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

Edwin I. Hatch Nuclear Plant
Revision to
Request to Revise Technical Specifications:
Quarterly Surveillance Extension

Ladies and Gentlemen:

By letter dated September 20, 2001, Southern Nuclear Operating Company (SNC) submitted to the NRC proposed Technical Specifications (TS) changes that extend quarterly surveillance frequencies to semi-annual; i.e., from 92 days to 184 days. By letter dated January 24, 2002, SNC provided responses to NRC review requests and committed to provide revisions to the September 20, 2001, submittal, "Edwin I. Hatch Nuclear Plant, Request to Revise Technical Specifications: Quarterly Surveillance Extension." This letter provides the revisions to the original surveillance extension request; i.e., TS surveillance frequencies of 92 days, initially proposed to be extended to quarterly, have been changed to "92 days on a STAGGERED TEST BASIS."

Enclosures 1 through 10 of the September 20, 2001, submittal were administratively revised to reflect the requested TS change; however, the basis justification remains valid. Revised Enclosures 1 through 10 of this letter replace in full the corresponding enclosures contained in Volumes 1 and 2 of the September 20, 2001, submittal.

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

Respectfully submitted,

Lewis Sumner

H. L. Sumner, Jr.

TWL/sp

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Enclosures:
1. Methodology Summary and Compliance with Generic Letter 91-04, Revised 04/02
2. Drift Study Cross Reference, Revised 04/02
3. Instrument Drift Analysis Methodology - Drift Analysis Design Guide, Revised 04/02
4. Bases for Change Request for Extended Intervals, Revised 04/02
5. Bases for Change Request for Reduced Intervals, Revised 04/02
6. 10 CFR 50.92 Evaluation and Environmental Assessment, Revised 04/02
7. Proposed Technical Specifications Pages and Insertion Instructions, Revised 04/02
8. Proposed Marked-Up Technical Specifications Pages, Revised 04/02
9. Proposed Bases Pages and Insertion Instructions, Revised 04/02
10. Proposed Marked-Up Bases Pages, Revised 04/02

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

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

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

ENCLOSURE 1 TAB

Enclosure 1

Edwin I. Hatch Nuclear Plant
Request to Revise Technical Specifications:
Quarterly Surveillance Extension

Methodology Summary and Compliance with Generic Letter 91-04

1.0 SUMMARY

This proposed license amendment involves a revision to the Edwin I. Hatch Nuclear Plant (HNP) Unit 1 and Unit 2 Technical Specifications (TS) to change the performance frequency for specified CHANNEL FUNCTIONAL TESTS and CHANNEL CALIBRATIONS from 92 days to 92 days on a STAGGERED TEST BASIS. This request is being submitted to the Nuclear Regulatory Commission (NRC) as a Cost Beneficial Licensing Action, and was developed in the same format as Generic Letter (GL) 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24 Month Fuel Cycle."[1] However, this change is not based upon a change to the plant operating cycle but is based upon historical plant performance since the implementation of the Allowable Out of Service Times and Surveillance Test Intervals (AOT/STI) is based upon General Electric (GE) NEDC 30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection System."[2]

In 1988, GE performed a detailed analysis to confirm the then current AOT/STI for boiling water reactor (BWR) protective systems. This analysis led to changing the frequency for several surveillance tests from monthly to quarterly and extending the Allowed Out of Service Time for many components and functions. The tests with the extended surveillance interval included the calibration of trip units and many of the CHANNEL FUNCTIONAL TESTS. This evaluation had several findings. The critical finding from this analysis was that for each of the RPS initiating events, the reactor protection system (RPS) unavailability was determined to be insensitive to the changes in component failure rates. A factor of 10 increase in the failure rates produced negligible (0.1%) impact on the RPS unavailability for each of the initiating events. The resultant impact on RPS failure frequency was also found to be negligible.

Additionally, several different sensitivity studies evaluated the impact of methods for performing surveillance and the effects of operator errors. However, it was found that reduced redundancy during testing has negligible impact on the RPS unavailability, because the reduced unavailability of any one sensor channel during this period has negligible impact on the RPS unavailability.

As discussed between the NRC and Southern Nuclear Operating Company (SNC) personnel in a meeting on May 15, 2001, and as documented by meeting minutes dated May 30, 2001, SNC has evaluated a change in surveillance intervals from the current 92 days to 92 days on a STAGGERED TEST BASIS using the plant-specific Probabilistic Risk Assessment (PRA). Specifically, a sensitivity study was performed, conservatively assuming the failure rates of the instrumentation presently included in the PRA are multiplied by a factor of 2 to account for the increased surveillance intervals. The methods for determining the sensitivity consider the effects of latent failures that are not detected until the next Functional Test. The length of time assumed for the latent failures is set equal to the proposed surveillance interval divided by 2. In order to perform this sensitivity study, all failures are very conservatively assumed to be latent.

The results of the sensitivity analysis show that the increase in surveillance intervals causes an insignificant increase in core damage frequency (CDF) and essentially no change in large early release frequency (LERF). Additionally, failure data collected for the associated procedures shows that surveillance procedure failures for multiple groups of RPS and emergency core cooling system (ECCS) instrumentation are very small in number. This shows a decreasing trend in instrument failure, thus supporting the conservatism of this sensitivity study.

In addition to the PRA evaluation performed, the proposed TS changes were evaluated with the guidance provided in GL 91-04.(1) While this TS change is not in support of a fuel cycle change, the GL(1) was viewed as an acceptable method of verifying that all critical factors had been reviewed for a CALIBRATION or FUNCTIONAL TEST frequency change. Enclosure 2 contains the HNP Drift Study Cross Reference. Enclosure 3 contains the HNP Instrument Drift Analysis Methodology - Drift Analysis Design Guide used in the developing this submittal. Enclosure 4 contains the Bases for the Change Request for Extended Intervals. Enclosure 5 contains the Bases for the Change Request for Reduced Intervals. Enclosure 6 contains the 10 CFR 50.92 Evaluation and Environmental Assessment. Enclosure 7 contains the page change instructions and the revised TS pages. Enclosure 8 contains the marked-up TS pages. Enclosure 9 contains the page change instructions and the revised TS Bases pages provided for information only. Enclosure 10 contains the marked-up TS Bases pages also provided for information only.

Historical surveillance test data and associated maintenance records were reviewed in evaluating the effect of the proposed change on safety. In addition, the licensing basis was reviewed for each revision to ensure it was not invalidated. Based upon the results of these reviews, it is concluded that there is no adverse effect on plant safety due to increasing the surveillance test intervals and the continued application of SR 3.0.2.

2.0 METHODOLOGY

In GL 91-04(1), the NRC provided generic guidance for evaluating a 24-month surveillance test interval for TS SRs and specified the evaluation steps needed to justify a 24-month surveillance interval. While this request is not associated with a fuel cycle change, the methodology defined in GL 91-04 is appropriate for the evaluation of any SR interval change. Discussions with NRC Staff indicate this methodology, combined with the PRA verification, is an acceptable approach for evaluation of a change to SR intervals. The following discussion defines each step outlined in GL 91-04 and describes the methodology used by the HNP staff to complete the evaluation for each TS SR line item. This methodology is very similar to the methodology used to justify extensions for a 24-month fuel cycle at the First Energy Perry Nuclear Power Plant. The NRC found the Perry methodology acceptable in a Safety Evaluation Report dated August 31, 2000.

A. Instrumentation Changes

GL 91-04(1) identifies 7 steps for the evaluation of instrumentation changes.

STEP 1:

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.

HNP Evaluation

The effect of longer calibration intervals on TS instrumentation was evaluated by reviewing the surveillance test history for the affected instrumentation, including, where necessary, an instrument drift study. The failure history evaluation and drift study demonstrate that, except on rare occasions, instrument drift has not exceeded the current allowable limits.

STEP 2:

Confirm that the values of drift for each instrument type (make, model, and range) and application have been determined with a high probability and a high degree of confidence. Provide a summary of the methodology and assumptions used to determine the rate of instrument drift with time based upon historical plant calibration data.

HNP Evaluation

HNP has performed drift evaluations, based upon a Hatch-Specific Drift Analysis Design Guide (Enclosure 3) using Microsoft Excel Spreadsheets based upon EPRI TR-103335, "Guidelines for Instrument Calibration Extension/Reduction Programs" Revision 1.(3) The EPRI IPASS software Version 2.2, Quattro-Pro, and Lotus 1-2-3 applications were also used to verify the analysis.

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 the extended calibration interval.

The AFAL methodology utilizes historical data obtained from surveillance tests. The raw calibration data is conditioned prior to use for the drift calculation. The conditioning consists of eliminating tests or individual data points that do not reflect actual drift. The removed data is generally limited to data associated or affected by:

- Instrument failures,
- Procedural problems that affect the calibration data,

- M&TE problems that affect the calibration data, or
- Human performance problems that affect the calibration data.

In limited cases, statistical outliers not meeting the above criteria were removed from the sample set. In each case, the values were well outside the expected performance conditions and in most cases, resulted in equipment replacement or repair during the next calibration. The HNP trending program, in the future, will require a prompt analysis of any instrument performance substantially outside of expected conditions. This performance will then result in timely replacement of the instrument or an evaluation of the impact of the instrument's performance on the assumptions and values used in the drift or setpoint analysis. These actions will effectively identify failures and potential failures of the instrumentation.

After the calibration data was properly conditioned, spreadsheets were used to calculate the difference between the current as-found value and the previous as-left value. This difference is the drift and can be expressed in units, percent of span, or percent of setting.

For each calibration point, the spreadsheet is used to determine the following:

- Tolerance interval (95%/95% for this analysis),
- Standard deviation,
- Mean.

The Excel spreadsheets were also used to perform other statistical analysis operations to identify outliers and determine normality of the data. Additional analyses were performed to verify that appropriate groupings were used and to determine if specific indications of a time drift magnitude correlation exist. The final calculation of the tolerance interval is based upon a Time Dependence Analysis (normally a binning technique) performed using Microsoft Excel spreadsheets.

STEP 3:

Confirm that the magnitude of instrument drift has been determined with a high probability and a high degree of confidence for a bounding calibration interval of 30 months for each instrument type (make, model number, and range) and application that performs a safety function. Provide a list of the channels by TS section that identifies these instrument applications.

NOTE: The surveillance intervals addressed by this document are extended to 92 days on a STAGGERED TEST BASIS. The drift analysis was performed to obtain a bounding value at a calibration interval of 230 days (184 days + 25%).

HNP Evaluation

In accordance with the methodology described in the previous section, the magnitude of instrument drift was determined with a high degree of confidence and a high degree of probability for a bounding calibration interval for each instrument make and model number and range. The associated instruments, including manufacturer and model number for each affected TS SR, where drift analysis was performed, are listed in Enclosure 2, with the drift methodology provided as Enclosure 3.

STEP 4:

Confirm that a comparison of the projected instrument drift errors has been made with the values of drift used in the setpoint analysis. If this results in revised setpoints to accommodate larger drift errors, provide proposed TS changes to update trip setpoints. If the drift errors result in revised safety analysis to support existing setpoints, provide a summary of the updated analysis conclusions to confirm that safety limits and safety analysis assumptions are not exceeded.

HNP Evaluation

HNP uses both the "Trip Setpoint Methodology for the Edwin I. Hatch Nuclear Plant Analog Transmitter Trip System Instrumentation" submitted for NRC approval in combination with the Analog Transmitter Trip System Instrumentation[4,5] and ISA-RP67.04.[11] Since the ATTS methodology is not identical to the published GE setpoint methodology provided in NEDC 31336P-A[6], setpoint assessments in which the calculated 30-month drift values replaced the vendor or assumed drift values from each setpoint calculation were performed. The Nominal Trip Setpoints (NTSPs) and Allowable Values were assessed, considering the 30-month drift. Setpoint calculations will be revised to consider 30 month drift and to develop NTSPs and Allowable Values. Where this new NTSP is more conservative than the plant setting, plant setpoints have been revised or will be revised prior to exceeding 22.5 months of operation (18 months + 25%). Where the NTSP is less conservative than the plant setting, the plant setpoints were not changed. Where it was not possible to accommodate the projected drift by adjusting plant settings (higher potential for spurious trip), Allowable Values and NTSPs were both changed. In each of these cases, there was sufficient margin within the existing safety analysis to accommodate the revision in the Allowable Values without revising the safety analysis.

Where the evaluation identified there was insufficient operating margin to allow for setpoint changes (e.g., spurious trip avoidance probability was low), the Analytical Limit or Allowable Values were evaluated for adjustment. There were no cases in which the Allowable Value was revised due to the drift evaluations.

In no case was it necessary to change the existing Analytical Limit or safety analysis to accommodate a larger instrument drift error.

STEP 5:

Confirm that the projected instrument errors caused by drift are acceptable for control of plant parameters to effect a safe shutdown with the associated instrumentation.

HNP Evaluation

As discussed in the previous sections, the calculated drift values were compared to drift allowances in the setpoint calculation, other uncertainty analysis, and the GE design basis. For instrument strings that provide process variable indication, an evaluation was performed, as shown in Enclosure 2, to verify the instruments could still be effectively utilized to perform a safe plant shutdown.

In no case was it necessary to change the existing safe shutdown analysis to account for failures or drift.

STEP 6:

Confirm that all conditions and assumptions of the setpoint and safety analyses have been checked and are appropriately reflected in the acceptance criteria of plant surveillance procedures for channel checks, channel functional tests, and channel calibrations.

HNP Evaluation

In the cases where the extrapolated drift was less than the value assumed in the HNP calculations, there was no change to plant surveillance procedures. The plant setpoint calculations will be revised to incorporate the new drift values and to indicate NTSPs and Allowable Values prior to the license amendment implementation.

For cases where the extrapolated drift was greater than the value assumed in the setpoint calculation, the setpoint calculations will be revised to calculate a new NTSP. Where the existing plant setpoint is conservative to the NTSP, no changes will be made to the plant surveillance procedures. Where the existing plant setpoint is less conservative than the NTSP, the plant setpoint calculation and the associated plant surveillance procedures will be revised prior to license amendment implementation. The plant surveillance procedures were verified to appropriately reflect the assumptions and conditions of the setpoint calculations.

The assumptions in the safety and setpoint analysis were properly reflected in the acceptance criteria for plant surveillance procedures prior to the evaluation of these procedures for changes in frequency. The review determined that the acceptance criteria did not require revision due to the change in the surveillance test frequency for any of the associated TS functions.

STEP 7:

Provide a summary description of the program for monitoring and assessing the effects of increased calibration surveillance intervals on instrument drift and its effect on safety.

HNP Evaluation

Instruments with TS calibration surveillance frequencies extended to 184 days will be monitored and trended. As-found and as-left calibration data will be recorded for each calibration activity and an evaluation of changes from previous calibrations will be evaluated for trends. This will identify occurrences of instruments found outside of their Allowable Value, or instruments whose performance is not as assumed in the drift or setpoint analysis.

When as-found conditions are outside the Allowable Value, an evaluation will be performed to determine if the assumptions made to extend the calibration frequency are still valid, to evaluate the effect on plant safety, and to evaluate instrument OPERABILITY.

In addition, the HNP trending program will address setpoints found to be outside of their Leave As Is Zone. (LAIZ). This LAIZ is based upon either added margin or a portion of the expected drift for the instruments. The HNP trending program will require that any time a setpoint value is found outside the LAIZ, an additional evaluation be performed to ensure the instruments performance is still enveloped by the assumptions in the drift or setpoint analysis. The trending program will also plot setpoint AFAL values to verify that the performance of the instruments is within expected boundaries and that adverse trends (repeated directional changes in AFAL even of smaller magnitudes) are detected and evaluated.

B. PRA Considerations

SNC evaluated a change in surveillance intervals from the current 92 days to 92 days on a STAGGERED TEST BASIS using the plant specific PRA. The HNP PRA models instrumentation for the RPS and the emergency core cooling system (ECCS). This instrumentation is extensively modeled and is readily comparable to the models used in NEDC 30851P-A.[2] RPS instrumentation in the PRA analysis includes the following:

- Reactor Scram Associated with Low Reactor Water Level,
- Reactor Scram Associated with Average Power Range Monitor High Neutron Flux,
- Main Steam Isolation Valve Closure Scram,
- High Reactor Pressure Scram,

- Turbine Stop Valve Closure Scram, and
- Turbine Control Valve Fast Closure Scram.

All of the listed instrumentation is controlled from the analog transmitter trip system (ATTS). The models include consideration for the transmitters, trip units, the ATTS relays, RPS signal relays, and scram channel relays. Common-cause modeling for RPS is performed in a manner similar to that used in the GE models for NEDC 30851P-A.[2]

The ECCS is modeled for the following devices:

- High Pressure Coolant Injection (HPCI) Automatic Start on Low Reactor Water Level,
- Reactor Core Isolation Cooling (RCIC) Automatic Start on Low Reactor Water Level,
- HPCI High Reactor Water Level Trip,
- Residual Heat Removal (RHR) Automatic Start in Low Pressure Coolant Injection (LPCI) Mode on Low Reactor Water Level,
- Core Spray (CS) Automatic Start on Low Reactor Water Level,
- CS Injection Valves Low Reactor Pressure Permissive for Opening, and
- RHR Injection Valves Low Reactor Pressure Permissive for Opening for LPCI Mode.

All of the listed instrumentation is controlled from the ATTS. The individual models include the transmitters, trip units, and the ATTS relays. All the instrumentation mentioned, except ECCS bulleted item 3, includes the associated engineered safety feature (ESF) relays. Common-cause modeling is included for all components except item 3.

Specifically, a sensitivity study was performed in which the failure rates, which are currently used in the PRA for the listed instrumentation, are conservatively multiplied by a factor of 2 in order to model the increased surveillance intervals. The length of time assumed for the latent failures is set equal to the proposed surveillance interval divided by 2. In order to perform this sensitivity study, all failure probability is very conservatively assumed to be latent. The assumption further states that the present demand failure rate is an hourly rate. This is described in the equations below.

$P = \lambda(T / 2)$
$P(3\ month) = \lambda\ ((3 \times 730\ hours\ per\ month) / 2)$
$P(6\ month) = \lambda\ ((6 \times 730\ hours\ per\ month) / 2)$

where: P = failure probability
λ = failure rate (i.e., the demand failure rate referenced as an hourly failure rate)
T = time interval between tests

The end result of the sensitivity study is a very small change in CDF and essentially no change in LERF. The CDF and LERF for the initial PRA and for the end result of the sensitivity study are shown in the table below. The changes in these values are also shown in the table.

Comparison of Results for CDF and LERF Values Initial PRA vs. Sensitivity Study

Parameter	Initial PRA Values	Sensitivity Study Results	Change in Values
CDF	1.24E-05	1.29E-05	5E-7
LERF	2.19E-06	2.19E-06	~ 0

The change in CDF is below the 1E-6 threshold recommended by Regulatory Guide 1.174. Therefore, the proposed increase in surveillance intervals causes an insignificant increase in CDF and essentially no change in LERF. Additionally, failure data was collected for the associated procedures, which shows that surveillance procedure failures for multiple groups of RPS and ECCS instrumentation are very small in number. This shows a decreasing trend in instrument failure, thus supporting the conservatism of this sensitivity study.

3.0 CONCLUSION

As described in the above discussion, the evaluations to justify a change in surveillance intervals have been completed. These evaluations have been determined to conform to the guidance provided in GL 91-04.[(1)] The specific evaluations for each HNP TS SR being changed are contained in Enclosure 4. The Significant Hazards Consideration performed in accordance with 10 CFR 50.92 for these changes is included as Enclosure 6.

4.0 COMMITMENTS WITHIN THIS LETTER

1. Instruments with TS calibration surveillance frequencies will be monitored and trended. As-found and as-left calibration data will be recorded for each calibration activity. This will identify occurrences of instruments found outside of their Allowable Value, or instruments whose performance is not as assumed in the drift or setpoint analysis.

When as-found conditions are outside the AV, an evaluation will be performed to determine if the assumptions made to extend the calibration frequency are still valid, to evaluate the effect on plant safety and to evaluate instrument operability.

In addition, the HNP trending program will address setpoints for TS calibration surveillance frequencies extended to 184 days found to be outside of their LAIZ. This LAIZ is based upon either added margin or a portion of the expected drift for the instruments. The HNP trending program will require that any time a setpoint value is found outside the LAIZ, an additional evaluation be performed to ensure that the instruments performance is still enveloped by the assumptions in the drift or setpoint analysis. The trending program will also plot setpoint AFAL values to verify that the performance of the instruments is within expected boundaries and that adverse trends (repeated directional changes in AFAL even of smaller magnitudes) are detected and evaluated.

2. Appropriate procedures and programs will be revised prior to or in conjunction with implementation of the license amendment.

5.0 REFERENCES

1. NRC Generic Letter No. 91-04, "Changes in Technical Specification Surveillance Intervals to accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

2. "Technical Specification Improvement Analysis for BWR Reactor Protection System," NEDC-30851P-A, DRF A00-02119-A, Class III, March 1988.

3. "Statistical Analysis of Instrument Calibration Data, Guidelines for Instrument Calibration Extension/Reduction Programs," EPRI TR-103335, Revision 1.

4. NRR Safety Evaluation Report for Amendment 103 to the Facility Operating License No DPR-57 for the Edwin I. Hatch Nuclear Plant Unit 1, dated December 7, 1984.

5. NRR Safety Evaluation Report for Amendment 67 to the Facility Operating License No DPR-57 for the Edwin I. Hatch Nuclear Plant Unit 2, dated November 6, 1986.

