a. Resistance Temperature Detector	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 57.15 gallons
	5(a)	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 57.15 gallons
b. Float Switch	1,2	2	G	SR 3.3.1.1.12 SR 3.3.1.1.15	≤ 57.15 gallons
	5(a)	2	H	SR 3.3.1.1.12 SR 3.3.1.1.15	≤ 57.15 gallons

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(c) Each APRM channel provides inputs to both trip systems.

SURVEILLANCE REQUIREMENTS

------------------------------------NOTES------------------------------------

1. Refer to Table 3.3.5.1-1 to determine which SRs apply for each ECCS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 3.c and 3.f; and (b) for up to 6 hours for Functions other than 3.c and 3.f provided the associated Function or the redundant Function maintains initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.1.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.1.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.1.4	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.5.1.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months

SURVEILLANCE REQUIREMENTS

----------------------------------NOTES----------------------------------

1. Refer to Table 3.3.5.2-1 to determine which SRs apply for each RCIC Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Function 2; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.2.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.2.4	Perform CHANNEL CALIBRATION.	24 months
SR 3.3.5.2.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	24 months

Enclosure 4

Edwin I. Hatch Nuclear Plant
Response to Request for Additional Information
Technical Specifications 24-Month Fuel Cycle Extension Request

Marked-Up Revised Proposed Technical Specifications Pages

Unit 1

3.3-8
3.3-40
3.3-49

Unit 2

3.3-8
3.3-41
3.3-50

Table 3.3.1.1-1 (page 2 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitor (continued)					
e. Two-out-of-Four Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.10 SR 3.3.1.1.15 SR 3.3.1.1.16	NA
f. OPRM Upscale	1	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.17	NA
3. Reactor Vessel Steam Dome Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 1085 psig
4. Reactor Vessel Water Level – Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≥ 0 inches
5. Main Steam Isolation Valve – Closure	1	8	F	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 10% closed
6. Drywell Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 1.92 psig
7. Scram Discharge Volume Water Level – High					
a. Resistance Temperature Detector	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 71 gallons
	5(a)	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 71 gallons
b. Float Switch	1,2	2	G	SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 71 gallons
	5(a)	2	H	SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 71 gallons

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(c) Each APRM channel provides inputs to both trip systems.

SURVEILLANCE REQUIREMENTS

-------------------------------------NOTES-------------------------------------

1. Refer to Table 3.3.5.1-1 to determine which SRs apply for each ECCS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 3.c and 3.f; and (b) for up to 6 hours for Functions other than 3.c and 3.f provided the associated Function or the redundant Function maintains initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.1.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.1.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.1.4	Perform CHANNEL CALIBRATION.	~~18~~ 24 months
SR 3.3.5.1.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	~~18~~ 24 months

SURVEILLANCE REQUIREMENTS

NOTES

1. Refer to Table 3.3.5.2-1 to determine which SRs apply for each RCIC Function.
2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Function 2; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.2.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.2.4	Perform CHANNEL CALIBRATION.	~~18~~ 24 months
SR 3.3.5.2.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	~~18~~ 24 months

Table 3.3.1.1-1 (page 2 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitor (continued)					
e. Two-out-of-Four Voter	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.10 SR 3.3.1.1.15 SR 3.3.1.1.16	NA
f. OPRM Upscale	1	3(c)	I	SR 3.3.1.1.1 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.17	NA
3. Reactor Vessel Steam Dome Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16	≤ 1085 psig
4. Reactor Vessel Water Level – Low, Level 3	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16	≥ 0 inches
5. Main Steam Isolation Valve – Closure	1	8	F	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15 SR 3.3.1.1.16	≤ 10% closed
6. Drywell Pressure – High	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 1.92 psig
7. Scram Discharge Volume Water Level – High					
a. Resistance Temperature Detector	1,2	2	G	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 57.15 gallons
	5(a)	2	H	SR 3.3.1.1.9 SR 3.3.1.1.13 SR 3.3.1.1.15	≤ 57.15 gallons
b. Float Switch	1,2	2	G	SR 3.3.1.1.~~13~~ (12) SR 3.3.1.1.15	≤ 57.15 gallons
	5(a)	2	H	SR 3.3.1.1.~~13~~ (12) SR 3.3.1.1.15	≤ 57.15 gallons

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(c) Each APRM channel provides inputs to both trip systems.

SURVEILLANCE REQUIREMENTS

------------------------------------NOTES------------------------------------

1. Refer to Table 3.3.5.1-1 to determine which SRs apply for each ECCS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 3.c and 3.f; and (b) for up to 6 hours for Functions other than 3.c and 3.f provided the associated Function or the redundant Function maintains initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.1.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.1.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.1.4	Perform CHANNEL CALIBRATION.	~~18~~ 24 months
SR 3.3.5.1.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	~~18~~ 24 months

SURVEILLANCE REQUIREMENTS

-----NOTES-----

1. Refer to Table 3.3.5.2-1 to determine which SRs apply for each RCIC Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Function 2; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.2.3	Perform CHANNEL CALIBRATION.	92 days
SR 3.3.5.2.4	Perform CHANNEL CALIBRATION.	~~18~~ 24 months
SR 3.3.5.2.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	~~18~~ 24 months