6. ISA RP67.04 Part II-1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation."

ENCLOSURE 2 TAB

Enclosure 2

Edwin I. Hatch Nuclear Plant
Request to Revise Technical Specifications:
Quarterly Surveillance Extension

Drift Study Cross Reference

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.1.1-1 (3)	1B21N678A	GE	184C5988G101	SNC-023
3.3.1.1-1 (3)	1B21N678B	GE	184C5988G101	SNC-023
3.3.1.1-1 (3)	1B21N678C	GE	184C5988G101	SNC-023
3.3.1.1-1 (3)	1B21N678D	GE	184C5988G101	SNC-023
3.3.1.1-1 (3)	2B21N678A	GE	184C5988G101	SNC-023
3.3.1.1-1 (3)	2B21N678B	GE	184C5988G101	SNC-023
3.3.1.1-1 (3)	2B21N678C	GE	184C5988G101	SNC-023
3.3.1.1-1 (3)	2B21N678D	GE	184C5988G101	SNC-023
3.3.1.1-1 (4)	1B21N680A	GE	184C5988G105	SNC-023
3.3.1.1-1 (4)	1B21N680B	GE	184C5988G105	SNC-023
3.3.1.1-1 (4)	1B21N680C	GE	184C5988G105	SNC-023
3.3.1.1-1 (4)	1B21N680D	GE	184C5988G105	SNC-023
3.3.1.1-1 (4)	2B21N680A	GE	184C5988G105	SNC-023
3.3.1.1-1 (4)	2B21N680B	GE	184C5988G105	SNC-023
3.3.1.1-1 (4)	2B21N680C	GE	184C5988G105	SNC-023
3.3.1.1-1 (4)	2B21N680D	GE	184C5988G105	SNC-023
3.3.1.1-1 (6)	1C71N650A	GE	184C5988G111	SNC-023
3.3.1.1-1 (6)	1C71N650B	GE	184C5988G111	SNC-023
3.3.1.1-1 (6)	1C71N650C	GE	184C5988G111	SNC-023
3.3.1.1-1 (6)	1C71N650D	GE	184C5988G111	SNC-023
3.3.1.1-1 (6)	2C71N650A	GE	184C5988G111	SNC-023
3.3.1.1-1 (6)	2C71N650B	GE	184C5988G111	SNC-023
3.3.1.1-1 (6)	2C71N650C	GE	184C5988G111	SNC-023
3.3.1.1-1 (6)	2C71N650D	GE	184C5988G111	SNC-023
3.3.3.1-1 (1)	1B21N690A	GE	184C5988G112	SNC-023
3.3.3.1-1 (1)	1B21N690D	GE	184C5988G112	SNC-023
3.3.3.1-1 (1)	2B21N690A	GE	184C5988G112	SNC-023
3.3.3.1-1 (1)	2B21N690D	GE	184C5988G112	SNC-023

Drift Study Cross Reference

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.4.2.a	1B21N694A	Rosemount	710DU0TS	SNC-023
3.3.4.2.a	1B21N694B	Rosemount	710DU0TS	SNC-023
3.3.4.2.a	1B21N694C	Rosemount	710DU0TS	SNC-023
3.3.4.2.a	1B21N694D	Rosemount	710DU0TS	SNC-023
3.3.4.2.a	2B21N694A	Rosemount	710DU0TS	SNC-023
3.3.4.2.a	2B21N694B	Rosemount	710DU0TS	SNC-023
3.3.4.2.a	2B21N694C	Rosemount	710DU0TS	SNC-023
3.3.4.2.a	2B21N694D	Rosemount	710DU0TS	SNC-023
3.3.4.2.b	1B21N620A	Rosemount	710DU1TT36249	SNC-023
3.3.4.2.b	1B21N620B	Rosemount	710DU1TT36249	SNC-023
3.3.4.2.b	1B21N642A	Rosemount	710DU1TS	SNC-023
3.3.4.2.b	1B21N642B	Rosemount	710DU1TS	SNC-023
3.3.4.2.b	1B21N643A	Rosemount	710DU1TT36249	SNC-023
3.3.4.2.b	1B21N643B	Rosemount	710DU1TT36249	SNC-023
3.3.4.2.b	2B21N620A	Rosemount	710DU1TT36249	SNC-023
3.3.4.2.b	2B21N620B	Rosemount	710DU1TT36249	SNC-023
3.3.4.2.b	2B21N642A	Rosemount	710DU1TS	SNC-023
3.3.4.2.b	2B21N642B	Rosemount	710DU1TS	SNC-023
3.3.4.2.b	2B21N643A	Rosemount	710DU1TT36249	SNC-023
3.3.4.2.b	2B21N643B	Rosemount	710DU1TT36249	SNC-023
3.3.5.1-1 (1.a)	1B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.a)	1B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.a)	1B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.a)	1B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.a)	2B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.a)	2B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.a)	2B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.a)	2B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (1.b)	1E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (1.b)	1E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (1.b)	1E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (1.b)	1E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (1.b)	2E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (1.b)	2E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (1.b)	2E11N694C	GE	184C5988G111	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.5.1-1 (1.b)	2E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (1.c)	1B21N690A	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.c)	1B21N690B	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.c)	1B21N690C	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.c)	1B21N690D	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.c)	2B21N690A	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.c)	2B21N690B	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.c)	2B21N690C	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.c)	2B21N690D	GE	184C5988G112	SNC-023
3.3.5.1-1 (1.d)	1E21N651A	GE	184C5988G502	SNC-023
3.3.5.1-1 (1.d)	1E21N651B	GE	184C5988G502	SNC-023
3.3.5.1-1 (1.d)	2E21N651A	GE	184C5988G502	SNC-023
3.3.5.1-1 (1.d)	2E21N651B	GE	184C5988G502	SNC-023
3.3.5.1-1 (2.a)	1B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.a)	1B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.a)	1B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.a)	1B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.a)	2B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.a)	2B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.a)	2B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.a)	2B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (2.b)	1E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.b)	1E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.b)	1E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.b)	1E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.b)	2E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.b)	2E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.b)	2E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.b)	2E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (2.c)	1B21N690A	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.c)	1B21N690B	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.c)	1B21N690C	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.c)	1B21N690D	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.c)	2B21N690A	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.c)	2B21N690B	GE	184C5988G112	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.5.1-1 (2.c)	2B21N690C	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.c)	2B21N690D	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	1B21N641B	GE	184C5988G300	SNC-023
3.3.5.1-1 (2.d)	1B21N641C	GE	184C5988G300	SNC-023
3.3.5.1-1 (2.d)	1B21N690B	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	1B21N690C	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	1B21N690E	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	1B21N690F	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	2B21N641B	GE	184C5988G300	SNC-023
3.3.5.1-1 (2.d)	2B21N641C	GE	184C5988G300	SNC-023
3.3.5.1-1 (2.d)	2B21N690B	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	2B21N690C	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	2B21N690E	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.d)	2B21N690F	GE	184C5988G112	SNC-023
3.3.5.1-1 (2.e)	1B21N685A	GE	184C5988G110	SNC-023
3.3.5.1-1 (2.e)	1B21N685B	GE	184C5988G110	SNC-023
3.3.5.1-1 (2.e)	2B21N685A	GE	184C5988G110	SNC-023
3.3.5.1-1 (2.e)	2B21N685B	GE	184C5988G110	SNC-023
3.3.5.1-1 (2.g)	1E11N682A	GE	184C5988G502	SNC-023
3.3.5.1-1 (2.g)	1E11N682B	GE	184C5988G502	SNC-023
3.3.5.1-1 (2.g)	2E11N682A	GE	184C5988G502	SNC-023
3.3.5.1-1 (2.g)	2E11N682B	GE	184C5988G502	SNC-023
3.3.5.1-1 (3.a)	1B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	1B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	1B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	1B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	1B21N692A	Rosemount	710DU1TS	SNC-023
3.3.5.1-1 (3.a)	1B21N692B	Rosemount	710DU1TS	SNC-023
3.3.5.1-1 (3.a)	1B21N692C	Rosemount	710DU1TS	SNC-023
3.3.5.1-1 (3.a)	1B21N692D	Rosemount	710DU1TS	SNC-023
3.3.5.1-1 (3.a)	2B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	2B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	2B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	2B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (3.a)	2B21N692A	Rosemount	710DU1TS	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.5.1-1 (3.a)	2B21N692B	Rosemount	710DU1TS	SNC-023
3.3.5.1-1 (3.a)	2B21N692C	Rosemount	710DU1TS	SNC-023
3.3.5.1-1 (3.a)	2B21N692D	Rosemount	710DU1TS	SNC-023
3.3.5.1-1 (3.b)	1E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.b)	1E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.b)	1E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.b)	1E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.b)	2E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.b)	2E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.b)	2E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.b)	2E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (3.c)	1B21N693B	GE	184C5988G105	SNC-023
3.3.5.1-1 (3.c)	1B21N693D	GE	184C5988G300	SNC-023
3.3.5.1-1 (3.c)	1B21N695B	GE	184C5988G105	SNC-023
3.3.5.1-1 (3.c)	2B21N693B	GE	184C5988G105	SNC-023
3.3.5.1-1 (3.c)	2B21N693D	GE	184C5988G300	SNC-023
3.3.5.1-1 (3.c)	2B21N695B	GE	184C5988G105	SNC-023
3.3.5.1-1 (3.e)	1E41N662B	GE	184C5988G114	SNC-023
3.3.5.1-1 (3.e)	1E41N662D	GE	184C5988G114	SNC-023
3.3.5.1-1 (3.e)	2E41N662B	GE	184C5988G114	SNC-023
3.3.5.1-1 (3.e)	2E41N662D	GE	184C5988G114	SNC-023
3.3.5.1-1 (3.f)	1E41N651	GE	184C5988G602	SNC-020
3.3.5.1-1 (3.f)	2E41N651	GE	184C5988G602	SNC-020
3.3.5.1-1 (4.a)	1B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.a)	1B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.a)	1B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.a)	1B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.a)	2B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.a)	2B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.a)	2B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.a)	2B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (4.b)	1E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (4.b)	1E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (4.b)	1E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (4.b)	1E11N694D	GE	184C5988G111	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.5.1-1 (4.b)	2E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (4.b)	2E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (4.b)	2E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (4.b)	2E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (4.d)	1B21N695A	GE	184C5988G105	SNC-023
3.3.5.1-1 (4.d)	1B21N695B	GE	184C5988G105	SNC-023
3.3.5.1-1 (4.d)	2B21N695A	GE	184C5988G105	SNC-023
3.3.5.1-1 (4.d)	2B21N695B	GE	184C5988G105	SNC-023
3.3.5.1-1 (4.e)	1E21N652A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.e)	1E21N652B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.e)	1E21N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.e)	1E21N655B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.e)	2E21N652A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.e)	2E21N652B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.e)	2E21N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.e)	2E21N655B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N655B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N655C	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N655D	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N656A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N656B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N656C	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	1E11N656D	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N655B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N655C	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N655D	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N656A	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N656B	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N656C	GE	184C5988G504	SNC-023
3.3.5.1-1 (4.f)	2E11N656D	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.a)	1B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (5.a)	1B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (5.a)	1B21N691C	Rosemount	710DU1TT24250	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.5.1-1 (5.a)	1B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (5.a)	2B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (5.a)	2B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (5.a)	2B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (5.a)	2B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.1-1 (5.b)	1E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.b)	1E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.b)	1E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.b)	1E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.b)	2E11N694A	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.b)	2E11N694B	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.b)	2E11N694C	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.b)	2E11N694D	GE	184C5988G111	SNC-023
3.3.5.1-1 (5.d)	1B21N695A	GE	184C5988G105	SNC-023
3.3.5.1-1 (5.d)	1B21N695B	GE	184C5988G105	SNC-023
3.3.5.1-1 (5.d)	2B21N695A	GE	184C5988G105	SNC-023
3.3.5.1-1 (5.d)	2B21N695B	GE	184C5988G105	SNC-023
3.3.5.1-1 (5.e)	1E21N652A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.e)	1E21N652B	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.e)	1E21N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.e)	1E21N655B	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.e)	2E21N652A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.e)	2E21N652B	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.e)	2E21N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.e)	2E21N655B	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N655B	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N655C	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N655D	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N656A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N656B	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N656C	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	1E11N656D	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	2E11N655A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	2E11N655B	GE	184C5988G504	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.5.1-1 (5.f)	2E11N655C	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	2E11N655D	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	2E11N656A	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	2E11N656B	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	2E11N656C	GE	184C5988G504	SNC-023
3.3.5.1-1 (5.f)	2E11N656D	GE	184C5988G504	SNC-023
3.3.5.2-1 (1)	1B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	1B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	1B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	1B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	1B21N692A	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (1)	1B21N692B	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (1)	1B21N692C	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (1)	1B21N692D	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (1)	2B21N691A	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	2B21N691B	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	2B21N691C	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	2B21N691D	Rosemount	710DU1TT24250	SNC-023
3.3.5.2-1 (1)	2B21N692A	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (1)	2B21N692B	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (1)	2B21N692C	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (1)	2B21N692D	Rosemount	710DU1TS	SNC-023
3.3.5.2-1 (2)	1B21N693A	GE	184C5988G105	SNC-023
3.3.5.2-1 (2)	1B21N693C	GE	184C5988G300	SNC-023
3.3.5.2-1 (2)	2B21N693A	GE	184C5988G105	SNC-023
3.3.5.2-1 (2)	2B21N693C	GE	184C5988G300	SNC-023
3.3.6.1-1 (1.a)	1B21N681A	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.a)	1B21N681B	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.a)	1B21N681C	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.a)	1B21N681D	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.a)	2B21N681A	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.a)	2B21N681B	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.a)	2B21N681C	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.a)	2B21N681D	GE	184C5988G104	SNC-023
3.3.6.1-1 (1.b)	1B21N015A	Barksdale	B2T-C12SS	SNC-006

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (1.b)	1B21N015B	Barksdale	B2T-C12SS	SNC-006
3.3.6.1-1 (1.b)	1B21N015C	Barksdale	B2T-C12SS	SNC-006
3.3.6.1-1 (1.b)	1B21N015D	Barksdale	B2T-C12SS	SNC-006
3.3.6.1-1 (1.b)	2B21N015A	Barksdale	B2T-M12SS	SNC-006
3.3.6.1-1 (1.b)	2B21N015B	Barksdale	B2T-M12SS	SNC-006
3.3.6.1-1 (1.b)	2B21N015C	Barksdale	B2T-M12SS	SNC-006
3.3.6.1-1 (1.b)	2B21N015D	Barksdale	B2T-M12SS	SNC-006
3.3.6.1-1 (1.c)	1B21N686A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N686B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N686C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N686D	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N687A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N687B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N687C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N687D	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N688A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N688B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N688C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N688D	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N689A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N689B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N689C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	1B21N689D	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N686A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N686B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N686C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N686D	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N687A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N687B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N687C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N687D	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N688A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N688B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N688C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N688D	GE	184C5988G505	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (1.c)	2B21N689A	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N689B	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N689C	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.c)	2B21N689D	GE	184C5988G505	SNC-023
3.3.6.1-1 (1.d)	1B21N056A	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.d)	1B21N056B	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.d)	1B21N056C	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.d)	1B21N056D	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.d)	2B21N056A	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.d)	2B21N056B	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.d)	2B21N056C	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.d)	2B21N056D	Barksdale	D1T-M18-SS	SNC-027
3.3.6.1-1 (1.e)	1B21N623A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N623B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N623C	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N623D	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N624A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N624B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N624C	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N624D	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N625A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N625B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N625C	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N625D	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N626A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N626B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N626C	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	1B21N626D	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N623A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N623B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N623C	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N623D	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N624A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N624B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N624C	GE	184C5988G201	SNC-024

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (1.e)	2B21N624D	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N625A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N625B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N625C	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N625D	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N626A	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N626B	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N626C	GE	184C5988G201	SNC-024
3.3.6.1-1 (1.e)	2B21N626D	GE	184C5988G201	SNC-024
3.3.6.1-1 (2.a)	1B21N680A	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.a)	1B21N680B	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.a)	1B21N680C	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.a)	1B21N680D	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.a)	2B21N680A	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.a)	2B21N680B	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.a)	2B21N680C	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.a)	2B21N680D	GE	184C5988G105	SNC-023
3.3.6.1-1 (2.b)	1C71N650A	GE	184C5988G111	SNC-023
3.3.6.1-1 (2.b)	1C71N650B	GE	184C5988G111	SNC-023
3.3.6.1-1 (2.b)	1C71N650C	GE	184C5988G111	SNC-023
3.3.6.1-1 (2.b)	1C71N650D	GE	184C5988G111	SNC-023
3.3.6.1-1 (2.b)	2C71N650A	GE	184C5988G111	SNC-023
3.3.6.1-1 (2.b)	2C71N650B	GE	184C5988G111	SNC-023
3.3.6.1-1 (2.b)	2C71N650C	GE	184C5988G111	SNC-023
3.3.6.1-1 (2.b)	2C71N650D	GE	184C5988G111	SNC-023
3.3.6.1-1 (3.a)	1E41N657A	GE	184C5988G501	SNC-023
3.3.6.1-1 (3.a)	1E41N657B	GE	184C5988G501	SNC-023
3.3.6.1-1 (3.a)	2E41N657A	GE	184C5988G501	SNC-023
3.3.6.1-1 (3.a)	2E41N657B	GE	184C5988G501	SNC-023
3.3.6.1-1 (3.b)	1E41N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.b)	1E41N658B	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.b)	1E41N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.b)	1E41N658D	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.b)	2E41N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.b)	2E41N658B	GE	184C5988G101	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (3.b)	2E41N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.b)	2E41N658D	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.c)	1E41N655A	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.c)	1E41N655B	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.c)	1E41N655C	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.c)	1E41N655D	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.c)	2E41N655A	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.c)	2E41N655B	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.c)	2E41N655C	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.c)	2E41N655D	GE	184C5988G102	SNC-023
3.3.6.1-1 (3.d)	1E11N694C	GE	184C5988G111	SNC-023
3.3.6.1-1 (3.d)	1E11N694D	GE	184C5988G111	SNC-023
3.3.6.1-1 (3.d)	1E41N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.d)	1E41N658B	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.d)	1E41N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.d)	1E41N658D	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.d)	2E11N694C	GE	184C5988G111	SNC-023
3.3.6.1-1 (3.d)	2E11N694D	GE	184C5988G111	SNC-023
3.3.6.1-1 (3.d)	2E41N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.d)	2E41N658B	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.d)	2E41N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.d)	2E41N658D	GE	184C5988G101	SNC-023
3.3.6.1-1 (3.e)	1E41N671A	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.e)	1E41N671B	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.e)	2E41N671A	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.e)	2E41N671B	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.f)	1E51N666C	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.f)	1E51N666D	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.f)	2E51N666C	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.f)	2E51N666D	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.g)	1E51M603A	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (3.g)	1E51M603B	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (3.g)	2E51M603A	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (3.g)	2E51M603B	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (3.h)	1E51N665C	GE	184C5988G401	SNC-022

Enclosure 2
Request to Revise Technical Specifications:
Quarterly Surveillance Extension
Drift Study Cross Reference

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (3.h)	1E51N665D	GE	184C5988G401	SNC-022
3.3.6.1-1 (3.h)	2E51N665C	GE	184C5988G401	SNC-022
3.3.6.1-1 (3.h)	2E51N665D	GE	184C5988G401	SNC-022
3.3.6.1-1 (3.i)	1E41N670A	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.i)	1E41N670B	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.i)	2E41N670A	GE	184C5988G201	SNC-024
3.3.6.1-1 (3.i)	2E41N670B	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.a)	1E51N657A	GE	184C5988G501	SNC-023
3.3.6.1-1 (4.a)	1E51N657B	GE	184C5988G501	SNC-023
3.3.6.1-1 (4.a)	2E51N657A	GE	184C5988G501	SNC-023
3.3.6.1-1 (4.a)	2E51N657B	GE	184C5988G501	SNC-023
3.3.6.1-1 (4.b)	1E51N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.b)	1E51N658B	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.b)	1E51N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.b)	1E51N658D	GE	184C59885101	SNC-023
3.3.6.1-1 (4.b)	2E51N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.b)	2E51N658B	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.b)	2E51N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.b)	2E51N658D	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.c)	1E51N685A	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.c)	1E51N685B	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.c)	1E51N685C	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.c)	1E51N685D	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.c)	2E51N685A	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.c)	2E51N685B	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.c)	2E51N685C	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.c)	2E51N685D	GE	184C5988G102	SNC-023
3.3.6.1-1 (4.d)	1E11N694A	GE	184C5988G111	SNC-023
3.3.6.1-1 (4.d)	1E11N694B	GE	184C5988G111	SNC-023
3.3.6.1-1 (4.d)	1E51N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.d)	1E51N658B	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.d)	1E51N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.d)	1E51N658D	GE	184C59885101	SNC-023
3.3.6.1-1 (4.d)	2E11N694A	GE	184C5988G111	SNC-023
3.3.6.1-1 (4.d)	2E11N694B	GE	184C5988G111	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (4.d)	2E51N658A	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.d)	2E51N658B	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.d)	2E51N658C	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.d)	2E51N658D	GE	184C5988G101	SNC-023
3.3.6.1-1 (4.e)	1E51N666A	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.e)	1E51N666B	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.e)	2E51N666A	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.e)	2E51N666B	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.f)	1E51M602A	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (4.f)	1E51M602B	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (4.f)	2E51M602A	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (4.f)	2E51M602B	Eagle	HP-5 or MP	SNC-005
3.3.6.1-1 (4.g)	1E51N665A	GE	184C5988G401	SNC-022
3.3.6.1-1 (4.g)	1E51N665B	GE	184C5988G401	SNC-022
3.3.6.1-1 (4.g)	2E51N665A	GE	184C5988G401	SNC-022
3.3.6.1-1 (4.g)	2E51N665B	GE	184C5988G401	SNC-022
3.3.6.1-1 (4.h)	1E51N661A	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.h)	1E51N661B	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.h)	2E51N661A	GE	184C5988G201	SNC-024
3.3.6.1-1 (4.h)	2E51N661B	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	1G31N662A	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	1G31N662D	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	1G31N662E	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	1G31N662H	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	1G31N662J	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	1G31N662M	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	2G31N662A	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	2G31N662D	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	2G31N662E	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	2G31N662H	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	2G31N662J	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.a)	2G31N662M	GE	184C5988G201	SNC-024
3.3.6.1-1 (5.b)	1G31N663A	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	1G31N663D	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	1G31N663E	GE	184C5988G401	SNC-022

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (5.b)	1G31N663H	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	1G31N663J	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	1G31N663M	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	2G31N663A	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	2G31N663D	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	2G31N663E	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	2G31N663H	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	2G31N663J	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.b)	2G31N663M	GE	184C5988G401	SNC-022
3.3.6.1-1 (5.d)	1B21N681A	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	1B21N681B	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	1B21N681C	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	1B21N681D	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	1B21N682A	GE	184C5988G300	SNC-023
3.3.6.1-1 (5.d)	1B21N682B	GE	184C5988G300	SNC-023
3.3.6.1-1 (5.d)	1B21N682C	GE	184C5988G300	SNC-023
3.3.6.1-1 (5.d)	1B21N682D	GE	184C5988G300	SNC-023
3.3.6.1-1 (5.d)	2B21N681A	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	2B21N681B	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	2B21N681C	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	2B21N681D	GE	184C5988G104	SNC-023
3.3.6.1-1 (5.d)	2B21N682A	GE	184C5988G300	SNC-023
3.3.6.1-1 (5.d)	2B21N682B	GE	184C5988G300	SNC-023
3.3.6.1-1 (5.d)	2B21N682C	GE	184C5988G300	SNC-023
3.3.6.1-1 (5.d)	2B21N682D	GE	184C5988G300	SNC-023
3.3.6.1-1 (6.a)	1B31N679A	GE	184C5988G121	SNC-023
3.3.6.1-1 (6.a)	1B31N679D	GE	184C5988G121	SNC-023
3.3.6.1-1 (6.a)	2B31N679A	GE	184C5988G121	SNC-023
3.3.6.1-1 (6.a)	2B31N679D	GE	184C5988G121	SNC-023
3.3.6.1-1 (6.b)	1B21N680A	GE	184C5988G105	SNC-023
3.3.6.1-1 (6.b)	1B21N680B	GE	184C5988G105	SNC-023
3.3.6.1-1 (6.b)	1B21N680C	GE	184C5988G105	SNC-023
3.3.6.1-1 (6.b)	1B21N680D	GE	184C5988G105	SNC-023
3.3.6.1-1 (6.b)	2B21N680A	GE	184C5988G105	SNC-023
3.3.6.1-1 (6.b)	2B21N680B	GE	184C5988G105	SNC-023

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.1-1 (6.b)	2B21N680C	GE	184C5988G105	SNC-023
3.3.6.1-1 (6.b)	2B21N680D	GE	184C5988G105	SNC-023
3.3.6.2-1 (1)	1B21N681A	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	1B21N681B	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	1B21N681C	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	1B21N681D	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	1B21N682A	GE	184C5988G300	SNC-023
3.3.6.2-1 (1)	1B21N682B	GE	184C5988G300	SNC-023
3.3.6.2-1 (1)	1B21N682C	GE	184C5988G300	SNC-023
3.3.6.2-1 (1)	1B21N682D	GE	184C5988G300	SNC-023
3.3.6.2-1 (1)	2B21N681A	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	2B21N681B	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	2B21N681C	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	2B21N681D	GE	184C5988G104	SNC-023
3.3.6.2-1 (1)	2B21N682A	GE	184C5988G300	SNC-023
3.3.6.2-1 (1)	2B21N682B	GE	184C5988G300	SNC-023
3.3.6.2-1 (1)	2B21N682C	GE	184C5988G300	SNC-023
3.3.6.2-1 (1)	2B21N682D	GE	184C5988G300	SNC-023
3.3.6.2-1 (2)	1C71N650A	GE	184C5988G111	SNC-023
3.3.6.2-1 (2)	1C71N650B	GE	184C5988G111	SNC-023
3.3.6.2-1 (2)	1C71N650C	GE	184C5988G111	SNC-023
3.3.6.2-1 (2)	1C71N650D	GE	184C5988G111	SNC-023
3.3.6.2-1 (2)	2C71N650A	GE	184C5988G111	SNC-023
3.3.6.2-1 (2)	2C71N650B	GE	184C5988G111	SNC-023
3.3.6.2-1 (2)	2C71N650C	GE	184C5988G111	SNC-023
3.3.6.2-1 (2)	2C71N650D	GE	184C5988G111	SNC-023
3.3.6.3-1 (1)	1B21N620A	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (1)	1B21N620B	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (1)	1B21N620C	GE	184C5988G106	SNC-023
3.3.6.3-1 (1)	1B21N620D	GE	184C5988G106	SNC-023
3.3.6.3-1 (1)	2B21N620A	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (1)	2B21N620B	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (1)	2B21N620C	GE	184C5988G106	SNC-023
3.3.6.3-1 (1)	2B21N620D	GE	184C5988G106	SNC-023
3.3.6.3-1 (2)	1B21N620A	Rosemount	710DU1TT36249	SNC-023

Drift Study Cross Reference

Technical Specifications Table Item or LCO	MPL No.	Manufacturer	Model No.	Drift Study
3.3.6.3-1 (2)	1B21N620B	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (2)	1B21N620C	GE	184C5988G106	SNC-023
3.3.6.3-1 (2)	1B21N620D	GE	184C5988G106	SNC-023
3.3.6.3-1 (2)	1B21N621A	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	1B21N621B	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	1B21N621C	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	1B21N621D	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	1B21N622A	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	1B21N622B	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	1B21N622C	GE	184C5988G606	SNC-020
3.3.6.3-1 (2)	1B21N622D	GE	184C5988G606	SNC-020
3.3.6.3-1 (2)	1B21N643A	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (2)	1B21N643B	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (2)	2B21N620A	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (2)	2B21N620B	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (2)	2B21N620C	GE	184C5988G106	SNC-023
3.3.6.3-1 (2)	2B21N620D	GE	184C5988G106	SNC-023
3.3.6.3-1 (2)	2B21N621A	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	2B21N621B	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	2B21N621C	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	2B21N621D	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	2B21N622A	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	2B21N622B	GE	184C5988G700	SNC-020
3.3.6.3-1 (2)	2B21N622C	GE	184C5988G606	SNC-020
3.3.6.3-1 (2)	2B21N622D	GE	184C5988G606	SNC-020
3.3.6.3-1 (2)	2B21N643A	Rosemount	710DU1TT36249	SNC-023
3.3.6.3-1 (2)	2B21N643B	Rosemount	710DU1TT36249	SNC-023

ENCLOSURE 3 TAB

Enclosure 3

Edwin I. Hatch Nuclear Plant
Request to Revise Technical Specifications:
Quarterly Surveillance Extension

Instrument Drift Analysis Methodology
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History of Revisions

Rev. No.	Approval Date	Reason & Description Change
0	3/1/2001	Initial Issue
1	5/4/2001	Revised Time Bin Limits of Section 3.9.3.1 for items c, d, e, and f, to ensure that upper bin limits for semi-annual, annual, and 18-month calibrations cover the normal TS allowance. Revised page 20 of the body of this document and pages 8 and I1 of Appendix A, the example drift study.
2	8/22/2001	Replaced Appendix A entirely. Therefore, no revision bars are shown on the Appendix.

Enclosure 3

Edwin I. Hatch Nuclear Plant
Request to Revise Technical Specifications:
Quarterly Surveillance Extension

Drift Analysis Design Guide

1. OBJECTIVE/PURPOSE

The objective of this Design Guide is to provide the necessary detail and guidance to perform drift analyses using past calibration history data for the purposes of:

- Quantifying component/loop drift characteristics within defined probability limits to gain an understanding of the expected behavior for the component/loop by evaluating past performance
- Estimating component/loop drift for integration into setpoint calculations
- Analysis aid for reliability centered maintenance practices (e.g., optimizing calibration frequency)
- Establishing a technical basis for extending calibration and surveillance intervals using historical calibration data
- Evaluating extended surveillance intervals in support of longer fuel cycles
- Trending device performance based on extended surveillance intervals

2. DRIFT ANALYSIS SCOPE

The scope of this design guide is limited to the calculation of the expected performance for a component, group of components or loop, utilizing past calibration data. The Drift Studies are the final product of the data analysis and will document the use of the drift data for the purposes listed in Section 1. The Setpoint/Uncertainty calculations will incorporate the values documented in the Drift Studies for the applications specific to a given loop or component.

The approaches described within this design guide can be applied to all devices that are surveilled or calibrated where As-Found and As-Left data is recorded. The scope of this design guide includes, but is not limited to, the following list of devices:

- Transmitters (Differential Pressure, Flow, Level, Pressure, Temperature, etc.)
- Bistables (Master & Slave Trip Units, Alarm Units, etc.)
- Indicators (Analog, Digital)
- Switches (Differential Pressure, Flow, Level, Position, Pressure, Temperature, etc.)
- Signal Conditioners/Converters (Summers, E/P Converters, Square Root Converters, etc.)
- Recorders (Temperature, Pressure, Flow, Level, etc.)
- Monitors & Modules (Radiation, Neutron, H_2O_2, Pre-Amplifiers, etc.)
- Relays (Time Delay, Undervoltage, Overvoltage, etc.)

Note that a given device or device type may be justified not to require drift analysis in accordance with this design guide, if appropriate. For the 24-Month Fuel Cycle Extension Project, if calibration intervals are to be extended for instrumentation, and the associated drift is not analyzed per this design guide, justification should be provided as a part of the project documentation.

3. DISCUSSION/METHODOLOGY

3.1. Methodology Options

This design guide is written to provide the methodology necessary for the analysis of As-Found versus As-Left calibration data, as a means of characterizing the performance of a component or group of components via the following methods:

3.1.1. Electric Power Research Institute (EPRI) has developed a guideline to provide nuclear plants with practical methods for analyzing historic component calibration data to predict component performance via a simple spreadsheet program (e.g., Excel, Lotus 1-2-3). This design guide is written in close adherence to this guideline, Reference 7.1.1.

3.1.2. Commercial Grade Software programs other than Microsoft Excel (e.g. IPASS, Lotus 1-2-3, SYSTAT, etc.), that will perform the functions necessary to evaluate drift, may be utilized providing:

- the intent of this design guide is met as outlined in Reference 7.1.1,
- software is used only as a tool to produce hard copy outputs which will be independently verified.

3.1.3. The EPRI IPASS software, version 2.03, may be used to perform or independently verify certain portions of the drift analysis. The IPASS software does not have the functionality to perform many of the functions required by the drift analysis, such as time dependency functions, and therefore, should only be used in conjunction with other software products to produce or verify an entire drift study.

3.1.4. For the 24 Month Cycle Extension Project, the final products of the data analyses are the hard copy drift studies, which will be formatted in accordance with the example drift study contained in Appendix A. The electronic files of the drift studies are an intermediate step from raw data to final product and are not controlled as QA files. The drift study is independently verified using different software than that used to create the drift study. The review of the drift study will include a summary tabulation of results from each program to provide visual evidence of the acceptability of the results of the review.

3.2. Data Analysis Discussion

The following data analysis methods were evaluated for use at E. I. Hatch Nuclear Plant: 1) As-Found Versus Setpoint, 2) Worst Case As-Found Versus As-Left, 3) Combined Calibration Data Points Analysis, and 4) As-Found Versus As-Left. The evaluation concluded that the As-Found versus As-Left methodology provided results that were more representative of the data and has been chosen for use by this Design Guide. Statistical tests not covered by this design guide may be utilized providing the Engineer performing the analysis adequately justifies the use of the tests.

3.2.1. As-Found Versus As-Left Calibration Data Analysis

The As-Found versus As-Left calibration data analysis is based on calculating drift by subtracting the previous As-Left component setting from the current As-Found setting. Each calibration point is treated as an independent set of data for purposes of characterizing drift across the full, calibrated span of the component/loop. By evaluating As-Found versus As-Left data for a component/loop or a similar group of components/loops, the following information may be obtained:

- The typical component/loop drift between calibrations (Random in nature)

- Any tendency for the component/loop to drift in a particular direction (Bias)
- Any tendency for the component/loop drift to increase in magnitude over time (Time Dependency)
- Confirmation that the selected setting or calibration tolerance is appropriate or achievable for the component/loop

3.2.1.1. General Features of As-Found Versus As-Left Analysis

- The methodology evaluates historical calibration data only. The method does not monitor on-line component output; data is obtained from component calibration records.
- Present and future performance is predicted based on statistical analysis of past performance.
- Data is readily available from component calibration records. Data can be analyzed from plant startup to the present or only the most recent data can be evaluated.
- Since only historical data is evaluated, the method is not intended as a tool to identify individual faulty components, although it can be used to demonstrate that a particular component model or application historically performs poorly.
- A similar class of components, i.e., same make, model, or application, is evaluated. For example, the method can determine the drift of all analog indicators of a certain type installed in the control room.
- The methodology is less suitable for evaluating the drift of a single component over time, due to statistical analysis penalties that occur with smaller sample sizes.
- The methodology obtains a value of drift for a particular model, loop, or function that can be used in component or loop uncertainty and setpoint calculations.
- The methodology is designed to support the analysis of longer calibration intervals due to fuel cycle extensions and is consistent with the NRC expectations described in Reference 7.3.3. Values for instrument drift developed in accordance with this Design Guide will be applied in accordance with References 7.2.1 and / or 7.2.4, as appropriate.

3.2.1.2. Error and Uncertainty Content in As-Found Versus As-Left Calibration Data

The As-Found versus the As-Left data includes several sources of uncertainty over and above component drift. The difference between As-Found and previous As-Left data encompasses the following error terms as a minimum: reference accuracy, Measurement and Test Equipment (M&TE) errors, and instrument drift. (References 7.2.1 and 7.2.4 are the setpoint calculation methodology documents for use at Hatch. Depending on the methods used, there may be no specific term for M&TE errors within the existing calculation. However, for those calculations, there is generally a "Calibration Error" term, which consists mainly of M&TE errors. Therefore, this term is also considered to be included in the As-Found and As-Left data comparisons.) The drift is not assumed to encompass the errors associated with temperature effect, since the temperature difference between the two calibrations is not quantified, and is not anticipated to be significant. Additional instruction for the use of As-Found and As-Left data may be found in Reference 7.1.2. The following possible contributors could be within the measured variation, but are not necessarily considered.

- Accuracy errors present between any two consecutive calibrations
- Measurement and test equipment error between any two consecutive calibrations
- Personnel-induced or human-related variation or error between any two consecutive calibrations
- Normal temperature effects due to a difference in ambient temperature between any two consecutive calibrations
- Power Supply variations between any two consecutive calibrations
- Environmental effects on component performance, e.g., radiation, humidity, vibration, etc., between any two consecutive calibrations that cause a shift in component output
- Misapplication, improper installation, or other operating effects that affect component calibration between any two consecutive calibrations
- True drift representing a change, time-dependent or otherwise, in component/loop output over the time period between any two consecutive calibrations

3.2.1.3. Potential Impacts of As-Found Versus As-Left Data Analysis

Many of the bulleted items listed in step 3.2.1.2 are not expected to have a significant effect on the measured As-Found and As-Left settings. Because there are so many independent parameters contributing to the possible variance in calibration data, they will all be considered together and termed the component's Analyzed Drift (ADR or DA) uncertainty. This approach has the following potential impacts on an analysis of the component's calibration data:

- The magnitude of the calculated variation may exceed any assumptions or manufacturer predictions regarding drift. Attempts to validate manufacturer's performance claims should consider the possible contributors listed in step 3.2.1.2 to the calculated drift.

- The magnitude of the calculated variation that includes all of the above sources of uncertainty may mask any "true" time-dependent drift. In other words, the analysis of As-Found versus As-Left data may not demonstrate any time dependency. This does not mean that time-dependent drift does not exist, only that it could be so small that it is negligible in the cumulative effects of component uncertainty, when all of the above sources of uncertainty are combined.

3.3. Confidence Interval

This Design Guide recommends a single confidence interval level to be used for performing data analyses and the associated calculations.

NOTE: The default Tolerance Interval Factor (TIF) for all drift studies, performed using this Design Guide, will be chosen for a 95%/95% probability and confidence, although this is not specifically required in every situation. This term means that the results have a 95% confidence (γ) that at least 95% of the population will lie between the stated interval (P) for a sample size (n). Components that perform functions that support a specific

Technical Specification value, TRM value or are associated with the safety analysis assumptions or inputs will always be analyzed at a 95%/95% confidence interval. Components/loops that fall into this level must:

- Be included in the data group (or be justified to apply the results per the guidance of Reference 7.1.1) if the analyzed drift value is to be applied to the component/loop in a Setpoint/Uncertainty Calculation.
- Use the 95/95% TIF for determination of the Analyzed Drift term. (See step 3.4.2.1 and Table 1 – 95%/95%Tolerance Interval Factors.)
- Be evaluated in the Setpoint/Uncertainty Calculation for application of the Analyzed Drift term. (For example, the ADR term may include the normal temperature effects for a given device, but due to the impossibility of separating out that specific term, an additional temperature uncertainty may be included in the Setpoint/Uncertainty Calculation.).

3.4. Calibration Data Collection

3.4.1. Sources Of Data

The sources of data to perform a drift analysis are Surveillance Tests, Calibration Procedures and other calibration processes (calibration files, calibration sheets for Balance of Plant devices, Preventative Maintenance, etc.).

3.4.2. How Much Data To Collect

3.4.2.1. The goal is to collect enough data for the instrument or group of instruments to make a statistically valid pool. There is no hard fast number that must be attained for any given pool. Table 1 provides the 95%/95% TIF for various sample pool sizes; it should be noted that the smaller the pool the larger the penalty. A tolerance interval is a statement of confidence that a certain proportion of the total population is contained within a defined set of bounds. For example, a 95%/95% TIF indicates a 95% level of confidence that 95% of the population is contained within the stated interval. (Note: For cases where the exact count is not contained within the table, linear interpolation of the values should be used to determine the Tolerance Interval Factor.)

Table 1 – 95%/95%Tolerance Interval Factors

Sample Size	95%/95%	Sample Size	95%/95%	Sample Size	95%/95%
≥ 2	37.674	≥ 23	2.673	≥ 120	2.205
≥ 3	9.916	≥ 24	2.651	≥ 130	2.194
≥ 4	6.370	≥ 25	2.631	≥ 140	2.184
≥ 5	5.079	≥ 26	2.612	≥ 150	2.175
≥ 6	4.414	≥ 27	2.595	≥ 160	2.167
≥ 7	4.007	≥ 30	2.549	≥ 170	2.160
≥ 8	3.732	≥ 35	2.490	≥ 180	2.154
≥ 9	3.532	≥ 40	2.445	≥ 190	2.148
≥ 10	3.379	≥ 45	2.408	≥ 200	2.143
≥ 11	3.259	≥ 50	2.379	≥ 250	2.121
≥ 12	3.162	≥ 55	2.354	≥ 300	2.106
≥ 13	3.081	≥ 60	2.333	≥ 400	2.084
≥ 14	3.012	≥ 65	2.315	≥ 500	2.070
≥ 15	2.954	≥ 70	2.299	≥ 600	2.060

Sample Size	95%/95%	Sample Size	95%/95%	Sample Size	95%/95%
≥ 16	2.903	≥ 75	2.285	≥ 700	2.052
≥ 17	2.858	≥ 80	2.272	≥ 800	2.046
≥ 18	2.819	≥ 85	2.261	≥ 900	2.040
≥ 19	2.784	≥ 90	2.251	1000	2.036
≥ 20	2.752	≥ 95	2.241	∞	1.960
≥ 21	2.723	≥ 100	2.233		
≥ 22	2.697	≥ 110	2.218		

3.4.2.2. Different information may be needed, depending on the analysis purpose, therefore, the total population of components - all makes, models, and applications - that will be analyzed must be known. (e.g., all Rosemount Trip Units)

3.4.2.3. Once the total population of components is known, the components should be separated into functionally equivalent groups. Each grouping is treated as a separate population for analysis purposes. (e.g., starting with all Rosemount 1153 Differential Pressure Transmitters as the initial group and breaking them down into various sub-groups - Different Range Codes, Large vs. Small Turn Down Factors, Level vs. Flow Applications, etc.).

3.4.2.4. Not all components or available calibration data points need to be analyzed within each group in order to establish statistical performance limits for the group. Acquisition of data should be considered from different perspectives.

- For each grouping, a large enough sample of components should be randomly selected from the population, so there is assurance that the evaluated components are representative of the entire population. By randomly selecting the components and confirming that the behavior of the randomly selected components is similar, a basis for not evaluating the entire population can be established. For sensors, a random sample from the population should include representation of all desired component spans and functions.
- For each selected component in the sample, enough historic calibration data should be provided to ensure that the component's performance over time is understood.
- Due to the difficulty of determining the total sample set, developing specific sampling criteria is difficult. A sampling method must be used which ensures that various instruments calibrated at different frequencies are included. The sampling method must also ensure that the different component types, operating conditions and other influences on drift are included. Because of the difficulty in developing a valid sampling program, it is often simpler to evaluate all available data for the required instrumentation within the chosen time period. This eliminates changing sample methods, should groups be combined or split, based on plant conditions or performance. For the purposes of this guide, specific justification in the drift study will be required to document any sampling plan.

3.5. Categorizing Calibration Data

3.5.1. Grouping Calibration Data

One analysis goal should be to combine functionally equivalent components (components with similar design and performance characteristics) into a single group. In some cases, all components of a particular manufacturer make and model can be combined into a single sample. In other cases, virtually no grouping of data beyond a particular component make, model, and specific span or application may be possible. Some examples of possible groupings include, but are not limited to, the following:

3.5.1.1. Small Groupings

- All devices of same manufacturer, model and range, covered by the same Surveillance Test
- All trip units used to monitor a specific parameter (assuming that all trip units are the same manufacturer, model and range)

3.5.1.2. Larger Groupings

- All transmitters of a specific manufacturer, model that have similar spans and performance requirements
- All Rosemount trip units with functionally equivalent model numbers
- All control room analog indicators of a specific manufacturer and model

3.5.2. Rationale for Grouping Components into a Larger Sample

- A single component analysis may result in too few data points to make statistically meaningful performance predictions.
- Smaller sample sizes associated with a single component may unduly penalize performance predictions by applying a larger TIF to account for the smaller data set. Larger sample sizes reflect a greater understanding and assurance of representative data that in turn, reduces the uncertainty factor.
- Large groupings of components into a sample set for a single population ultimately allows the user to state the plant-specific performance for a particular make and model of component. For example, the user may state, "Main Steam Flow Transmitters have historically drifted by less than 1%", or "All control room indicators of a particular make and model have historically drifted by less than 1.5%".
- An analysis of smaller sample sizes is more likely to be influenced by non-representative variations of a single component (outliers).
- Grouping similar components together, rather than analyzing them separately, is more efficient and minimizes the number of separate calculations that must be maintained.

3.5.3. Considerations when Combining Components into a Single Group

Grouping components together into a sample set for a single population does not have to become a complicated effort. Most components can be categorized readily into the appropriate population. Consider the following guidelines when grouping functionally equivalent components together.

- If performed on a type-of-component basis, component groupings should usually be established down to the manufacturer make and model, as a minimum. For example, data from Rosemount and General Electric transmitters should not be combined in the same drift analysis. The principles of operation are different for the various manufacturers, and combining the data could mask some trend for one type of component. This said, it might be desirable to combine groups of components for certain studies. If dissimilar component types are combined, a separate analysis of each component type should still be completed to ensure analysis results of the mixed population are not misinterpreted or misapplied.

- Sensors of the same manufacturer make and model, but with different calibrated spans or elevated zero points, can possibly still be combined into a single group. For example, a single analysis that determines the drift for all Rosemount 1153 pressure transmitters installed onsite might simplify the application of the results. Note that some manufacturers provide a predicted accuracy and drift value for a given component model, regardless of its span. However, the validity of combining components with a variation of span, ranging from tens of pounds to several thousand pounds, should be confirmed. As part of the analysis, the performance of components within each span should be compared to the overall expected performance to determine if any differences are evident between components with different spans.
- Components combined into a single group should be exposed to similar calibration or surveillance conditions, as applicable. Note that the term operating condition was not used in this case. Although it is desirable that the grouped components perform similar functions, the method by which the data is obtained for this analysis is also significant. If half the components are calibrated in the summer at 90°F and the other half in the winter at 40°F, a difference in observed drift between the data for the two sets of components might exist. In many cases, ambient temperature variations are not expected to have a large effect since the components are located in environmentally controlled areas.

3.5.4. Verification that Data Grouping is Appropriate

- Combining functionally equivalent components into a single group for analysis purposes may simplify the scope of work; however, some level of verification should be performed to confirm that the selected component grouping is appropriate. As an example, the manufacturer may claim the same accuracy and drift specifications for two components of the same model, but with different ranges, e.g., 0-5 PSIG and 0-3000 PSIG. However, in actual application, components of one range may perform differently than components of another range.
- Standard statistics texts provide methods that can be used to determine if data from similar types of components can be pooled into a single group. If different groups of components have essentially equal variances and means at the desired statistical level, the data for the groups can be pooled into a single group.
- When evaluating groupings, care must be taken not to split instrument groups only because they are calibrated on a different time frequency. Differences in variances may be indicative of a time dependent component to the device drift. The separation of these groups may later mask a time-dependence for the component drift.
- A t-Test (two samples assuming unequal variances) should also be performed on the proposed components to be grouped. The t-Test returns the probability associated with a Student's t-Test to determine whether two samples are likely to have come from the same two underlying populations

that have unequal variances. If for example, the proposed group contains 5 sub-groups the t-Tests should be performed on all possible combinations for the groupings. However, if there is no plausible engineering explanation for the two sets of data being incompatible, the groups should be combined, despite the results of the t-Test. The following formula is used to determine the test statistic value t.

$$t' = \frac{\overline{x_1} - \overline{x}_2 - \Delta_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$ (Ref. 7.3.5)

Where ;

t' - test statistic

n - Total number of data points

x - Mean of the samples

s^2 - Pooled variance

Δ_0 - Hypothesized mean difference

The following formula is used to estimate the degrees of freedom for the test statistic.

$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$$

Where;

Values are as previously defined.

3.5.5. Examples of Proven Groupings:

- All control room indicators receiving a 4-20mADC (or 1-5VDC) signal. Notice that a combined grouping may be possible even though the indicators have different indication spans. For example, a 12 mADC signal should move the indicator pointer to the 50% of span position on each indicator scale, regardless of the span indicated on the face plate (exceptions are non-linear meter scales).
- All control room bistables of similar make or model tested monthly for Technical Specification surveillance. Note that this assumes that all bistables are tested in a similar manner and have the same input range, e.g., a 1-5VDC or 4-20mADC spans.
- A specific type of pressure transmitter used for similar applications in the plant in which the operating and calibration environment does not vary significantly between applications or location.
- A group of transmitters of the same make and model, but with different spans, given that a review confirms that the transmitters of different spans have similar performance characteristics.

3.5.6. Using Data from Other Nuclear Power Plants:

- It is acceptable, although not recommended, to pool Hatch specific data with data obtained from other utilities providing the requirements of step 3.5.4 are met and the data can be verified to be of high quality. In this case the data must also be verified to be acceptable for grouping. Acceptability may be defined by verification of grouping, and an evaluation of calibration procedures, Measurement and Test Equipment used, and defined setting tolerances. Where there is agreement in calibration method (starting at zero increasing to 100 percent and decreasing to 0 taking data every 25%), calibration equipment, and area environment (if performance is affected by the temperature), there is a good possibility that the groups may be combined. Previously collected industry information may not have sufficient information about the manner of collection to allow combining with plant specific data.

3.6. Outlier Analysis

An outlier is a data point significantly different in value from the rest of the sample. The presence of an outlier or multiple outliers in the sample of component or group data may result in the calculation of a larger than expected sample standard deviation and tolerance interval. Calibration data can contain outliers for several reasons. Outlier analyses can be used in the initial analysis process to help to identify problems with data that require correction. Examples include:

- *Data Transcription Errors* - Calibration data can be recorded incorrectly either on the original calibration data sheet or in the spreadsheet program used to analyze the data.
- *Calibration Errors* - Improper setting of a device at the time of calibration would indicate larger than normal drift during the subsequent calibration.
- *Measuring & Test Equipment Errors* - Improperly selected or miscalibrated test equipment could indicate drift, when little or no drift was actually present.
- *Scaling or Setpoint Changes* - Changes in scaling or setpoints can appear in the data as larger than actual drift points unless the change is detected during the data entry or screening process.
- *Failed Instruments* - Calibrations are occasionally performed to verify proper operation due to erratic indications, spurious alarms, etc. These calibrations may be indicative of component failure (not drift), which would introduce errors that are not representative of the device performance during routine conditions.
- *Design or Application Deficiencies* - An analysis of calibration data may indicate a particular component that always tends to drift significantly more than all other similar components installed in the plant. In this case, the component may need an evaluation for the possibility of a design, application, or installation problem. Including this particular component in the same population as the other similar components may skew the drift analysis results.

3.6.1. Detection of Outliers

There are several methods for determining the presence of outliers. This design guide utilizes the Critical Values for t-Test (Extreme Studentized Deviate). The t-Test utilizes the values listed in Table 2 with an upper significance level of 5% to compare a given data point against. Note that the critical value of t increases as the sample size increases. This signifies that as the sample size grows, it is more likely that the sample is truly representative of the population. The t-Test assumes that the data is normally distributed.

Table 2 - Critical Values For t-Test

Sample Size	Upper 5% Significance Level	Sample Size	Upper 5% Significance Level
≤ 3	1.15	22	2.60
4	1.46	23	2.62
5	1.67	24	2.64
6	1.82	25	2.66
7	1.94	≤ 30	2.75
8	2.03	≤ 35	2.82
9	2.11	≤ 40	2.87
10	2.18	≤ 45	2.92
11	2.23	≤ 50	2.96
12	2.29	≤ 60	3.03
13	2.33	≤ 70	3.09
14	2.37	≤ 75	3.10
15	2.41	≤ 80	3.14
16	2.44	≤ 90	3.18
17	2.47	≤ 100	3.21
18	2.50	≤ 125	3.28
19	2.53	≤ 150	3.33
20	2.56	>150	4.00
21	2.58		

3.6.2. t-Test Outlier Detection Equation

$$t = \frac{|x_i - \bar{x}|}{s}$$

(Ref. 7.1.1)

Where;

X_i - An individual sample data point

$\overline{X}$ - Mean of all sample data points

s - Standard deviation of all sample data points

t - Calculated value of extreme studentized deviate that is compared to the critical value of t for the sample size.

3.6.3. Outlier Expulsion

This design guide does not permit multiple outlier tests or passes. The removal of poor quality data as listed in Section 3.6 is not considered removal of outliers, since it is merely assisting in identifying data errors. However, after removal of poor quality data as listed in Section 3.6, certain data points can still appear as outliers when the outlier analysis is performed. These "unique outliers" are not consistent with the other data collected; and could be judged as erroneous points, which tend to skew the representation of the distribution of the data. However, for the general case, since these outliers may accurately represent instrument performance, only one (1) additional unique outlier (as indicated by the t-Test, may be removed from the drift data. However, for special cases, with specific justification, up to 2.5% of the population will be allowed for removal as additional outliers, per this design guide. After removal of poor quality data and the removal of the unique outlier(s) (if necessary), the remaining drift data is known as the Final Data Set.

For transmitters, or other devices with multiple calibration points, the general process will be to use the calibration point with the worst case drift values. This is determined by comparing the different calibration points and using the one with the largest error, determined by adding the absolute value of the drift mean to 2 times the drift standard deviation. The data set with the largest of those terms will be used throughout the rest of the analysis, after outlier removal, as the Final Data Set. (Note that it is possible to use a specific calibration point and neglect the others, only if that is the single point of concern for all devices in the data set.)

The data set basic statistics (i.e., the Mean, Median, Standard Deviation, Variance, Minimum, Maximum, Kurtosis, Skewness, Count and Average Time Interval Between Calibrations) should be computed and displayed for the data set prior to removal of the unique outlier and for the Final Data Set, if different.

3.7. Methods For Verifying Normality

A test for normality can be important because many frequently used statistical methods are based upon an assumption that the data is normally distributed. This assumption applies to the analysis of component calibration data also. For example, the following analyses may rely on an assumption that the data is normally distributed:

- Determination of a tolerance interval that bounds a stated proportion of the population based on calculation of mean and standard deviation
- Identification of outliers
- Pooling of data from different samples into a single population

The normal distribution occurs frequently and is an excellent approximation to describe many processes. Testing the assumption of normality is important to confirm that the data appears to fit the model of a normal distribution, but tests will not prove that the normal distribution is a correct model for the data. At best, it can only be found that the data is reasonably consistent with the characteristics of a normal distribution, and that the treatment of a distribution as normal is conservative. For example, some tests for normality will only allow the rejection of the hypothesis that the data is not normally distributed. A group of data passing the test does not mean the data is normally distributed; it only means that there is no evidence to say that it is not normally distributed. However, because of the wealth of industry evidence that drift can be conservatively represented by a normal distribution, a group of data passing these tests will be considered as normally distributed without adjustments to the standard deviation of the data set.

Distribution-free techniques are available when the data is not normally distributed; however, these techniques are not as well known and often result in penalizing the results by calculating tolerance intervals that are substantially larger than the normal distribution equivalent. Because of this fact, there is a good reason to demonstrate that the data is normally distributed or can be bounded by the assumption of normality.

Analytically verifying that a sample appears to be normally distributed usually invokes a form of statistics known as hypothesis testing. In general, a hypothesis test includes the following steps:

1) Statement of the hypothesis to be tested and any assumptions
2) Statement of a level of significance to use as the basis for acceptance or rejection of the hypothesis
3) Determination of a test statistic and a critical region
4) Calculation of the appropriate statistics to compare against the test statistic
5) Statement of conclusions

The following sections discuss various ways in which the assumption of normality can be verified to be consistent with the data or can be claimed to be a conservative representation of the actual data. Analytical hypothesis testing and subjective graphical analyses are discussed. If any of the analytical hypothesis tests (Chi-Squared, D Prime, or W Test) are passed, the coverage analysis and additional graphical analyses are not required. The following are methods for assessing normality:

3.7.1. Chi-Squared, x^2, Goodness of Fit Test

This well-known test is stated as a method for assessing normality in References 7.1.1 and 7.1.2. The x^2 test compares the actual distribution of sample values to the expected distribution. The expected values are calculated by using the normal mean and standard deviation for the sample. If the distribution is normally or approximately normally distributed, the difference between the actual versus expected values should be very small. And, if the distribution is not normally distributed, the differences should be significant.

3.7.1.1. Equations To Perform The x^2 Test

1) First calculate the mean for the sample group

$$\overline{X} = \frac{\sum X_i}{n}$$ (Ref. 7.1.1)

Where;

X_i - An individual sample data point
$\overline{X}$ - Mean of all sample data points
n - Total number of data points

2) Second calculate the standard deviation for the sample group

$$s = \sqrt{\frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}}$$

(Ref. 7.1.1)

Where;

x - Sample data values (x1, x2, x3, ...)
s - Standard deviation of all sample data points
n - Total number of data points

3) Third the data must be divided into bins to aid in determination of a normal distribution. The number of bins selected is up to the individual performing the analysis. Refer to Reference 7.1.1 for further guidance. For most applications, a 12-bin analysis will be performed on the drift data. See Section 4.4.

4) Fourth calculate the x^2 value for the sample group

$$x^2 = \sum \frac{(O_i - E_i)^2}{E_i} \qquad E_i = NP_i$$ (Ref. 7.1.1)

Where;

E_i - Expected values for the sample
N - Total number of samples in the population
P_i - Probability that a given sample will be contained in a bin

O_i - Observed sample values (O_1, O_2, O_3, ...)
x^2 - Chi squared result

5) Fifth, calculate the degrees of freedom. The degrees of freedom term is computed as the number of bins used for the chi-square computation minus the constraints. In all cases for these drift calculations, since the count, mean and standard deviation are computed, the constraints term is equal to three.
6) Sixth, compute the Chi squared per degree of freedom term (X_0^2). This term is merely the Chi squared term computed in step 4 above, divided by the degrees of freedom.
7) Finally, evaluate the results. The results are evaluated in the following manner, as prescribed in Reference 7.1.1. If the Chi squared result computed in step 4 is less than or equal to the degrees of freedom, the assumption that the distribution is normal will not be rejected. If the value from step 4 is greater than the degrees of freedom, then one final check will be made. The degrees of freedom and X_0^2 are used to look up the probability of obtaining a X_0^2 term greater than the observed value, in percent. (See Table C-3 of Reference 7.1.1.) If the lookup value is greater than or equal to 5%, then the assumption of normality will not be rejected. However, if the lookup value is less than 5%, the assumption of normality is rejected.

3.7.2. W Test

Reference 7.1.4 recommends this test for sample sizes less than 50. The W Test calculates a test statistic value for the sample population and compares the calculated value to the critical values for W, which are tabulated in Reference 7.1.4. The W Test is a lower-tailed test. Thus if the calculated value of W is less than the critical value of W, the assumption of normality would be rejected at the stated significance level. If the calculated value of W is larger than the critical value of W, there is no evidence to reject the assumption of normality. Reference 7.1.4 establishes the methods and equations required for performing a W Test.

3.7.3. D-Prime (D') Test

Reference 7.1.4 recommends this test for moderate to large sample sizes, greater than or equal to 50. The D′ Test calculates a test statistic value for the sample population and compares the calculated value to the values for the D′ percentage points of the distribution, which are tabulated in Reference 7.1.4. The D′ Test is two-sided, which means that the two-sided percentage limits at the stated level of significance must bound the calculated D′ value. For the given sample size, the calculated value of D′ must lie within the two values provided in the Reference 7.1.4 table in order to accept the hypothesis of normality.

3.7.3.1. Equations To Perform The D′ Test

1) First, calculate the linear combination of the sample group. (Note: Data must be placed in ascending order of magnitude, prior to the application of this formula.)

$$T = \sum \left[\left(i - \frac{n+1}{2} \right) \times x_i \right] \quad \text{(Ref. 7.1.4)}$$

Where;

T - linear combination

x_i - An individual sample data point

i - The number of the sample point

n - Total number of data points

2) Second, calculate the S^2 for the sample group.

$$S^2 = (n-1)s^2$$ (Ref. 7.1.4)

Where;

S^2 - Sum of the Squares about the mean

s^2 - Unbiased estimate of the sample population variance

n - Total number of data points

3) Third, calculate the D′ value for the sample group.

$$D' = \frac{T}{S}$$ (Ref. 7.1.4)

4) Finally, evaluate the results. If the D' value lies within the acceptable range of results (for the given data count) per Table 5 of Reference 7.1.4, for the P = 0.025 and 0.975, then the assumption of normality is not rejected. (If the exact data count is not contained within the tables, the critical value limits for the D' value should be linearly interpolated to the correct data count.) If however, the value lies outside that range, the assumption of normality is rejected.

3.7.4. Probability Plots

Probability plots are discussed, since a graphical presentation of the data can reveal possible reasons for why the data is or is not normal. A probability plot is a graph of the sample data with the axes scaled for a normal distribution. If the data is normal, the data will tend to follow a straight line. If the data is non-normal, a nonlinear shape should be evident from the graph. This method of normality determination is subjective, and is not required if the numerical methods show the data to be normal, or if a coverage analysis is used. The types of probability plots used by this design guide are as follows:

- *Cumulative Probability Plot* - an XY scatter plot of the Final Data Set plotted against the percent probability (P_i) for a normal distribution. P_i is calculated using the following equation:

$$P_i = \frac{100 \times \left(i - \frac{1}{2}\right)}{n}$$ (Ref. 7.1.1)

where; i = sample number i.e. 1,2,...

n = sample size

NOTE: Refer, as necessary, to Appendix C Section C.4 of Reference 7.1.1.

- *Normalized Probability Plot* - an XY scatter plot of the Final Data Set plotted against the probability for a normal distribution expressed in multiples of the standard deviation.

3.7.5. Coverage Analysis

A coverage analysis is discussed for cases in which the hypothesis tests reject the assumption of normality, but the assumption of normality may still be a conservative representation of the data. The coverage analysis involves the use of a histogram of the Final 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 is derived, which adequately covers the set of drift data, as observed. This normal distribution will be used as the model for the drift of the device.

Sample counting is used to determine an acceptable normal distribution. The Standard Deviation of the group is computed. The number of times the samples are within ± two Standard Deviations of the mean is computed. The count is divided by the total number of samples in the group to determine a percentage. For information, the percentage of samples within ± one Standard Deviation of the mean may also be computed. The following table provides the percentages that should be within these values for a normal distribution:

Table 3 – Values For A Normal Distribution

	Percentages for a Normal Distribution
1 Standard Deviation	68.27%
2 Standard Deviations	95.45%

If the percentage of data within the two standard deviations tolerance is greater than the value in Table 3 for a given data set, the existing standard deviation is acceptable to be used for the encompassing normal distribution model. However, if the percentage is less than required, the standard deviation of the model will be enlarged, such that the required percentage fall within the ± two Standard Deviations bounds of Table 3. The required multiplier for the standard deviation in order to provide this coverage is termed the Normality Adjustment Factor (NAF). If no adjustment is required, the NAF is equal to one (1).

3.8. Binomial Pass/Fail Analysis For Distributions Considered Not To Be Normal

A pass/fail criteria for component performance simply compares the As-Found versus As-Left surveillance drift data against a pre-defined acceptable value of drift. If the drift value is less than the pass/fail criteria, that data point passes; if it is larger than the pass/fail criteria, it fails. By comparing the total number of passes to the number of failures, a probability can be computed for the expected number of component passes in the population. Note that the term failure in this instance does not mean that the component actually failed, only that it exceeded the selected pass/fail criteria for the analysis. Often the pass/fail criteria will be established at a point that clearly demonstrates acceptable component performance. The equations used to determine the Failure Proportion, Normal, Minimum and Maximum Probabilities are as follows:

Failure Proportion

P_f = x/n where;

x = Number of values exceeding the pass/fail criteria (Failures) (Ref. 7.1.1)

n = Total number of drift values in the sample

Normal Probability that a value will pass

$P = 1 - P_f$ (Ref. 7.1.1)

Minimum Probability that a value will pass

$$P_l = 1 - \frac{x}{n} - z \times \sqrt{\left(\frac{1}{n}\right) \times \left(\frac{x}{n}\right) \times \left(1 - \frac{x}{n}\right)}$$ (Ref. 7.1.1)

Maximum Probability that a value will pass

$$P_u = 1 - \frac{x}{n} + z \times \sqrt{\left(\frac{1}{n}\right) \times \left(\frac{x}{n}\right) \times \left(1 - \frac{x}{n}\right)}$$ (Ref. 7.1.1)

where;

P_l = the minimum probability that a value will pass

P_u = the maximum probability that a value will pass

z = the standardized normal distribution value corresponding to the desired confidence level, e.g., z = 1.96 for a 95% confidence level.

The Binomial Pass/Fail Analysis is a good tool for verifying that drift values calculated for calibration extensions are appropriate for the interval. See Reference 7.1.1 for the necessary detail to perform a pass/fail analysis.

3.9. Time-Dependent Drift Analysis

The component/loop drift calculated in the previous sections represented a predicted performance limit, without any consideration of whether the drift may vary with time between calibrations or component age. This section discusses the importance of understanding the time-related performance and the impact of any time-dependency on an analysis. Understanding the time dependency can be either important or unimportant, depending on the application. A time dependency analysis is important whenever the drift analysis results are intended to support an extension of calibration intervals.

3.9.1. Limitations of Time Dependency Analyses

Reference 7.1.1 performed drift analysis for numerous components at several nuclear plants as part of the project. The data evaluated did not demonstrate any significant time-dependent or age-dependent trends. Time dependency may have existed in all of the cases analyzed, but was insignificant in comparison to other uncertainty contributors. Because time dependency cannot be completely ruled out, there should be an ongoing evaluation to verify that component drift continues to meet expectations whenever calibration intervals are extended.

3.9.2. Scatter (Drift Interval) Plot

A drift interval plot is an XY scatter plot that shows the Final Data Set plotted against the time interval between tests for the data points. This plot method relies upon the human eye to discriminate the plot for any trend in the data to exhibit a time dependency. A prediction line can be added to this plot which shows a "least squares" fit of the data over time. This can provide visual evidence of an increasing or decreasing mean over time, considering all drift data. An increasing standard deviation is indicated by a trend towards increasing "scatter" over the increased calibration intervals.

3.9.3. Standard Deviations and Means at Different Calibration Intervals (Binning Analysis)

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 and means 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 interval between calibrations increases.

3.9.3.1. The data that is available will be placed in interval bins. The intervals that will normally be used will coincide with Technical Specification calibration intervals plus the allowed tolerance as follows:

a. 0 to 45 days (covers most weekly and monthly calibrations)

b. 46 to 135 days (covers most quarterly calibrations)

c. 136 to 230 days (covers most semi-annual calibrations)

d. 231 to 460 days (covers most annual calibrations)

e. 461 to 690 days (covers most old refuel cycle calibrations)

f. 691 to 900 days (covers most extended refuel cycle calibrations)

g. > 900 days covers missed and forced outage refueling cycle calibrations.

Data will naturally fall into these time interval bins based on the calibration requirements for the subject instrument loops. Only on occasion will a device be calibrated on a much longer or shorter interval than that of the rest of the population within its calibration requirement group. Therefore, the data will naturally separate into groups for analysis.

3.9.3.2. Different bin splits may be used, but must be evaluated for data coverage and acceptable data groupings.

3.9.3.3. For each bin, where there is data, the mean (average), standard deviation, average time interval and data count will be computed.

3.9.3.4. To determine if time dependency does or does not exist, the data needs to be distributed across multiple bins, with a sufficient population of data in each of two or more bins to consider the statistical results for those bins to be valid. Normally the minimum expected distribution that would allow evaluation is defined below.

a. A bin will be considered valid in the final analysis if it holds more than five data points and more than ten percent of the total data count.
b. At least two bins, including the bin with the most data, must be left for evaluation to occur.

The distribution percentages listed in these criteria are somewhat arbitrary, and thus engineering evaluation can modify them for a given evaluation.

The mean and standard deviations of the valid bins are plotted versus average time interval on a diagram. This diagram can give a good visual indication of whether or not the mean or standard deviation of a data set is increasing significantly over time interval between calibrations.

NOTE: If multiple valid bins do NOT exist for a given data set, then the plot is not to be shown, and the regression analyses are not to be performed. The reasoning is that there is not enough diversity in the calibration intervals analyzed to make meaningful conclusions about time dependency from the existing data. Unless overwhelming evidence to the contrary exists in the scatter plot, the single bin data set will be established as moderately time dependent for the purposes of extrapolation of the drift value.

3.9.4. Regression Analyses and Plots

Regression Analyses can often provide very valuable data for the determination of time dependency. A standard regression analysis within an EXCEL spreadsheet will plot the drift data versus time, with a prediction line showing the trend. It will also provide Analysis of Variance (ANOVA) table printouts, which contain information required for various numerical tests to determine level of dependency between two parameters (time and drift value). Note that regression analyses are only to be performed if multiple valid bins are determined from the binning analysis.

Regression Analyses are to be performed on the Final Data Set drift values and on the Absolute Value of the Final Data Set drift values. The Final Data Set drift values show trends for the mean of the data set, and the Absolute Values show trends for the standard deviation over time.

Regression Plots

The following are descriptions of the two plots generated by these regressions.

- *Drift Regression* - an XY scatter plot that fits a line through the final drift data plotted against the time interval between tests for the data points using the "least squares" method to predict values for the given data set. The predicted line is plotted through the actual data for use in predicting drift over time. It is important to note that statistical outliers can have a dramatic effect upon the regression line.
- *Absolute Value Drift Regression* - an XY scatter plot that fits a line through the Absolute Value of the final drift data plotted against the time interval between tests for the data points using the "least squares" method to predict values for the given data set. The predicted line is plotted through the actual data for use in predicting drift, in either direction, over time. It is important to note that statistical outliers can have a dramatic effect upon the regression line.

Regression Time Dependency Analytical Tests

Typical spreadsheet software includes capabilities to include ANOVA tables with regression analyses. ANOVA tables give various statistical information, which can allow certain numerical tests to be employed to search for time dependency of the drift data. For each of the two regressions (drift regression and absolute value drift regression), the following ANOVA parameters will be used to determine if time dependency of the drift data is evident. All tests listed should be evaluated, and if time dependency is indicated by any of the tests, the data should be considered as time dependent.

- *R Squared Test* - The R Squared value, printed out in the ANOVA table, is a relatively good indicator of time dependency. If the value is greater than 0.3, then it appears that the data does closely conform to a linear function, and therefore, should be considered time dependent.

- *P Value Test* - A P Value for X Variable 1 (as indicated by the ANOVA table for an EXCEL spreadsheet) less than 0.05 is indicative of time dependency.
- *Significance of F Test* - An ANOVA table F value greater than the critical F-table value (for a 0.25% probability, the number of data points for the regression, and two degrees of freedom for the numerator) would indicate a time dependency. In an EXCEL spreadsheet, the FINV function can be used to return critical values from the F distribution. To return the critical value of F, use the significance level (in this case 0.025 or 2.5%) as the probability argument to FINV, 2 as the numerator degrees of freedom, and the data count minus two as the denominator. If the F value in the ANOVA table exceeds the critical value of F, then the drift is considered time dependent.

NOTE: For each of these tests, if time dependency is indicated, the plots should be observed to determine the reasonableness of the result. The tests above generally assess the possibility that the function of drift is linear over time, not necessarily that the function is significantly increasing over time. Time dependency can be indicated even when the plot shows the drift to remain approximately the same or decrease over time. Generally, a decreasing drift over time is not expected for instrumentation, nor is a case where the drift function crosses zero. Under these conditions, the extrapolation of the drift term would normally be established assuming no time dependency, if extrapolation of the results is required beyond the analyzed time intervals between calibrations.

3.9.5. Additional Time Dependency Analyses

- *Instrument Resetting Evaluation* - For data sets that consist of a single calibration interval the time dependency determination may be accomplished simply by evaluating the frequency at which instruments require resetting. This type of analysis is particularly useful when applied to extend monthly Technical Specification surveillances to quarterly. However, is less useful for instruments such as sensors or relays that may be reset at each calibration interval regardless of whether the instrument was already in calibration.

  The Instrument Resetting Evaluation may be performed only if the devices in the sample pool are shown to be stable, not requiring adjustment (i.e. less than 5% of the data shows that adjustments were made). Care also must be taken when mechanical connections or flex points may be exercised by the act of checking calibration (actuation of a bellows or switch movement), where the act of checking the actuation point may have an affect on the next reading. Methodology for calculating the drift is as follows:

  Monthly As-Found/As-Left

  (As-Found Current Calibration - As-Left Previous Calibration) or

  $AF_1 - AL_2$ (Ref. 7.1.1)

  Quarterly As-Found/As-Left using Monthly Data

  $(AF_1 - AL_2) + (AF_2 - AL_3) + (AF_3 - AL_4)$ (Ref. 7.1.1)

3.9.6. Age-Dependent Drift Considerations

Age-dependency is the tendency for a component's drift to increase in magnitude as the component ages. This can be assessed by plotting the As-Found value for each calibration minus the previous calibration As-Left value of each component over the period of time for which data is available. Random fluctuations around zero may obscure any age-dependent drift trends. By plotting the absolute values of the As-Found versus As-Left calibration data, the tendency for the magnitude of drift to increase with time can be assessed. This analysis is generally not performed as a part of a standard drift study, but can be used when establishing maintenance practices.

3.10. Calibration Point Drift

For devices with multiple calibration points (e.g., transmitters, indicators, etc.) the Drift-Calibration Point Plot is a useful tool for comparing the amount of drift exhibited by the group of devices at the different calibration points. The plot consists of a line graph of tolerance interval as a function of calibration point. This is useful to understand the operation of an instrument, but is not normally included as a part of a standard drift study.

3.11. Drift Bias Determination

If an instrument or group of instruments consistently drifts predominately in one direction, the drift is assumed to have a bias. When the absolute value of the calculated average for the sample pool exceeds the values in Table 4 for the given sample size and calculated standard deviation, the average is treated as a bias to the drift term. The application of the bias must be carefully considered separately, so that the overall treatment of the analyzed drift remains conservative. Refer to Example 1 below.

Table 4 – Maximum Values of Non-Biased Mean

Sample Size (n)	Normal Deviate (t) @ 0.025 for 95% Confidence	Maximum Value of Non-Biased Mean (x_{crit}) For Given STDEV (s)								
		s ≥ 0.10%	s ≥ 0.25%	s ≥ 0.50%	s ≥ 0.75%	s ≥ 1.00%	s ≥ 1.50%	s ≥ 2.00%	s ≥ 2.50%	s ≥ 3.00%
≤5	2.571	0.115	0.287	0.575	0.862	1.150	1.725	2.300	2.874	3.449
≤10	2.228	0.070	0.176	0.352	0.528	0.705	1.057	1.409	1.761	2.114
≤15	2.131	0.055	0.138	0.275	0.413	0.550	0.825	1.100	1.376	1.651
≤20	2.086	0.047	0.117	0.233	0.350	0.466	0.700	0.933	1.166	1.399
≤25	2.060	0.041	0.103	0.206	0.309	0.412	0.618	0.824	1.030	1.236
≤30	2.042	0.037	0.093	0.186	0.280	0.373	0.559	0.746	0.932	1.118
≤40	2.021	0.032	0.080	0.160	0.240	0.320	0.479	0.639	0.799	0.959
≤60	2.000	0.026	0.065	0.129	0.194	0.258	0.387	0.516	0.645	0.775
≤120	1.980	0.018	0.045	0.090	0.136	0.181	0.271	0.361	0.452	0.542
>120	1.960	Values Computed Per Equation Below								

The maximum values of non-biased mean (Xcrit) for a given standard deviation (s) and sample size (n) is calculated using the following formula:

$$x_{crit} = t \times \frac{s}{\sqrt{n}}$$ (Ref. 7.3.7)

Where;

Xcrit = Maximum value of non-biased mean for a given s & n, expressed in %

t = Normal Deviate for a t-distribution @ 0.025 for 95% Confidence

s = Standard Deviation of sample pool

n = Sample pool size

Example of determining and applying bias to the analyzed drift term:

1) Transmitter Group With a Biased Mean - A group of transmitters are calculated to have a standard deviation of 1.150%, mean of –0.355% with a count of 47. From Table 4, the maximum value that a negligible mean could be is ± 0.258%. Therefore, the mean value is significant, and must be considered. The analyzed drift term for a 95%/95% tolerance interval level is shown as DA = –0.355% ± 1.150% x 2.408 (TIF from Table 1 for 47 samples) or DA = –0.355% ± 2.769%. For conservatism, the DA term for the positive direction is not reduced by the bias value where as the negative direction is summed with the bias value, so DA = + 2.769%, – 3.124%.

2) Transmitter Group With a Non-Biased Mean - A group of transmitters are calculated to have a standard deviation of 1.150%, mean of 0.100% with a count of 47. From Table 4, the maximum value that a negligible mean could be is ± 0.258%. Therefore, the mean value is insignificant, and can be neglected. The analyzed drift term for a 95%/95% tolerance interval level is shown as DA = ± 1.150% x 2.408 (TIF from Table 1 for 47 samples) or DA = ± 2.769%.

3.12. Time Dependent Drift Uncertainty

When calibration intervals are extended beyond the range for which historical data is available, the statistical confidence in the ability to predict drift is reduced. The bias and the random portions of the drift will be extrapolated separately, but in the same manner. Where the analysis shows slight to moderate time dependency or time dependency is indeterminate, the formula below will be used.

$$DA_{Extended} = DA \times \sqrt{\frac{Rqd\_Calibration\_Interval}{Max\_FDS\_Time\_Interval}}$$

Where: $DA_{Extended}$ = the newly determined, extrapolated Drift Bias or Random Term

DA = the bias or random drift term from the Final Data Set

Max_FDS_Time_Interval = the maximum observed time interval within the Final Data Set

Rqd_Calibration_Interval = the worst case calibration interval, once the calibration interval requirement is changed.

This method assumes that the drift to time relationship is not linear. Where there is indication of a strong relationship between drift and time the following formula may be used.

$$DA_{Extended} = DA \times \left[\frac{Rqd\_Calibration\_Interval}{Max\_FDS\_Time\_Interval}\right]$$

Where the terms are the same as defined above.

Where it can be shown that there is no relationship between surveillance interval and drift, the drift value determined may be used for other time intervals without change. However, for conservatism, due to the uncertainty involved in extrapolation to time intervals outside of the analysis period, drift values that show minimal or no particular time dependency will generally be treated as moderately time dependent, for the purposes of the extrapolation.

3.13. Shelf Life Of Analysis Results

Any analysis result based on performance of existing components has a shelf life. In this case, the term shelf life is used to describe a period of time extending from the present into the future during which the analysis results are considered valid. Predictions for future component/loop performance are based upon our knowledge of past calibration performance. This approach assumes that changes in component/loop performance will occur slowly or not at all over time. For example, if evaluation of the last ten years of data shows the component/loop drift is stable with no observable trend, there is little reason to expect a dramatic change in performance during the next year. However, it is also difficult to claim that an analysis completed today is still a valid indicator of component/loop performance ten years from now. For this reason, the analysis results should be re-verified periodically (every 3-5 years).

Depending on the type of component/loop, the analysis results are also dependent on the method of calibration, the component/loop span, and the M&TE accuracy. Any of the following program or component/loop changes should be evaluated to determine if they affect the analysis results.

- Changes to M&TE accuracy
- Changes to the component or loop (e.g. span, environment, manufacturer, model, etc.)
- Calibration procedure changes that alter the calibration methodology

4. PERFORMING AN ANALYSIS

Drift data for Technical Specification and TRM related instruments will be collected as a part of the Plant Hatch evaluations for extension of plant surveillance to support a 24-Month Fuel Cycle or extended quarterly calibrations. The collected data will be entered into Microsoft Excel spreadsheets, grouped by manufacturer and model number. All data will also be entered into the IPASS software program. Analysis will be performed using both IPASS and EXCEL spreadsheets. The IPASS analyses are all embedded in the software and it is not possible to follow each specific analysis. The IPASS analysis will be repeated in the spreadsheet, to trace errors or changes. The discussion provided in this section is to assist in setting up a spreadsheet and performing the independent analysis. For IPASS analysis see the IPASS User's Manual (Reference 7.1.5).

Microsoft Excel spreadsheets generally compute values to an approximate 15 decimal resolution, which is well beyond any required rounding for engineering analyses. However, for printing and display purposes, most values are displayed to lesser resolution. It is possible that hand computations with will produce slightly different results, because of using rounded numbers in initial and intermediate steps, but the Excel computed values are considered highly accurate in comparison. Values with significant differences between the original computations and the computations of the independent verifier will be investigated to ensure that the Excel spreadsheet is properly computing the required values.

4.1. Populating The Spreadsheet

4.1.1. For A New Analysis

4.1.1.1. The Responsible Engineer will determine the component group to be analyzed (e.g., all Rosemount Trip Units). The Responsible Engineer should determine the possible sub-groups within the large groupings, which from an engineering perspective, might show different drift characteristics, and therefore, may warrant separation into smaller groups. This would entail looking at the manufacturer, model, calibration span, setpoints, time intervals, specifications, locations, environment, etc., as necessary.

4.1.1.2. The Responsible Engineer will develop a list of component numbers, manufacturers, models, component types, brief descriptions, surveillance tests, calibration procedures and calibration information (spans, setpoints, etc.).

4.1.1.3. The Responsible Engineer will determine the data to be collected, following the guidance of Sections 3.4 through 3.6 of this Design Guide.

4.1.1.4. The Data Entry Person will identify, locate and collect data for the component group to be analyzed (e.g., all Surveillance Tests for the Rosemount Transmitters completed to present).

4.1.1.5. The Data Entry Person will sort the data by surveillance test or calibration procedure if more than one test/procedure is involved.

4.1.1.6. The Data Entry Person will sequentially sort the surveillance or calibration sheets descending, by date, starting with the most recent date.

4.1.1.7. The Data Entry Person will enter the Surveillance or Calibration Procedure Number, Tag Numbers, Required Trips, Indications or Outputs, Date, As-Found and As-Left values on the appropriate data entry sheet.

4.1.1.8. The Responsible Engineer will verify the data entered.

4.1.1.9. The Responsible Engineer will review the notes on each calibration data sheet to determine possible contributors for excluding data. The notes should be condensed and entered onto the EXCEL spreadsheet for the applicable calibration points. Where appropriate and obvious, the Responsible Engineer should remove the data that is invalid for calculating drift for the device.

4.1.1.10. The Responsible Engineer will calculate the time interval for each drift point by subtracting the date from the previous calibration from the date of the subject calibration. (If the data is not valid for either the As-Left or As-Found calibration information, then the value will not be computed for this data point.)

4.1.1.11. The Responsible Engineer will calculate the Drift value for each calibration by subtracting the As-Left value from the previous calibration from the As-Found value of the subject calibration. (If the data is not valid for either the As-Left or As-Found calibration information, then the value will not be computed for this data point.)

4.2. Spreadsheet Performance Of Basic Statistics

Separate data columns are created for each calibration point within the calibrated span of the device. The % Span of each calibration point should closely match from device to device within a given analysis. Basic statistics include, at a minimum, determining the number of data points in the sample, the average drift, the average time interval between calibrations, standard deviation of the drift, variance of the drift, minimum drift value, maximum drift value, kurtosis, and skewness contained in each data column. This section provides the specific details for using Microsoft Excel. Other spreadsheet programs, statistical or Math programs that are similar in function, are acceptable for use to perform the data analysis, provided all analysis requirements are met.

4.2.1. Determine the number of data points contained in each column for each initial group by using the "COUNT" function. Example cell format = **COUNT(C2:C133).** The Count function returns the number of all populated cells within the range of cells C2 through C133.

4.2.2. Determine the average for the data points contained in each column for each initial group by using the "AVERAGE" function. Example cell format = **AVERAGE(C2:C133).** The Average function returns the average of the data contained within the range of cells C2 through C133. This average is also known as the mean of the data. This same method should be used to determine the average time interval between calibrations.

4.2.3. Determine the standard deviation for the data points contained in each column for each initial group by using the "STDEV" function. Example cell format **=STDEV(C2:C133).** The Standard Deviation function returns the measure of how widely values are dispersed from the mean of the data contained within the range of cells C2 through C133. Formula used by Microsoft Excel to determine the standard deviation:

STD (Standard Deviation of the sample population): (Ref. 7.3.5)

$$s = \sqrt{\frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}}$$

Where;

x - Sample data values (x_1, x_2, x_3, ...)

s - Standard deviation of all sample data points

n - Total number of data points

4.2.4. Determine the variance for the data points contained in each column for each initial group by using the "VAR" function. Example cell format **=VAR(C2:C133).** The Variance function returns the measure of how widely values are dispersed from the mean of the data contained within the range of cells C2 through C133. Formula used by Microsoft Excel to determine the variance:

VAR (Variance of the sample population): (Ref. 7.3.5)

$$s^2 = \frac{n\sum x^2 - \left(\sum x\right)^2}{n(n-1)}$$

Where;

x - Sample data values (x_1, x_2, x_3, ...)

s^2 - Variance of the sample population

n - Total number of data points

4.2.5. Determine the kurtosis for the data points contained in each column for each initial group by using the "KURT" function. Example cell format **=KURT(C2:C133).** The Kurtosis function returns the relative peaked-ness or flatness of the distribution within the range of cells C2 through C133. Formula used by Microsoft Excel to determine the kurtosis:

$$KURT = \left\{\frac{n(n+1)}{(n-1)(n-2)(n-3)}\sum\left(\frac{x_i - \bar{x}}{s}\right)^4\right\} - \frac{3(n-1)^2}{(n-2)(n-3)} \quad \text{(Ref. 7.3.5)}$$

Where ;

x - Sample data values (x_1, x_2, x_3, ...)
n - Total number of data points
s - Sample Standard Deviation

4.2.6. Determine the skewness for the data points contained in each column for each initial group by using the "SKEW" function. Example cell format **=SKEW(C2:C133)**. The Skewness function returns the degree of symmetry around the mean of the cells contained within the range of cells C2 through C133. Formula used by Microsoft Excel to determine the skewness:

$$SKEW = \frac{n(n+1)}{(n-1)(n-2)}\sum\left(\frac{x_i - \bar{x}}{s}\right)^3$$

(Ref. 7.3.5)

Where;

x - Sample data values (x_1, x_2, x_3, ...)
n - Total number of data points
s - Sample Standard Deviation

4.2.7. Determine the maximum value for the data points contained in each column for each initial group by using the "MAX" function. Example cell format **=MAX(C2:C133)**. The Maximum function returns the largest value of the cells contained within the range of cells C2 through C133.

4.2.8. Determine the minimum value for the data points contained in each column for each initial group by using the "MIN" function. Example cell format **=MIN(C2:C133)**. The Minimum function returns the smallest value of the cells contained within the range of cells C2 through C133.

4.2.9. Determine the median value for the data points contained in each column for each initial group by using the "MEDIAN" function. Example cell format **=MEDIAN(C2:C133)**. The median is the number in the middle of a set of numbers; that is, half the numbers have values that are greater than the median, and half have values that are less. If there is an even number of numbers in the set, then MEDIAN calculates the average of the two numbers in the middle.

4.2.10. Where sub-groups have been combined in a data set, which have engineering reasons for the possibility that the data should be separated, analyze the statistics and component data of the sub-groups to determine the acceptability for combination.

4.2.11. Perform a t-Test in accordance with step 3.5.4 on each possible sub-group combination to test for the acceptability of combining the data.

Acceptability for combining the data is indicated when the absolute value of the Test Statistic (t Stat) is greater than the [t Critical two-tail]. Example: t Stat for combining sub-group A & B may be 0.703, which is larger than the t Critical two-tail of 0.485. However, as a part of this process, the Responsible Engineer should ensure that the indication unacceptability does not mask time dependency. In other words, if the only difference in the groupings is that of the calibration interval, the differences in the data characteristics could exist because of time dependent drift. If this is the only difference, the data should be combined, even though the tests show that it may not be appropriate.

4.3. Outlier Detection And Expulsion

Refer to Section 3.7 for a detailed explanation of Outliers.

4.3.1. Obtain the Critical Values for the t-Test from Table 2, which is based on the sample size of the data contained within the specified range of cells, use the COUNT value to determine the sample size.

4.3.2. Perform the outlier test for all the samples. For any values that show up as outliers, analyze the initial input data to determine if the data is erroneous. If so, remove the data in the earlier pages of the spreadsheet, and re-run all of the analysis up to this point. Continue this process until all erroneous data has been removed.

4.3.3. If appropriate, if any outliers are still displayed, remove the worst-case outlier as a statistical outlier, per step 3.6.3 above. Only for a special case may up to 2.5% of the population be removed as outliers; and if this is done, the justification must be provided. Once this outlier(s) have been removed, the remaining data set is the Final Data Set.

4.3.4. For transmitters, or other devices with multiple calibration points, the general process will be to use the calibration point with the worst case drift values. This is determined by comparing the different calibration points and using the one with the largest error, determined by adding the absolute value of the mean to 2 times the standard deviation. The data set with the largest of those terms will be used throughout the rest of the analysis, after outlier removal, as the Final Data Set. (Note that it is possible to use a specific calibration point and neglect the others, only if that is the single point of concern for all devices in the data set.)

4.3.5. Recalculate the Average, Median, Standard Deviation, Variance, Minimum, Maximum, Kurtosis, Skewness, Count and Average Time Interval Between Calibrations for the Final Data Set.

4.4. Normality Tests

To test for normality of the Final Data Set, the first step is to perform the required hypothesis testing. For Final Data Sets with 50 or more data points, the hypothesis testing can be done with either the Chi-Square (3.7.1) or the D' Tests (3.7.3). If the Final Data Set has less than 50 data points, the W Test (3.7.2) or Chi-Square Test may be used. The Chi-Square test should generally be performed with 12 bins of data, starting from [$-\infty$ to (mean-2.5σ)], and bin increments of 0.5σ, ending at [(mean+2.5σ) to $+\infty$]. (Since the same bins are to be used for the histogram in the coverage analysis, the work for these two tasks may be combined.) If the data passes either of the tests, only the passed test need be shown in the spreadsheet. However, if the assumption of normality is rejected by both of the hypothesis tests, the results of both tests should be presented.

If the assumption of normality is rejected by both tests, then a coverage analysis should be performed as described in Section 3.7.5. As explained above the for Chi-Square test, the coverage analysis and histogram will be established with a 12 bin approach unless inappropriate for the application.

If an adjustment is required to the standard deviation to provide a normal distribution that adequately covers the data set, then the required multiplier to the standard deviation (Normality Adjustment Factor (NAF)) will be determined iteratively in the coverage analysis. This multiplier will produce a normal distribution model for the drift, which shows adequate data population from the Final Data Set within the $\pm 1\sigma$ and $\pm 2\sigma$ bands of the model.

4.5. Time Dependency Testing

Time dependency testing is only required for instruments for which the calibration intervals are being extended. Time dependency is evaluated through the use of a scatter (drift interval) plot, binning analysis, and regression analyses. The methods for each of these are detailed below.

4.5.1. Scatter Plot

The scatter plot is performed under a new page to the spreadsheet entitled "Scatter Plot" or "Drift Interval Plot". The Final Data Set, including drift values and associated times between calibrations are copied into the first two columns of the new page of the spreadsheet. The chart function of EXCEL is used to merely chart the data with the x axis being the calibration interval and the y axis being the drift value. The prediction line should be added to the chart, along with the equation of the prediction line. This plot provides visual indication of the trend of the mean, and somewhat obscurely, of any increases in the scatter of the data over time.

4.5.2. Binning Analysis

The binning analysis is performed under a separate page of the EXCEL spreadsheet. The Final Data Set is copied onto the first two columns, and then split by bins 1 through 8 into the time intervals as defined in Section 3.9.3.1. A table is set up to compute the standard deviation, mean, average time interval, and count of the data in each time bin. Similar equation methods are used here as described in Section 4.2 above, when characterizing the drift data set. Another table is used to evaluate the validity of the bins, based on population per the criteria of Section 3.9.3.4. If multiple valid bins are not established, the time dependency analysis stops at this page, and no regression analyses are performed.

The standard deviations, means and average time intervals are tabulated, and a plot is generated to show the variation of the bin averages and standard deviations versus average time interval, if multiple bins are established. This plot can be used to establish whether standard deviations and means are significantly increasing over time between calibrations.

4.5.3. Regression Analyses

The regression analyses are performed in accordance with the requirements of Section 3.9.4, given that multiple valid time bins were established in the binning analysis. New pages should be created for the Drift Regression and the Absolute Value Drift Regression. The Final Data Set should be copied into the first columns of each of these pages, and the blank lines should be removed. On the Absolute Value Regression page, a third column should be created, which merely takes the absolute value of the drift column.

For each of the two Regression Analyses, use the following steps to produce the regression analysis output. Using the "Data Analysis" package under "Tools" in Microsoft EXCEL, the Regression option should be chosen. The Y range will be established as the Drift (or Absolute Value of Drift) data range, and the X range should be the calibration time intervals. The output range should be established on the same page of the spreadsheet, directly to the right of the data already entered. The option for the residuals should be established as "Line Fit Plots". The regression computation should then be performed. The output of the regression routine will be a list of residuals, an ANOVA table listing, and a plot of the Drift (or Absolute Value of Drift) versus the Time Interval Between Calibrations. A prediction line will be included on the plot. Add a cell close to the

ANOVA table listing which establishes the Critical Value of F, using the guidance of Section 3.9.4 for the Significance of F Test. This will utilize the FINV function of Microsoft EXCEL.

Analyze the results in the Drift Regression ANOVA table for R Square, P Value, and F Value, using the guidance of Section 3.9.4. If any of these analytical means shows time dependency in the Drift Regression, the mean of the data set should be established as strongly time dependent if the slope of the prediction line significantly increases over time from an initially positive value (or decreases over time from an initially negative value), without crossing zero within the time interval of the regression analysis. This increase can also be validated by observing the results of the binning analysis plot for the mean of the bins, and by observing the scatter plot prediction line.

Analyze the results in the Absolute Value of Drift Regression ANOVA table for R Square, P Value, and F Value, using the guidance of Section 3.9.4. If any of these analytical means shows time dependency, the standard deviation of the data set should be established as strongly time dependent if the slope of the prediction line significantly increases over time. This increase can also be validated by observing the results of the binning analysis plot for the standard deviation of the bins, and by observing any discernible increases in data scatter as time increases on the scatter plot.

Regardless of the results of the analytical regression tests, if the plots tend to indicate significant increases in either the mean or standard deviation over time, those parameters should be judged to be strongly time dependent. Otherwise, for conservatism, the data will always be considered to be moderately time dependent if extrapolation of the data is necessary, to accommodate the uncertainty involved in the extrapolation process, since no data has generally been taken at time intervals as large as those proposed.

4.6. Calculate The Analyzed Drift Value

The first step in determining the Analyzed Drift Value is to determine the required time interval for which the value must be computed. For the majority of the cases, the required nominal calibration time interval will be 24 months, or a maximum of 30 months. Since the average time intervals will generally be computed in days, the conservative value for a 30-Month calibration interval will be established as 915 days.

The Analyzed Drift Value generally consists of two separate components - a random term and a bias term. If the mean of the Final Data Set is significant per the criteria in Section 3.11, a bias term will be considered. If no extrapolation is necessary, the bias term will be set equal to the mean of the Final Data Set. Extrapolation of this term will be performed in one of two methods, as determined by the degree of time dependency established in the time dependency analysis. If the mean is determined to be strongly time dependent, the following equation will be used, which extrapolates the value in a linear fashion.

$$DA_{30Mo.bias} = \bar{x} \times \frac{915\_Days}{Max\_FDS\_Time\_Interval}$$

It the mean is determined to be moderately time dependent, the following equation will be used to extrapolate the mean. (Note that this equation will also generally be used for cases where no time dependency is evident, because of the uncertainty in defining a drift value beyond analysis limits.)

$$DA_{30Mo.bias} = \bar{x} \times \sqrt{\frac{915\_Days}{Max\_FDS\_Time\_Interval}}$$

The random portion of the Analyzed Drift is calculated by multiplying the standard deviation of the Final Data Set by the Tolerance Interval Factor for the sample size and by the Normality Adjustment Factor, if required from the Coverage Analysis, and extrapolating the final result in a fashion similar to the methods shown above for the bias term. Use the following procedure to perform the operation.

4.6.1. Use the COUNT value of the Final Data Set to determine the sample size.

4.6.2. Obtain the appropriate Tolerance Interval Factor (TIF) for the size of the sample set. Table 1 lists the 95%/95% TIFs; refer to Standard statistical texts for other TIF multipliers. Note: TIFs other than 95%/95% must be specifically justified.

4.6.3. For a generic data analysis, multiple Tolerance Interval Factors may be used, providing a clear tabulation of results is included in the analysis, showing each value for the multiple levels of TIF.

4.6.4. Multiply the Tolerance Interval Factor by the standard deviation for the data points contained in the Final Data Set and by the Normality Adjustment Factor determined in the Coverage Analysis (if applicable).

4.6.5. If the analyzed drift term calculated above is applied to the existing calibration interval, application of additional drift uncertainty is not necessary.

4.6.6. When calculating drift for calibration intervals that exceed the historical calibration intervals, use the following equations, depending on whether the data is shown to be strongly time dependent or moderately time dependent.

For a Strongly Time Dependent random term, use the following equation.

$$DA_{30Mo.random} = \sigma \times TIF \times NAF \times \frac{915\_Days}{Max\_FDS\_Time\_Interval}$$

For a Moderately Time Dependent random term, use the following equation. (Note that this equation will also generally be used for cases where no time dependency is evident, because of the uncertainty in defining a drift value beyond analysis limits.)

$$DA_{30Mo.random} = \sigma \times TIF \times NAF \times \sqrt{\frac{915\_Days}{Max\_FDS\_Time\_Interval}}$$

Where: σ = Standard Deviation of the Final Data Set

TIF = Tolerance Interval Factor from Table 1

NAF = Normality Adjustment Factor from the Coverage Analysis (If Applicable)

Max_FDS_Time_Interval = the maximum observed time interval within the Final Data Set

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 since they are not expected to fully contribute to the errors observed.

4.6.7. Since random errors are always expressed as ± errors, specific consideration of directionality is not generally a concern. However, for bistables and switches, the directionality of any bias error must be carefully considered. Because of the fact that the As-Found and As-Left setpoints are recorded during calibration, the drift values determined up to this point in the drift study are representative of a drift in the setpoint, not in the indicated value.

Per Reference 7.1.2, error is defined as the algebraic difference between the indication and the ideal value of the measured signal. In other words,

error = indicated value - ideal value (actual value)

For devices with analog outputs, a positive error means that the indicated value exceeds the actual value, which would mean that if a bistable or switching mechanism used that signal to produce an actuation on an increasing trend, the actuation would take place **prior to** the actual variable reaching the value of the intended setpoint. As analyzed so far in the drift study, the drift of a bistable or switch causes just the opposite effect. A positive Analyzed Drift would mean that the **setpoint** is higher than intended; thereby causing actuation to occur **after** the actual variable has exceeded the intended setpoint.

A bistable or switch can be considered to be a black box, which contains a sensing element or circuit and an ideal switching mechanism. At the time of actuation, the switch or bistable can be considered an indication of the process variable. Therefore, a positive shift of the setpoint can be considered to be a negative error. In other words, if the switch setting was intended to be 500 psig, but actually switched at 510 psig, at the time of the actuation, the switch "indicated" that the process value was 500 psig when the process value was actually 510 psig. Thus,

error = indicated value (500 psig) - actual value (510 psig) = -10 psig

Therefore, a positive shift of the setpoint on a switch or bistable is equivalent to a negative error, as defined by Reference 7.1.2. **Therefore, for clarity and consistency with the treatment of other bias error terms, the sign of the bias errors of a bistable or switch will be reversed, in order to comply with the convention established by Reference 7.1.2.**

5. CALCULATIONS

5.1. Drift Studies / Calculation

The Drift Studies / Calculations should be performed in accordance with the methodology described above, with the following documentation requirements.

5.1.1. The title includes the Manufacturer/Model number of the component group analyzed.

5.1.2. The calculation objective will:

5.1.2.1. describe, at a minimum, that the objective of the calculation is to document the drift analysis results for the component group, and extrapolate the drift value to the required calibration period (if applicable), 5.1.2.2. provide a list for the group of all pertinent information in tabular form (e.g. Tag Numbers, Manufacturer, Model Numbers, ranges and calibration spans), and

5.1.2.3. describe any limitations on the application of the results. For instance, if the analysis only applies to a certain range code, the objective will state this fact.

5.1.3. The method of solution will describe, at a minimum, a summary of the methodology used to perform the drift analysis outlined by this Design Guide. Exceptions taken to this Design Guide will be included in this section including basis and references for exceptions.

5.1.4. The actual calculation/analysis will provide:

5.1.4.1. A listing of data which was removed, and the justification for doing so

5.1.4.2. List of references

5.1.4.3. A narrative discussion of the specific activities performed for this calculation

5.1.4.4. Results and conclusions, including

- Manufacturer and model number analyzed
- bias and random Analyzed Drift values, as applicable
- The applicable Tolerance Interval Factors (provide detailed discussion and justification if other than 95%/95%)
- applicable drift time interval for application
- normality conclusion
- statement of time dependency observed, as applicable
- limitations on the use of this value in application to uncertainty calcs, as applicable
- limitations on the application if the results to similar instruments, as applicable

5.1.5. Attachments, including the following information:

5.1.5.1. Input data with notes on removal and validity

5.1.5.2. Computation of drift data and calibration time intervals

5.1.5.3. Outlier summary, including Final Data Set and basic statistical summaries

5.1.5.4. Chi-Square Test Results (If Applicable)

5.1.5.5. W Test or D' Test Results (If Applicable)

5.1.5.6. Coverage analysis, including histogram, percentages in the required sigma bands, and Normality Adjustment Factor (if applicable)

5.1.5.7. Scatter Plot with prediction line and equation

5.1.5.8. Binning Analysis Summaries for Bins and Plots (as applicable)

5.1.5.9. Regression Plots, ANOVA Tables, and Critical F Values

5.1.5.10. Derivation of the Analyzed Drift values, with summary of conclusions

5.2. Setpoint/Uncertainty Calculations

To apply the results of the drift analyses to a specific device or loop, a setpoint/uncertainty calculation will be performed, revised or evaluated in accordance with References 7.2.1 and/or 7.2.4, as appropriate. Per Section 3.2.1.2 above, the Analyzed Drift term characterizes the Reference Accuracy, M&TE (or calibration error) and drift error terms for the analyzed device, loop, or function. In order to save time, a comparison between these terms (or subset of these terms) in an existing setpoint calculation to the Analyzed Drift can be made. If the terms within the existing calculation bound the Analyzed Drift term, then the existing calculation is conservative as is, and does not specifically require revision. If revision to the calculation is necessary, the Analyzed Drift term may be incorporated into the calculation, setting the Reference Accuracy, M&TE (or calibration error), and drift terms for the analyzed devices to zero.

When comparing the results to setpoint calculations which have more than one device in the instrument loop which has been analyzed for drift, comparisons can be made between the DA terms and the original terms on a device-by-device basis, or on a total loop basis. Care should be taken to properly combine terms for comparison in accordance with References 7.2.1 and 7.2.4, as appropriate.

When applying the drift study results of bistables or switches to a setpoint calculation, the preparer should fully understand the directionality of any bias terms within DA and apply the bias terms accordingly. (See Section 4.6.7 above.)

6.0 DEFINITIONS

95%/95% -	Standard statistics term meaning that the results have a 95% confidence (γ) that at least 95% of the population will lie between the stated interval (P) for a sample size (n).	Ref. 7.1.1
Analyzed Drift (DA) – Synonymous with ADR	A term representing the errors determined by a completed drift analysis for a group. Uncertainties that may be represented by the analyzed drift term are component accuracy errors, M&TE errors, personnel-induced or human related errors, ambient temperature and other environmental effects, power supply effects, misapplication errors and true component drift.	Section 3.2.1.3
As-Found (FT) -	The condition in which a channel, or portion of a channel, is found after a period of operation and before recalibration.	Ref. 7.1.3
As-Left (CT) -	The condition in which a channel, or portion of a channel, is left after calibration or final setpoint device verification.	Ref. 7.1.3
Bias (B) -	A shift in the signal zero point by some amount.	Ref. 7.1.1
Calibrated Span (CS) -	The maximum calibrated upper range value less the minimum calibrated lower range value.	Ref. 7.1.1
Calibration Interval -	The elapsed time between the initiation or successful completion of calibrations or calibration checks on the same instrument, channel, instrument loop, or other specified system or device.	Ref. 7.1.1
Chi-Square Test -	A test to determine if a sample appears to follow a given probability distribution. This test is used as one method for assessing whether a sample follows a normal distribution.	Ref. 7.1.1
Confidence Interval -	An interval that contains the population mean to a given probability.	Ref. 7.1.1
Coverage Analysis -	An analysis to determine whether the assumption of a normal distribution effectively bounds the data. A histogram is used to graphically portray the coverage analysis.	Ref. 7.1.1
Cumulative Distribution -	An expression of the total probability contained within an interval from $-\infty$ to some value x.	Ref. 7.1.1
D-Prime Test -	A test to verify the assumption of normality for moderate to large sample sizes.	Ref. 7.1.1
Dependent -	In statistics, dependent events are those for which the probability of all occurring at once is different than the product of the probabilities of each occurring separately. In setpoint determination, dependent uncertainties are those uncertainties for which the sign or magnitude of one uncertainty affects the sign or magnitude of another uncertainty.	Ref. 7.1.1
Drift -	An undesired change in output over a period of time where change is unrelated to the input, environment, or load.	Ref. 7.1.2
Error -	The algebraic difference between the indication and the ideal value of the measured signal.	Ref. 7.1.2
Final Data Set -	The set of data that will be analyzed for normality, time dependence, and used to determine the drift value. This data has all outliers and erroneous data removed.	Section 3.6.3
Functionally Equivalent -	Components with similar design and performance characteristics that can be combined to form a single population for analysis purposes.	Ref. 7.1.1
Histogram -	A graph of a frequency distribution.	Ref. 7.1.1

Independent -	In statistics, independent events are those in which the probability of all occurring at once is the same as the product of the probabilities of each occurring separately. In setpoint determination, independent uncertainties are those for which the sign or magnitude of one uncertainty does not affect the sign or magnitude of any other uncertainty.	Ref. 7.1.1
Instrument Channel -	An arrangement of components and modules as required to generate a single protective action signal when required by a plant condition. A channel loses its identity where single protective action signals are combined.	Ref. 7.1.2
Instrument Range -	The region between the limits within which a quantity is measured, received or transmitted, expressed by stating the lower and upper range values.	Ref. 7.1.2
Kurtosis -	A characterization of the relative peaked-ness or flatness of a distribution compared to a normal distribution. A large kurtosis indicates a relatively peaked distribution and a small kurtosis indicates a relatively flat distribution.	Ref. 7.1.1
M&TE -	Measurement and Test Equipment.	Ref. 7.1.1
Maximum Span -	The component's maximum upper range limit less the maximum lower range limit.	Ref. 7.1.1
Mean -	The average value of a random sample or population.	Ref. 7.1.1
Median -	The value of the middle number in an ordered set of numbers. Half the numbers have values that are greater than the median and half have values that are less than the median. If the data set has an even number of values, the median is the average of the two middle values.	Ref. 7.1.1
Module -	Any assembly of interconnected components that constitutes an identifiable device, instrument or piece of equipment. A module can be removed as a unit and replaced with a spare. It has definable performance characteristics that permit it to be tested as a unit.	Ref. 7.1.2
Normality Adjustment Factor -	A multiplier to be used for the standard deviation of the Final Data Set to provide a drift model that adequately covers the population of drift points in the Final Data Set.	Section 3.7.5
Normality Test -	A statistics test to determine if a sample is normally distributed.	Ref. 7.1.1
Outlier -	A data point significantly different in value from the rest of the sample.	Ref. 7.1.1
Population -	The totality of the observations with which we are concerned. A true population consists of all values, past, present and future.	Ref. 7.1.1
Probability -	The branch of mathematics which deals with the assignment of relative frequencies of occurrence (confidence) of the possible outcomes of a process or experiment according to some mathematical function.	Ref. 7.3.7
Prob. Density Function -	An expression of the distribution of probability for a continuous function.	Ref. 7.1.1
Probability Plot -	A type of graph scaled for a particular distribution in which the sample data will plot as approximately a straight line if the data follows that distribution. For example, normally distributed data will plot as a straight line on a probability plot scaled for a normal distribution; the data may not appear as a straight line on a graph scaled for a different type of distribution.	Ref. 7.1.1
Proportion -	A segment of a population that is contained by an upper and lower limit. Tolerance intervals determine the bounds or limits of a proportion of the population, not just the sampled data. The proportion (P) is the second term in the tolerance interval value (e.g. 95%/99%).	Ref. 7.3.7
Random -	Describing a variable whose value at a particular future instant cannot be predicted exactly, but can only be estimated by a probability distribution function.	Ref. 7.1.1

Raw Data -	As found minus As-Left calibration data used to characterize the performance of a functionally equivalent group of components.	Ref. 7.1.1
Reference Accuracy -	A number or quantity that defines a limit that errors will not exceed when a device is used under specified operating conditions.	Ref. 7.1.2
Sample -	A subset of a population.	Ref. 7.1.1
Sensor -	The portion of an instrument channel that responds to changes in a plant variable or condition and converts the measured process variable into a signal. e.g., electric or pneumatic	Ref. 7.1.2
Signal Conditioning -	One or more modules that perform signal conversion, buffering , isolation or mathematical operations on the signal as needed.	Ref. 7.1.2
Skewness -	A measure of the degree of symmetry around the mean.	Ref. 7.1.1
Span -	The algebraic difference between the upper and lower values of a calibrated span.	Ref. 7.1.2
Standard Deviation -	A measure of how widely values are dispersed from the population mean.	Ref. 7.1.1
Surveillance Interval -	The elapsed time between the initiation or successful completion of a surveillance or surveillance check on the same component, channel, instrument loop, or other specified system or device.	Ref. 7.1.1
Time-Dependent Drift -	The tendency for the magnitude of component drift to vary with time.	Ref. 7.1.1
Time-Dependent Drift Uncertainty -	The uncertainty associated with extending calibration intervals beyond the range of available historical data for a given instrument or group of instruments.	Ref. 7.1.1
Time-Independent Drift -	The tendency for the magnitude of component drift to show no specific trend with time.	Ref. 7.1.1
Tolerance -	The allowable variation from a specified or true value.	Ref. 7.1.2
Tolerance Interval -	An interval that contains a defined proportion of the population to a given probability.	Ref. 7.1.1
Trip Setpoint -	A predetermined value for actuation of the final actuation device to initiate protective action.	Ref. 7.1.2
t-Test -	For this Design Guide the t-Test is used to determine: 1) if a sample is an outlier of a sample pool. 2) if two groups of data originate from the same pool.	Ref. 7.1.1
Uncertainty -	The amount to which an instrument channel's output is in doubt (or the allowance made therefore) due to possible errors either random or systematic which have not been corrected for. The uncertainty is generally identified within a probability and confidence level.	Ref. 7.1.1
Variance -	A measure of how widely values are dispersed from the population mean.	Ref. 7.1.1
W Test -	A test to verify the assumption of normality for sample size less than 50.	Ref. 7.1.1

7.0 REFERENCES

7.1 Industry Standards and Correspondence

7.1.1 EPRI TR-103335R1, "Statistical Analysis of Instrument Calibration Data - Guidelines for Instrument Calibration Extension/Reduction Programs," October 1998.

7.1.2 ISA-RP67.04-Part II-1994, "Recommended Practice, Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation."

7.1.3 ISA-S67.04-Part I-1994, "Standard, Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation."

7.1.4 ANSI N15.15-1974, "Assessment of the Assumption of Normality (Employing Individual Observed Values)."

7.1.5 CM-106752-R2, Users Manual: IPASS (Rev. 2), "Instrument Performance Analysis Software System for As-Found-As-Left (AFAL) Data," July 1999.

7.1.6 NRC to EPRI Letter, "Status Report on the Staff Review of EPRI Technical Report TR-103335, "Guidelines for Instrument Calibration Extension/Reduction Program"," dated March 1994.

7.1.7 Regulatory Guide 1.105, Rev. 2, "Instrument Setpoints."

7.1.8 GE NEDC 31336P-A "General Electric Instrument Setpoint Methodology."

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

7.2 Calculations and Programs

7.2.1 E. I. Hatch Nuclear Plant ATTS Trip Setpoint Methodology.

7.2.2 SINH 90-017, "E. I. Hatch Nuclear Plant, SCS Calculation Unit 2," Rev. 5.

7.2.3 SMNH 89-071, "E. I. Hatch Nuclear Plant, SCS Calculation Unit 1," Rev. 4.

7.2.4 Hatch Project I&C/EQ Desktop Instructions IDI 4.0, "Preparation of Instrument Setpoint Calculations," Rev. 0.

7.3 Miscellaneous

7.3.1 IPASS (Instrument Performance Analysis Software System), Revision 2.03, created by EDAN Engineering in conjunction with EPRI.

7.3.2 NRC Status Report on the Staff Review of EPRI Technical Report TR-103335 "Guidelines For Instrument Calibration Extension/Reduction Programs, "Dated March 1994.

7.3.3 NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle."

7.3.4 MPAC, Maintenance Planning and Control System.

7.3.5 Microsoft Excel Version 97SR-2, Spreadsheet Program.

7.3.6 Microsoft Access Version 97SR-2, Database Program.

7.3.7 Statistics for Nuclear Engineers and Scientists Part 1: Basic Statistical Inference, William J. Beggs; February 1981.

ENCLOSURE 4 TAB

Enclosure 4

Edwin I. Hatch Nuclear Plant
Request to Revise Technical Specifications:
Quarterly Surveillance Extension

Bases for Change Request for Extended Intervals

A description of and the justification for each proposed Technical Specifications (TS) change is provided below.

TS 3.3.1.1 Reactor Protection System (RPS) Instrumentation

As stated in the TS Bases, the RPS initiates a reactor scram when one or more monitored parameters exceed their specified limits, to preserve the integrity of the fuel cladding and the Reactor Coolant System (RCS) and minimize the energy that must be absorbed following a loss of coolant accident (LOCA). This can be accomplished either automatically or manually. TS 3.3.1.1 requires that each RPS instrumentation channel be demonstrated OPERABLE by the performance of a LOGIC SYSTEM FUNCTIONAL TEST and a CHANNEL FUNCTIONAL TEST or a CHANNEL CALIBRATION for the operational conditions at the frequencies shown in Table 3.3.1.1-1. The RPS System, along with the RPS initiation logic, is designed to be single failure proof and, therefore, is highly reliable.

The following Surveillance Requirements (SRs) were evaluated relative to extending their respective testing intervals. These SRs ensure the RPS will function as designed during an analyzed event. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 3 Reactor Vessel Steam Dome Pressure - High

As stated in the TS Bases, an increase in the reactor pressure vessel (RPV) pressure during reactor operation compresses the steam voids and results in a positive reactivity insertion. This causes the neutron flux and THERMAL POWER transferred to the reactor coolant to increase, which could challenge the integrity of the fuel cladding and the reactor coolant pressure boundary (RCPB). No specific safety analysis takes direct credit for this Function. However, the Reactor Vessel Steam Dome Pressure - High Function initiates a scram for transients that result in a pressure increase, counteracting the pressure increase by rapidly reducing core power. For the overpressurization protection analysis of the FSAR, reactor scram (the analyses conservatively assume scram on the Average Power Range Monitor Neutron Flux - High signal, not the Reactor Vessel Steam Dome Pressure - High signal), along with the safety/relief valves (S/RVs), limits the peak RPV pressure to less than the ASME Code Section III limits.

Four channels of Reactor Vessel Steam Dome Pressure - High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure no single instrument failure will preclude a scram from this Function on a valid signal.

SR 3.3.1.1.9 Perform CHANNEL FUNCTIONAL TEST
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated General Electric (GE) trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in NRC Generic Letter (91-04).[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.1.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel routinely monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and routine monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 4 Reactor Vessel Water Level - Low, Level 3

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, a reactor scram is initiated at Level 3 to substantially reduce the heat generated in the fuel from fission. The Reactor Vessel Water Level - Low, Level 3 Function is assumed in the analysis of the recirculation line break. The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the Emergency Core Cooling System (ECCS), ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low, Level 3 Function, with two channels in each trip system arranged in one-out-of-two logic, are required to be OPERABLE to ensure no single instrument failure precludes a scram from this Function on a valid signal. The Function is required in MODES 1 and 2 where considerable energy exists in the RCS resulting in the limiting transients and accidents. ECCS initiations at Reactor Vessel Water Level - Low Low, Level 2 and Low Low Low, Level 1 provide sufficient protection for level transients in all other MODES.

SR 3.3.1.1.9 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.1.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and, with the exception of the trip unit, confirms operation of all channel components. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and performance of a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design.

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 5 Main Steam Isolation Valve - Closure
As stated in the TS Bases, a main steam isolation valve (MSIV) closure results in loss of the main turbine and the condenser as a heat sink for the nuclear steam supply system, and indicates a need to shut down the reactor to reduce heat generation. Therefore, a reactor scram is initiated on a Main Steam Isolation Valve - Closure signal before the MSIVs are completely closed, in anticipation of the complete loss of the normal heat sink and subsequent overpressurization transient. However, for the overpressurization protection analysis, the Average Power Range Monitor Neutron Flux - High Function, along with the S/RVs, limits the peak RPV pressure to less than the ASME Code Limits. That is, the direct scram on position switches for MSIV closure events is not assumed in the overpressurization analysis. Additionally, MSIV closure is assumed in transients, such as low steam line pressure, manual closure of MSIVs, and high steam line flow. The reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the ECCS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. Per Unit 2 FSAR paragraph 7.2.2.10.4, automatic closure of the MSIVs is initiated when conditions indicate a steam line break. The main steam line (MSL) isolation scram setting is selected to give the earliest positive indication of isolation valve closure.

Per the TS Bases, MSIV closure signals are initiated from position switches located on each of the eight MSIVs. Each MSIV has two position switches; one inputs to RPS trip system A, while the other inputs to RPS trip system B. Thus, each RPS trip system receives an input from eight Main Steam Isolation Valve - Closure channels, each consisting of one position switch. The logic for the Main Steam Isolation Valve - Closure Function is arranged such that either the inboard or outboard valve on three or more of the MSLs must close in order for a scram to occur. In addition, certain combinations of valves closed in two lines will result in a half-scram.

Sixteen channels of the Main Steam Isolation Valve - Closure Function, with eight channels in each trip system, are required to be OPERABLE to ensure no single instrument failure will preclude the scram from this Function on a valid signal. This Function is only required in MODE 1 since, with the MSIVs open and the heat generation rate high, a pressurization transient can occur if the MSIVs close. In MODE 2, the heat generation rate is low enough so that the other diverse RPS Functions provide sufficient protection.

SR 3.3.1.1.9 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] Local valve limit switches perform this function. Limit switches are mechanical devices that require mechanical adjustment only; drift is not applicable to these devices. The limit switches are highly reliable, and therefore, a change in the surveillance interval from 92 days to 92 days on a STAGGARED TEST BASIS does not significantly affect availability or functionality of the limit switches.

The 16-channel design (8 channels for each trip system) for these protective circuits ensures no single failure or out-of-tolerance condition for a limit switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these limit switches. Therefore, operators can detect certain circuit failures limit switch failures, through known false alarm conditions. Based upon:

1. the high degree of reliability of the 16-channel system design, and

2. the failure-detection capability due to continual monitoring of the system alarms;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 6 Drywell Pressure - High

As stated in the TS Bases, high pressure in the drywell could indicate a break in the RCPB. A reactor scram is initiated to minimize the possibility of fuel damage and to reduce the amount of energy being added to the coolant and the drywell. The Drywell Pressure - High Function is a secondary scram signal to Reactor Vessel Water Level - Low, Level 3 for LOCA events inside the drywell. However, no credit is taken for a scram initiated from this Function for any of the design basis accidents (DBAs) analyzed in the FSAR. This Function was not specifically credited in the accident analysis, but it is retained for the overall redundancy and diversity of the RPS as required by the NRC-approved licensing basis. The Allowable Value was selected to be as low as possible and indicative of a LOCA inside primary containment. The Function is required in MODES 1 and 2 where considerable energy exists in the RCS, resulting in the limiting transients and accidents.

Four channels of Drywell Pressure - High Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure no single instrument failure will preclude a scram from this Function on a valid signal.

SR 3.3.1.1.9 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.1.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3 establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 7 SDV Water Level - High

As stated in the TS Bases, the SDV receives the water displaced by the motion of the CRD pistons during a reactor scram. Should this volume fill to a point where there is insufficient volume to accept the displaced water, control rod insertion will be hindered. Therefore, a reactor scram is initiated while the remaining free volume is still sufficient to accommodate the water from a full core scram. The two types of SDV Water Level - High Functions are inputs to the RPS logic. No credit for a scram initiated from these Functions is assumed in any event analyzed in the FSAR. However, they are retained to ensure the RPS remains OPERABLE. Two diverse types of level instruments perform this Function.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 7.a SDV Water Level - High - Resistance Temperature Detector

SR 3.3.1.1.12 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from 92 days to 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the approach described in GL 91-04.[1] FCI thermal level switches and associated electronics perform this Function. The thermal level switches consist of a thermal probe that provides input to electronic level switches in the MCR. Opposing temperature elements within the probe send a relatively large signal if the probe is uncovered, and a very small signal if the probe is covered with water, with the corresponding indication being either covered or uncovered. These are discrete devices, for which instrument drift does not apply. Additionally, these devices are highly reliable. Therefore, a change in the surveillance interval from 92 days to 92 days on a

STAGGERED TEST BASIS does not affect the level switches relative to drift, and the extension of this SR interval is justified, based upon a review of the surveillance test history.

Based upon the above discussion, the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history for the calibration test demonstrates that failures are rarely observed during this SR activity and no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

NOTE: The surveillance interval for SR 3.3.1.1.12 is being extended to 24 months per a separate TS amendment request. Justification for the proposed change for this Function is provided therein.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 8 Turbine Stop Valve - Closure

As stated in the TS Bases, closure of the turbine stop valves (TSVs) results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated at the start of TSV Closure in anticipation of the transients that result from the closure of these valves. The Turbine Stop Valve - Closure Function is the primary scram signal for the turbine trip event analyzed in the FSAR. This Function is required, consistent with analysis assumptions, whenever THERMAL POWER is ≥ 28% of rated thermal power (RTP). This Function is not required when THERMAL POWER is < 28% of RTP, since the Reactor Vessel Steam Dome Pressure - High and the Average Power Range Monitor Neutron Flux - High Functions are adequate to maintain the necessary safety margins.

Turbine Stop Valve - Closure signals are initiated from position switches located on each of the four TSVs. Two independent position switches are associated with each stop valve. One of the two switches provides input to RPS trip system A, and the other to RPS trip system B. Thus, each RPS trip system receives an input from four Turbine Stop Valve - Closure channels, each consisting of one position switch. The logic for the Turbine Stop Valve - Closure Function is such that three or more TSVs must be closed to produce a scram. In addition, certain combinations of two valves closed will result in a half-scram.

Eight channels of Turbine Stop Valve - Closure Function, with four channels in each trip system, are required to be OPERABLE to ensure no single instrument failure will preclude a scram from this Function if the TSVs should close.

SR 3.3.1.1.9 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] Namco valve limit switches perform this function. Limit switches are mechanical devices that require mechanical adjustment only; drift is not applicable to these devices. The limit switches are highly reliable,

and therefore, a change in the surveillance interval from 92 days to 92 days on a STAGGERED TEST BASIS does not significantly affect the availability or functionality of the limit switches.

The eight-channel design (four channels for each trip system) for these protective circuits ensures no single failure or out-of-tolerance condition for a limit switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these limit switches. Therefore, operators can detect certain circuit failures and limit switch failures, through known false alarm conditions. Based upon:

1. the high degree of reliability of the 8-channel system design, and

2. the failure-detection capability due to continual monitoring of the system alarms;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 9 Turbine Control Valve Fast Closure, Trip Oil Pressure - Low

As stated in the TS Bases, fast closure of the Turbine Control Valves (TCVs) results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated on TCV fast closure in anticipation of the transients that result from the closure of these valves. The Turbine Control Valve Fast Closure, Trip Oil Pressure - Low is the primary scram signal for the generator load rejection event analyzed in the FSAR. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the end-of-cycle recirculation pump trip (EOC-RPT) System, ensures the Safety Limit (SL) Minimum Critical Power Ratio (MCPR) is not exceeded. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low signals are initiated by the electrohydraulic control (EHC) fluid pressure at each control valve. This Function is required, consistent with the analysis assumptions, whenever THERMAL POWER is ≥ 28% of RTP. This Function is not required when THERMAL POWER is < 28% of RTP, since the Reactor Vessel Steam Dome Pressure - High and the Average Power Range Monitor Neutron Flux - High Functions are adequate to maintain the necessary safety margins.

Turbine Control Valve Fast Closure, Trip Oil Pressure - Low signals are initiated by the EHC fluid pressure at each control valve. One pressure switch is associated with each control valve, and each switch is assigned to a separate RPS logic channel.

Four channels of the Turbine Control Valve Fast Closure, Trip Oil Pressure - Low Function with two channels in each trip system arranged in a one-out-of-two logic are required to be OPERABLE to ensure no single instrument failure will preclude a scram from this Function on a valid signal.

SR 3.3.1.1.9 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace

period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] SOR pressure switches were recently installed to perform this function reliably, which are calibrated on a Frequency corresponding to the refueling interval. The setpoints are established, assuming drift for the calibration interval. Therefore, the instrument drift is not dependent upon the length of this surveillance interval.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a pressure switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these pressure switches. Therefore, operators can detect certain circuit failures and pressure switch failures, through known false alarm conditions.

A review of the surveillance test history provides a high degree of confidence that the pressure switches will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design, and

2. the failure-detection capability due to the continual monitoring of the system alarms;

the effect, if any, on this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.2.1 Control Rod Block Instrumentation

As stated in the TS Bases, control rods provide the primary means for control of reactivity changes. Control rod block instrumentation includes channel sensors, logic circuitry, switches, and relays designed to ensure the fuel cladding integrity SL and the specified fuel design limits are not violated during postulated transients and accidents. During high-power operation, the rod block monitor (RBM) provides protection for control rod withdrawal error events. During low-power operations, control rod blocks from the rod worth minimizer (RWM) enforce specific control rod sequences designed to mitigate the consequences of the control rod drop accident (CRDA). During shutdown conditions, control rod blocks from the Reactor Mode Switch - Shutdown Position Function ensure all control rods remain inserted to prevent inadvertent criticalities.

The following SRs were evaluated with respect to extending their respective testing intervals. These SRs ensure the availability of safety functions that respond to plant transients and design basis events. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

Table 3.3.2.1-1 Control Rod Block Instrumentation
Function 2 Rod Worth Minimizer

As stated in the TS Bases, the purpose of the RWM is to control rod patterns during startup and shutdown, such that only specified control rod sequences and relative positions are allowed over the operating range from all control rods inserted to 10% RTP. The sequences effectively limit the potential amount and rate of reactivity increase during a CRDA. Prescribed control rod sequences are stored in the RWM, which will initiate control rod withdrawal and insert blocks when the actual sequence deviates beyond allowances from the stored sequence. The RWM determines the actual sequence-based position indication for each control rod. Per Unit 2 FSAR subsection 7.10.4, "Power level for automatic cutout of the [Nuclear Measurement Analysis and Control Rod Worth Minimizer] NUMAC-RWM function is sensed by APRM power and is set nominally at 22.5% of rated power." The RWM is a single channel system that provides input into both Reactor Manual Control System (RMCS) rod block circuits.

SR 3.3.2.1.2 Perform CHANNEL FUNCTIONAL TEST. [NOTE: Not required to be performed until 1 hour after any control rod is withdrawn at < 10% RTP in MODE 2.]

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1)

Control rod sequences input to the RWM are verified to be in conformance with the banked position withdrawal sequence (BPWS) prior to declaring the RWM OPERABLE following loading of the sequence into the RWM (SR 3.3.2.1.8). Therefore, proper control rod sequences are verified to exist prior to use. The NUMAC-RWM circuitry is designed to be highly reliable.

Based upon the above discussion, the effect, if any, of this proposed change on system reliability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

SR 3.3.2.1.3 Perform CHANNEL FUNCTIONAL TEST. [NOTE: Not required to be performed until 1 hour after THERMAL POWER is < 10% RTP in MODE 1.]

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1)

Control rod sequences input to the RWM are verified to be in conformance with the BPWS prior to declaring the RWM OPERABLE following loading of the sequence into the RWM (SR 3.3.2.1.8). Therefore, proper control rod sequences are verified to exist prior to use. The NUMAC-RWM circuitry is designed to be highly reliable.

Based upon the above discussion, the effect, if any, of this proposed change on system reliability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.2.2 Feedwater and Main Turbine Trip High Water Level Instrumentation

As stated in the TS Bases, The feedwater and main turbine high water level trip instrumentation is designed to detect a potential failure of the Feedwater Level Control System that causes excessive feedwater flow. With excessive feedwater flow, RPV water level rises toward the high water level setpoint, causing the trip of the two feedwater pump turbines and the main turbine. A trip of the feedwater pump turbines limits further increase in reactor vessel water level by limiting further addition of feedwater to the RPV. A trip of the main turbine and closure of the stop valves protects the turbine from damage due to water entering the turbine. The feedwater and main turbine high water level trip instrumentation is assumed to be capable of providing a turbine trip in the design basis transient analysis for a feedwater controller failure, maximum demand event. The high level trip indirectly initiates a reactor scram from the main turbine trip (above 28% of RTP) and trips the feedwater pumps, thereby terminating the event. The reactor scram mitigates the reduction in MCPR.

The Limiting Condition for Operation (LCO) requires three channels of the Reactor Vessel Water Level - High instrumentation to be OPERABLE to ensure no single instrument failure will prevent the feedwater pump turbines and main turbine trip on a valid Reactor Vessel Water Level - High signal. Two of the three channels are needed to provide trip signals in order for the feedwater and main turbine trips to occur.

SR 3.3.2.2.1 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except the transmitters, will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) Rosemount transmitters and Yokogawa trip units are used to perform this function. Setpoints for this parameter are based upon instrument drift for the calibration interval for the associated devices, which corresponds to the refueling interval. Therefore, instrument drift is unaffected by a change to the CHANNEL FUNCTIONAL TEST interval.

The three-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history provides a high degree of confidence that the trip units will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the three-channel system design, and

2. the failure-detection capability due to the continual monitoring of the instrumentation;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.4.1 End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation

As stated in the TS Bases, the EOC-RPT instrumentation initiates an RPT to reduce the peak reactor pressure and power resulting from turbine trip or generator load rejection transients to provide additional margin to core thermal MCPR SLs. The need for the additional negative reactivity in excess of that normally inserted on a scram reflects end of cycle reactivity considerations. Depending upon the MCPR Operating Limit (OL), flux shapes at the end of cycle can be such that the control rods will not be able to ensure thermal limits are maintained by inserting sufficient negative reactivity during the first few feet of rod travel upon a scram caused by either Turbine Stop Valve - Closure or Turbine Control Valve Fast Closure, Trip Oil Pressure - Low. The physical phenomenon involved is that the void reactivity feedback due to the pressurization transient can add positive reactivity at a faster rate than the control rods can add negative reactivity. EOC-RPT allows a margin improvement, which in turn allows a reduction in the MCPR OL.

The EOC-RPT instrumentation is composed of sensors that detect initiation of closure of the TSVs or fast closure of the TCVs, combined with relays, logic circuits, and fast acting circuit breakers that interrupt power from the recirculation pump motor generator (MG) set generators to each of the recirculation pump motors. The channels include electronic equipment (e.g., trip relays) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs an EOC-RPT signal to the trip logic. When the RPT breakers trip open, the recirculation pumps coast down under their own inertia. The EOC-RPT has two identical trip systems, either of which can actuate an RPT.

Each EOC-RPT trip system is a two-out-of-two logic for each Function; thus, either two TSV - Closure or two TCV Fast Closure, Trip Oil Pressure - Low signals are required for a trip system to actuate. If either trip system actuates, both recirculation pumps trip. There are two EOC-RPT breakers in series per recirculation pump. One trip system trips one of the two EOC-RPT breakers for each recirculation pump, and the second trip system trips the other EOC-RPT breaker for each recirculation pump. The EOC-RPT initiation logic is designed to be single failure proof and, therefore, is highly reliable.

The following SRs were evaluated with respect to extending their respective testing intervals. These SRs ensure the availability of safety functions that respond to plant transients and design basis events. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

LCO 3.3.4.1.a Two channels per trip system for each EOC-RPT instrumentation Function listed below shall be OPERABLE:
1. Turbine Stop Valve (TSV) - Closure; and

As stated in the TS Bases, closure of the TSVs and a main turbine trip result in the loss of a heat sink and increases reactor pressure, neutron flux, and heat flux that must be limited. Therefore, an RPT is initiated on a TSV - Closure signal before the TSVs are completely closed in anticipation of the effects that result from closure of these valves. EOC-RPT decreases reactor power and aids the reactor scram in ensuring the MCPR SL is not exceeded during the worst-case transient.

Closure of the TSVs is determined by measuring the position of each valve. While there are two separate position switches associated with each stop valve, only the signal from one switch for each TSV is used, with each of the four channels being assigned to a separate trip channel. The logic for the TSV - Closure Function is such that two or more TSVs must be closed to produce an EOC-RPT. This protection is required, consistent with the safety analysis assumptions, whenever THERMAL POWER is ≥ 28% of RTP. Below 28% of RTP, the Reactor Vessel Steam Dome Pressure - High and the Average Power Range Monitor (APRM) Fixed Neutron Flux - High Functions of the RPS are adequate to maintain the necessary margin to the MCPR SL.

Four channels of TSV - Closure, with two channels in each trip system, are available and required to be OPERABLE to ensure no single instrument failure will preclude an EOC-RPT from this Function on a valid signal.

SR 3.3.4.1.1 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] Namco valve limit switches perform this function. Limit switches are mechanical devices that require mechanical adjustment only; drift is not applicable to these devices. The limit switches are highly reliable, and therefore, a change in the surveillance interval from 92 days to 92 days on a STAGGERED TEST BASIS does not significantly affect availability or functionality of the limit switches.

The four-channel design (two channels for each trip system) for these protective circuits ensures no single failure or out-of-tolerance condition for a limit switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these limit switches. Therefore, operators can detect certain circuit failures and limit switch failures, through known false alarm conditions. Based upon:

1. the high degree of reliability of the four-channel system design, and

2. the failure-detection capability due to continual monitoring of the system alarms;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

LCO 3.3.4.1.a Two channels per trip system for each EOC-RPT instrumentation Function listed below shall be OPERABLE:

2. Turbine Control Valve (TCV) Fast Closure, Trip Oil Pressure - Low.

As stated in the TS Bases, fast closure of the TCVs during generator load rejection results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, an RPT is initiated on TCV Fast Closure, Trip Oil Pressure - Low in anticipation of the transients that result from the closure of these valves. The EOC-RPT decreases reactor power and aids the reactor scram in ensuring that the MCPR SL is not exceeded during the worst-case transient.

Fast closure of the TCVs is determined by measuring the electrohydraulic control fluid pressure at each control valve. There is one pressure switch associated with each control valve, and the signal from each transmitter is assigned to a separate trip channel. The logic for the TCV Fast Closure, Trip Oil Pressure - Low Function is such that two or more TCVs must be closed (pressure transmitter trips) to produce an EOC-RPT. This protection is required consistent with the safety analysis whenever THERMAL POWER is ≥ 28% of RTP. Below 28% of RTP, the Reactor Vessel Steam Dome Pressure - High and the APRM Fixed Neutron Flux - High Functions of the RPS are adequate to maintain the necessary margin to the MCPR SL.

Four channels of TCV Fast Closure, Trip Oil Pressure - Low, with two channels in each trip system, are available and required to be OPERABLE to ensure no single instrument failure will preclude an EOC-RPT from this Function on a valid signal.

SR 3.3.4.1.1 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] SOR pressure switches were recently installed to perform this Function more reliably. These switches are calibrated on a Frequency corresponding to the refueling interval. The setpoints are established, assuming drift for the calibration interval. Therefore, the instrument drift is not dependent upon the length of this surveillance interval.

The four-channel design (two channels for each trip system) for these protective circuits ensures no single failure or out-of-tolerance condition for a pressure switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these pressure switches. Therefore, operators can detect certain circuit failures and pressure switch failures through known false-alarm conditions.

A review of the surveillance test history provides a high degree of confidence that the pressure switches will operate reliably for the extended surveillance interval.

Based upon:

1. the high degree of reliability of the four-channel system design, and

2. the failure-detection capability due to the continual monitoring of the system alarms;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.4.2 Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation

As stated in the TS Bases, the ATWS-RPT System initiates an RPT, adding negative reactivity, following events in which a scram does not (but should) occur, to lessen the effects of an ATWS event. Tripping the recirculation pumps adds negative reactivity from the increase in steam voiding in the core area as core flow decreases. When Reactor Vessel Water Level - ATWS-RPT Level or Reactor Steam Dome Pressure - High setpoint is reached, the recirculation pump drive motor breakers trip. The ATWS-RPT System includes sensors, relays, bypass capability, circuit breakers, and switches that are necessary to cause initiation of an RPT.

The following SRs were evaluated with respect to extending their respective testing intervals. These SRs ensure the availability of safety functions that respond to plant transients and design basis events. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

LCO 3.3.4.2 Two channels per trip system for each ATWS-RPT instrumentation Function listed below shall be OPERABLE:
a. Reactor Vessel Water Level - ATWS-RPT Level;

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, the ATWS-RPT System is initiated at a low level to aid in maintaining level above the top of the active fuel. The reduction of core flow reduces the neutron flux and THERMAL POWER and, therefore, the rate of coolant boiloff.

Reactor vessel water level signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - ATWS-RPT Level, with two channels in each trip system, are available and required to be OPERABLE to ensure no single instrument failure precludes an ATWS-RPT from this Function on a valid signal.

SR 3.3.4.2.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.4.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

LCO 3.3.4.2 Two channels per trip system for each ATWS-RPT instrumentation Function listed below shall be OPERABLE:
b. Reactor Steam Dome Pressure - High.

As stated in the TS Bases, excessively high RPV pressure may rupture the RCPB. An increase in the RPV pressure during reactor operation compresses the steam voids and results in a positive reactivity insertion. This increases neutron flux and THERMAL POWER, which could potentially result in fuel failure and overpressurization. The Reactor Steam Dome Pressure - High Function initiates an RPT for transients that result in a pressure increase, counteracting the pressure increase by rapidly reducing core power generation. For the overpressurization event, the RPT aids in the termination of the ATWS event and, along with the safety/relief valves, limits the peak RPV pressure to less than the ASME Code Section III limits.

The Reactor Steam Dome Pressure - High signals are initiated from four pressure transmitters that monitor reactor steam dome pressure. Four channels of Reactor Steam Dome Pressure - High, with two channels in each trip system, are available and are required to be OPERABLE to ensure no single instrument failure precludes an ATWS-RPT from this Function on a valid signal.

SR 3.3.4.2.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.4.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.5.1 Emergency Core Cooling System (ECCS) Instrumentation

As stated in the TS Bases, the purpose of the ECCS instrumentation is to initiate appropriate responses from the systems to ensure the fuel is adequately cooled in the event of a design basis accident or transient. For most anticipated operational occurrences (AOOs) and DBAs, a wide range of dependent and independent parameters are monitored. The ECCS instrumentation actuates the Core Spray (CS) System, the Low Pressure Coolant Injection (LPCI) System, the HPCI System, the Automatic Depressurization System (ADS), and the diesel generators (DGs).

The following SRs were evaluated with respect to extending their respective testing intervals. The subject SRs ensure the ECCS will function as designed during an analyzed event. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 1 Core Spray System

As stated in the TS Bases, the CS System may be initiated by automatic means. Automatic initiation occurs for conditions of Reactor Vessel Water Level - Low Low Low, Level 1 or Drywell Pressure - High. Each of these diverse variables is monitored by four redundant transmitters, which are, in turn, connected to four trip units. The outputs of the trip units for each Function are connected to relays which send signals to two trip systems, with each trip system arranged in a one-out-of-two taken twice logic (each trip unit sends a signal to both trip systems). Each trip system can initiate both CS pumps.

Upon receipt of an automatic initiation signal, the CS pumps are started immediately after power is available. The high drywell pressure and low water level initiation signals automatically reset once the conditions clear.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 1.a CS System - Reactor Vessel Water Level - Low Low Low, Level 1

As stated in the TS Bases, low reactor pressure vessel (RPV) water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. The low pressure ECCS, associated DGs, and plant service water (PSW) turbine building (T/B) isolation are initiated at Level 1 to ensure CS and flooding Functions are available to prevent or minimize fuel damage.

The Reactor Vessel Water Level - Low Low Low, Level 1 Function is assumed to be OPERABLE for various transients analyzed in the FSAR and for the recirculation line break. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are only required to be OPERABLE when the ECCS, DG(s), or PSW System are required to be OPERABLE to ensure no single instrument failure precludes ECCS and DG initiation, and PSW T/B isolation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 1.b CS System - Drywell Pressure - High

As stated in the TS Bases, high pressure in the drywell could indicate a break in the RCPB. The low pressure ECCS, associated DGs, and PSW T/B isolation are initiated upon receipt of the Drywell Pressure - High Function to minimize the possibility of fuel damage. The Drywell Pressure - High Function, along with the Reactor Water Level - Low Low Low, Level 1 Function, is directly assumed in the analysis of the recirculation line break. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

The Drywell Pressure - High Function is required to be OPERABLE when the ECCS, DG(s), or PSW System are required to be OPERABLE, in conjunction with times when the primary containment is required to be OPERABLE. Thus, four channels of the CS Drywell Pressure - High Function are required to be OPERABLE in MODES 1, 2, and 3 to ensure no single instrument failure precludes ECCS and DG initiation and PSW T/B isolation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and 3.

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 1.c CS System - Reactor Steam Dome Pressure – Low (Injection Permissive)

As stated in the TS Bases, low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of permitting initiation of the ECCS during the transients analyzed in the FSAR. In addition, the Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of Reactor Steam Dome Pressure - Low Function are only required to be OPERABLE when the ECCS is required to be OPERABLE to ensure no single instrument failure precludes ECCS initiation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[(2)] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 1.d CS System - Core Spray Pump Discharge Flow - Low (Bypass)

As stated in the TS Bases, the minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump. The CS Pump Discharge Flow - Low Functions are assumed to be OPERABLE and capable of closing the minimum flow valves to ensure the low pressure ECCS flows assumed during the transients and accidents analyzed in the FSAR are met. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter per ECCS subsystem is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded.

Each of the two channels of the CS Pump Discharge Flow - Low Function is only required to be OPERABLE when CS is required to be OPERABLE to ensure no single instrument failure precludes the ECCS Function.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations from the expected values, given the operating conditions.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 2 Low Pressure Coolant Injection (LPCI) System

As stated in the TS Bases, LPCI is an operating mode of the Residual Heat Removal (RHR) System, with two LPCI subsystems. The LPCI subsystems may be initiated by automatic means. Automatic initiation occurs for conditions of Reactor Vessel Water Level - Low Low Low, Level 1 or Drywell Pressure - High. Each of these diverse variables is monitored by four redundant transmitters, which, in turn, are connected to four trip units. The outputs of the trip units for each Function are connected to relays which send signals to two trip systems, with each trip system arranged in a one-out-of-two taken twice logic (each trip unit sends a signal to both trip systems). Each trip system can initiate all four LPCI pumps.

Upon receipt of an automatic initiation signal, all LPCI pumps will start immediately if power is provided by the 1D (Unit 2 - 2D) Startup Auxiliary Transformer (SAT). If power is provided by the 1C (Unit 2 - 2C) SAT or the DGs, the LPCI C pump starts within 1 second when power is available, and the LPCI A, B, and D pumps are started after a time delay. This limits the loading of the 1C (Unit 2 - 2C) SAT and the standby power sources. Once an initiation signal is received, the signal is sealed in and must be manually reset when the signal clears.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 2.a LPCI System - Reactor Vessel Water Level - Low Low Low, Level 1

As stated in the TS Bases, low reactor pressure vessel (RPV) water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. The low pressure ECCS, associated DGs, and plant service water (PSW) turbine building (T/B) isolation are initiated at Level 1 to ensure CS and flooding Functions are available to prevent or minimize fuel damage.

The Reactor Vessel Water Level - Low Low Low, Level 1 Function is assumed to be OPERABLE for various transients analyzed in the FSAR and for the recirculation line break. The core cooling function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are only required to be OPERABLE when the ECCS, DG(s), or PSW System are required to be OPERABLE to ensure no single instrument failure precludes ECCS and DG initiation, and PSW T/B isolation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
***Function 2.b LPCI System* - Drywell Pressure - High**

As stated in the TS Bases, high pressure in the drywell could indicate a break in the RCPB. The low pressure ECCS, associated DGs, and PSW T/B isolation are initiated upon receipt of the Drywell Pressure - High Function in order to minimize the possibility of fuel damage. The Drywell Pressure - High Function, along with the Reactor Water Level - Low Low Low, Level 1 Function, is directly assumed in the analysis of the recirculation line break. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

The Drywell Pressure - High Function is required to be OPERABLE when the ECCS, DG(s), or PSW Systems are required to be OPERABLE in conjunction with times when the primary containment is required to be OPERABLE. Thus, four channels of the LPCI Drywell Pressure - High Function are required to be OPERABLE in MODES 1, 2, and 3 to ensure no single instrument failure precludes ECCS and DG initiation and PSW T/B isolation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 2.c LPCI System - Reactor Steam Dome Pressure – Low (Injection Permissive)

As stated in the TS Bases, low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. The Reactor Steam Dome Pressure-Low is one of the Functions assumed to be OPERABLE and capable of permitting initiation of the ECCS during the transients analyzed in the FSAR. In addition, the Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of Reactor Steam Dome Pressure - Low Function are only required to be OPERABLE when the ECCS is required to be OPERABLE to ensure no single instrument failure precludes ECCS initiation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 2.d LPCI System - Reactor Steam Dome Pressure – Low (Recirculation Discharge Valve Permissive)

As stated in the TS Bases, low reactor steam dome pressure signals are used as permissives for recirculation discharge valve closure. This ensures the LPCI subsystems inject into the proper RPV location assumed in the safety analysis. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of closing the valve during the transients analyzed in the FSAR. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. The Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break.

Four channels of the Reactor Steam Dome Pressure - Low Function are only required to be OPERABLE in MODES 1, 2, and 3 with the associated recirculation pump discharge valve open.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[(2)] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this

Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation,

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 2.e LPCI System - Reactor Vessel Shroud Level - Level 0

As stated in the TS Bases, the Level 0 Function is provided as a permissive to allow the RHR System to be manually aligned from the LPCI mode to the suppression pool cooling/spray or drywell spray modes. The permissive ensures water in the vessel is approximately two-thirds core height before the manual transfer is allowed. This ensures LPCI is available to prevent or minimize fuel damage. This Function may be overridden during accident conditions as allowed by plant procedures. Reactor Vessel Shroud Level - Level 0 Function is implicitly assumed in the analysis of the recirculation line break, since the analysis assumes that no LPCI flow diversion occurs when reactor water level is below Level 0.

Reactor Vessel Shroud Level - Level 0 signals are initiated from two level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. The Reactor Vessel Shroud Level - Level 0 Allowable Value is chosen to allow the low-pressure core flooding systems to activate and provide adequate cooling before allowing a manual transfer.

Two channels of the Reactor Vessel Shroud Level - Level 0 Function are only required to be OPERABLE in MODES 1, 2, and 3. In MODES 4 and 5, the specified initiation time of the LPCI subsystems is not assumed, and other administrative controls are adequate to control the valves that this Function isolates (since the systems that the valves are opened for are not required to be OPERABLE in MODES 4 and 5 and are normally not used).

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

<u>Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation</u>
Function 2.g LPCI System - Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

As stated in the TS Bases, the minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump. The LPCI Pump Discharge Flow-Low Function is assumed to be OPERABLE and capable of closing the minimum flow valves to ensure the LPCI flows assumed during the transients and accidents analyzed in the FSAR are met. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter per ECCS subsystem is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode.

Each of the two channels of the LPCI Pump Discharge Flow - Low Function is only required to be OPERABLE when LPCI is required to be OPERABLE to ensure no single instrument failure precludes the ECCS Function.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1]. The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 3 High Pressure Coolant Injection (HPCI) System -

As stated in the TS Bases, the HPCI System may be initiated by automatic means. Automatic initiation occurs for conditions of Reactor Vessel Water Level - Low Low, Level 2 or Drywell Pressure - High. Each of these diverse variables is monitored by four redundant transmitters, which are, in turn, connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic for each Function. Once an initiation signal is received, the signal is sealed in and must be manually reset when the signal clears.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 3.a HPCI System - Reactor Vessel Water Level – Low Low, Level 2

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, the HPCI System is initiated at Level 2 to maintain level above the top of the active fuel. While HPCI is not assumed to be OPERABLE in any DBA or transient analysis, the Reactor Vessel Water Level - Low Low, Level 2 is one of the Functions capable of initiating HPCI during the transients analyzed in the FSAR and during a LOCA. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are required to be OPERABLE only when HPCI is required to be OPERABLE to ensure no single instrument failure precludes HPCI initiation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[(2)] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 3.b HPCI System - Drywell Pressure - High

As stated in the TS Bases, high pressure in the drywell could indicate a break in the RCPB. The HPCI System is initiated upon receipt of the Drywell Pressure - High Function in order to minimize the possibility of fuel damage. While HPCI is not assumed to be OPERABLE in any DBA or transient analysis, the Drywell Pressure - High Function is capable of initiating HPCI during a LOCA. The core cooling function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of the Drywell Pressure - High Function are required to be OPERABLE when HPCI is required to be OPERABLE to ensure no single instrument failure precludes HPCI initiation.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 3.c HPCI System - Reactor Vessel Water Level – High, Level 8

As stated in the TS Bases, high RPV water level indicates sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to trip the HPCI turbine to prevent overflow into the MSLs. The Reactor Vessel Water Level - High, Level 8 Function is not assumed in the accident and transient analyses. It was retained since it is a potentially significant contributor to risk.

Reactor Vessel Water Level - High, Level 8 signals for HPCI are initiated from two level transmitters from the narrow range water level measurement instrumentation. Two channels of Reactor Vessel Water Level - High, Level 8 Function are required to be OPERABLE only when HPCI is required to be OPERABLE.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific

methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 3.e HPCI System - Suppression Pool Water Level – High

As stated in the TS Bases, excessively high suppression pool water can result in the loads on the suppression pool exceeding design values, should there be a blowdown of the reactor vessel pressure through the S/RVs. Therefore, signals indicating high suppression pool water level are used to transfer the suction source of HPCI from the condensate storage tank (CST) to the suppression pool to eliminate the possibility of HPCI continuing to provide additional water from a source outside containment. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valves must be open before the CST suction valve automatically closes. While HPCI is not assumed to be OPERABLE in any DBA or transient analysis, this Function is implicitly assumed if HPCI is to be utilized, since the long-term use of HPCI during a DBA requires the HPCI suction source to be the suppression pool.

Suppression Pool Water Level - High signals are initiated from two sets of level transmitters and trip units. Two channels of Suppression Pool Water Level - High Function are required to be

OPERABLE only when HPCI is required to be OPERABLE to ensure no single instrument failure precludes HPCI swap to suppression pool source.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 3.f HPCI System - High Pressure Coolant Injection Pump Discharge Flow – Low (Bypass)

As stated in the TS Bases, the minimum flow instruments are provided to protect the HPCI pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum-flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump. While HPCI is not assumed to be OPERABLE in any DBA or transient analysis, the High Pressure Coolant Injection Pump Discharge Flow - Low Function is capable of closing the minimum flow valve to ensure the HPCI flow provided, if HPCI is utilized during the transients and accidents analyzed in the FSAR, is adequate. The core cooling function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter is used to detect the HPCI System's flow rate. The logic is arranged such that the transmitter causes the minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. One channel is required to be OPERABLE when the HPCI is required to be OPERABLE.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations from expected values, given the operating conditions.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

2. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 4 Automatic Depressurization System (ADS) Trip System A

As stated in the TS Bases, the ADS may be initiated by automatic means. Automatic initiation occurs when signals indicating Reactor Vessel Water Level - Low Low Low, Level 1; Drywell Pressure - High or ADS Bypass Low Water Level Actuation Timer; confirmed Reactor Vessel Water Level - Low, Level 3; and CS or LPCI Pump Discharge Pressure - High are all present and the ADS Initiation Timer has timed out. There are two transmitters each for Reactor Vessel Water Level - Low Low Low, Level 1 and Drywell Pressure - High, and one transmitter for confirmed Reactor Vessel Water Level - Low, Level 3 in each of the two ADS trip systems. Each of these transmitters connects to a trip unit, which then drives a relay whose contacts form the initiation logic.

Each ADS trip system includes a time delay between satisfying the initiation logic and the actuation of the ADS valves. The ADS Initiation Timer time delay setpoint chosen is long enough that HPCI has sufficient operating time to recover to a level above Level 1, yet not so long that the LPCI and CS Systems are unable to adequately cool the fuel if HPCI fails to maintain that level. An alarm in the control room is annunciated when either of the timers is timing. Resetting the ADS initiation signals resets the ADS Initiation Timers.

The ADS also monitors the discharge pressures of the four LPCI pumps and the two CS pumps. ADS Trip System A includes two discharge pressure permissive transmitters from LPCI pumps A and D. The signals are used as a permissive for ADS actuation, indicating that there is a source of core coolant available once the ADS has depressurized the vessel. Any one of the six low pressure pumps is sufficient to permit automatic depressurization.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 4.a ADS Trip System A - Reactor Vessel Water Level-Low Low Low, Level 1

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, ADS receives one of the signals necessary for initiation from this Function. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ADS during the accidents analyzed in the FSAR. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are required to be OPERABLE only when ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two channels input to ADS trip system A, while the other two channels input to ADS trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the

surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR 103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits (two channels to ADS Trip System A and two channels to Trip System B) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 4.b ADS Trip System A - Drywell Pressure - High

As stated in the TS Bases, high pressure in the drywell could indicate a break in the RCPB. Therefore, ADS receives one of the signals necessary for initiation from this Function in order to minimize the possibility of fuel damage. Drywell Pressure - High is assumed to be OPERABLE and capable of initiating the ADS during the accidents analyzed in the FSAR. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of Drywell Pressure - High Function are only required to be OPERABLE when ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two channels input to ADS trip system A, while the other two channels input to ADS trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits (two channels to ADS Trip System A and two channels to Trip System B) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 4.d ADS Trip System A - Reactor Vessel Water Level – Low, Level 3 (Confirmatory)

As stated in the TS Bases, the Reactor Vessel Water Level - Low, Level 3 Function is used by the ADS only as a confirmatory low water level signal. ADS receives one of the signals necessary for initiation from Reactor Vessel Water Level - Low Low Low, Level 1 signals. To prevent spurious initiation of the ADS due to spurious Level 1 signals, a Level 3 signal must also be received before ADS initiation commences.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from two level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels of Reactor Vessel Water Level - Low, Level 3 Function are only required to be OPERABLE when the ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. One channel inputs to ADS trip system A, while the other channel inputs to ADS trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits (one channel to ADS Trip System A and one channel to Trip System B) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 4.e ADS Trip System A - Core Spray Pump Discharge Pressure - High

As stated in the TS Bases, the Pump Discharge Pressure - High signals from the CS and LPCI pumps are used as permissives for ADS initiation, indicating that there is a source of low-pressure cooling water available once the ADS has depressurized the vessel. Pump Discharge Pressure - High is one of the Functions assumed to be OPERABLE and capable of permitting ADS initiation during the events analyzed in the FSAR with an assumed HPCI failure. For these events the ADS depressurizes the reactor vessel so that the low pressure ECCS can perform the core cooling Functions. This core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Pump discharge pressure signals are initiated from twelve pressure transmitters, two on the discharge side of each of the six low pressure ECCS pumps. To generate an ADS permissive in one trip system, it is necessary that only one pump (one channel for each LPCI pump, two channels for each CS pump, or one channel from one CS pump and the opposite channel for the other CS pump) indicate the high discharge pressure condition. The actual operating point of this Function is not assumed in any transient or accident analysis.

Twelve channels of Core Spray and Low Pressure Coolant Injection Pump Discharge Pressure - High Function are only required to be OPERABLE when the ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two CS channels associated with CS pump A and four LPCI channels associated with LPCI pumps A and D are required for trip system A. Two CS channels associated with CS pump B and four LPCI channels associated with LPCI pumps B and C are required for trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The fail safe design of the protective circuits for the pump discharge pressures as described above ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the fail safe system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 4.f ADS Trip System A - Low Pressure Coolant Injection Pump Discharge Pressure - High

As stated in the TS Bases, the Pump Discharge Pressure - High signals from the CS and LPCI pumps are used as permissives for ADS initiation, indicating that there is a source of low pressure cooling water available once the ADS has depressurized the vessel. Pump Discharge Pressure - High is one of the Functions assumed to be OPERABLE and capable of permitting ADS initiation during the events analyzed in the FSAR with an assumed HPCI failure. For these events the ADS depressurizes the reactor vessel so that the low pressure ECCS can perform the core cooling Functions. This core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Pump discharge pressure signals are initiated from twelve pressure transmitters, two on the discharge side of each of the six low pressure ECCS pumps. To generate an ADS permissive in one trip system, it is necessary that only one pump (one channel for each LPCI pump, two channels for each CS pump, or one channel from one CS pump and the opposite channel for the other CS pump) indicate the high discharge pressure condition. The actual operating point of this Function is not assumed in any transient or accident analysis.

Twelve channels of Core Spray and Low Pressure Coolant Injection Pump Discharge Pressure - High Function are only required to be OPERABLE when the ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two CS channels associated with CS pump A and four LPCI channels associated with LPCI pumps A and D are required for trip system A. Two CS channels associated with CS pump B and four LPCI channels associated with LPCI pumps B and C are required for trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The fail safe design of the protective circuits for the pump discharge pressures as described above ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the fail safe system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 5 Automatic Depressurization System (ADS) Trip System B

As stated in the TS Bases, the ADS may be initiated by automatic means. Automatic initiation occurs when signals indicating Reactor Vessel Water Level - Low Low Low, Level 1; Drywell Pressure - High or ADS Bypass Low Water Level Actuation Timer; confirmed Reactor Vessel Water Level - Low, Level 3; and CS or LPCI Pump Discharge Pressure - High are all present and the ADS Initiation Timer has timed out. There are two transmitters each for Reactor Vessel Water Level - Low Low Low, Level 1 and Drywell Pressure - High, and one transmitter for confirmed Reactor Vessel Water Level - Low, Level 3 in each of the two ADS trip systems. Each of these transmitters connects to a trip unit, which then drives a relay whose contacts form the initiation logic.

Each ADS trip system includes a time delay between satisfying the initiation logic and the actuation of the ADS valves. The ADS Initiation Timer time delay setpoint chosen is long enough that HPCI has sufficient operating time to recover to a level above Level 1, yet not so long that the LPCI and CS Systems are unable to adequately cool the fuel if HPCI fails to maintain that level. An alarm in the control room is annunciated when either of the timers is timing. Resetting the ADS initiation signals resets the ADS Initiation Timers.

The ADS also monitors the discharge pressures of the four LPCI pumps and the two CS pumps. ADS Trip System B includes two discharge pressure permissive transmitters from LPCI pumps B and C. The signals are used as a permissive for ADS actuation, indicating that there is a source of core coolant available once the ADS has depressurized the vessel. Any one of the six low pressure pumps is sufficient to permit automatic depressurization.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 5.a ADS Trip System B - Reactor Vessel Water Level - Low Low Low, Level 1

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, ADS receives one of the signals necessary for initiation from this Function. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ADS during the accidents analyzed in the FSAR. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are required to be OPERABLE only when ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two channels input to ADS trip system A, while the other two channels input to ADS trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits (two channels to ADS Trip System A and two channels to Trip System B) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL

CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval.

Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 5.b ADS Trip System B - Drywell Pressure - High

As stated in the TS Bases, high pressure in the drywell can indicate a break in the RCPB. Therefore, ADS receives one of the signals necessary for initiation from this Function in order to minimize the possibility of fuel damage. The Drywell Pressure - High is assumed to be OPERABLE and capable of initiating the ADS during the accidents analyzed in the FSAR. The core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Four channels of Drywell Pressure - High Function are only required to be OPERABLE when ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two channels input to ADS Trip System A, while the other two channels input to ADS Trip System B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1]

The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits (two channels to ADS Trip System A and two channels to Trip System B) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation
Function 5.d ADS Trip System B - Reactor Vessel Water Level – Low, Level 3 (Confirmatory)

As stated in the TS Bases, the Reactor Vessel Water Level-Low, Level 3 Function is used by the ADS only as a confirmatory low water level signal. ADS receives one of the signals necessary for initiation from Reactor Vessel Water Level-Low Low Low, Level 1 signals. To prevent spurious initiation of the ADS due to spurious Level 1 signals, a Level 3 signal must also be received before ADS initiation commences.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from two level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels of Reactor Vessel Water Level - Low, Level 3 Function are only required to be OPERABLE when the ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. One channel inputs to ADS Trip System A, while the other channel inputs to ADS trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits (one channel to ADS Trip System A and one channel to Trip System B) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

<u>Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation</u>
Function 5.e ADS Trip System B - Core Spray Pump Discharge Pressure - High

As stated in the TS Bases, the Pump Discharge Pressure - High signals from the CS and LPCI pumps are used as permissives for ADS initiation, indicating that there is a source of low pressure cooling water available once the ADS has depressurized the vessel. Pump Discharge

Pressure - High is one of the Functions assumed to be OPERABLE and capable of permitting ADS initiation during the events analyzed in the FSAR with an assumed HPCI failure. For these events the ADS depressurizes the RPV so that the low pressure ECCS can perform the core cooling functions. This core cooling function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Pump discharge pressure signals are initiated from twelve pressure transmitters, two on the discharge side of each of the six low pressure ECCS pumps. To generate an ADS permissive in one trip system, it is necessary that only one pump (one channel for each LPCI pump, two channels for each CS pump, or one channel from one CS pump and the opposite channel for the other CS pump) indicate the high discharge pressure condition. The actual operating point of this Function is not assumed in any transient or accident analysis.

Twelve channels of the Core Spray and Low Pressure Coolant Injection Pump Discharge Pressure - High Function are only required to be OPERABLE when the ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two CS channels associated with CS pump A and four LPCI channels associated with LPCI pumps A and D are required for Trip System A. Two CS channels associated with CS pump B and four LPCI channels associated with LPCI pumps B and C are required for Trip System B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints. Additionally, for this Function, a CHANNEL CHECK confirms proper operation every 12 hours, which will detect most equipment failures or malfunctions.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

<u>**Table 3.3.5.1-1 Emergency Core Cooling System Instrumentation**</u>
Function 5.f ADS Trip System B - Low Pressure Coolant Injection Pump Discharge Pressure - High

As stated in the TS Bases, the Pump Discharge Pressure - High signals from the CS and LPCI pumps are used as permissives for ADS initiation, indicating that there is a source of low pressure cooling water available once the ADS has depressurized the vessel. Pump Discharge Pressure - High is one of the Functions assumed to be OPERABLE and capable of permitting ADS initiation during the events analyzed in the FSAR with an assumed HPCI failure. For these events the ADS depressurizes the reactor vessel so that the low pressure ECCS can perform the core cooling Functions. This core cooling Function of the ECCS, along with the scram action of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Pump discharge pressure signals are initiated from twelve pressure transmitters, two on the discharge side of each of the six low pressure ECCS pumps. To generate an ADS permissive in one trip system, it is necessary that only one pump (one channel for each LPCI pump, 2 channels for each CS pump, or 1 channel from one CS pump and the opposite channel for the other CS pump) indicate the high discharge pressure condition. The actual operating point of this Function is not assumed in any transient or accident analysis.

Twelve channels of Core Spray and Low Pressure Coolant Injection Pump Discharge Pressure - High Function are only required to be OPERABLE when the ADS is required to be OPERABLE to ensure no single instrument failure precludes ADS initiation. Two CS channels associated with CS pump A and four LPCI channels associated with LPCI pumps A and D are required for trip system A. Two CS channels associated with CS pump B and four LPCI channels associated with LPCI pumps B and C are required for trip system B.

SR 3.3.5.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[(2)] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The fail safe design of the protective circuits for the pump discharge pressures as described above ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the fail safe system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.5.2 Reactor Core Isolation Cooling (RCIC) System Instrumentation

As stated in the TS Bases, the purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is unavailable, such that RCIC System initiation occurs and maintains sufficient reactor water level such that initiation of the low pressure ECCS pumps does not occur. The RCIC System may be initiated by automatic means. Automatic initiation occurs for conditions of Reactor Vessel Water Level - Low Low, Level 2. The RCIC test line isolation valve is closed on a RCIC initiation signal to allow full system flow.

The RCIC System provides makeup water to the reactor until the RPV water level reaches the high water level (Level 8) trip, at which time the RCIC steam supply and cooling water supply valves close. (The injection valve also closes due to the closure of the steam supply valve.) The RCIC System restarts if RPV level again drops to the low-level initiation point (Level 2).

The RCIC System is not an Engineered Safety Feature (ESF) System and no credit is taken in the safety analyses for RCIC System operation. Extending the SR interval is acceptable because the RCIC System, along with the RCIC System initiation logic, is designed to be highly reliable.

The following SRs were evaluated with respect to extending their respective testing intervals. These SRs ensure the availability of safety functions that respond to plant transients and design basis events. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

Table 3.3.5.2-1 Reactor Core Isolation Cooling System Instrumentation
Function 1 Reactor Vessel Water Level – Low Low, Level 2

As stated in the TS Bases, low RPV water level indicates normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure no single instrument failure precludes RCIC initiation.

SR 3.3.5.2.2 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.5.2-1 Reactor Core Isolation Cooling System Instrumentation
Function 2 Reactor Vessel Water Level – High, Level 8

As stated in the TS Bases, high RPV water level indicates sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to close the RCIC steam supply and cooling water supply valves to prevent overflow into the MSLs. (The injection valve also closes due to the closure of the steam supply valve.)

Reactor Vessel Water Level - High, Level 8 signals for RCIC are initiated from two level transmitters from the narrow range water level measurement instrumentation, which sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels of Reactor Vessel Water Level - High, Level 8 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure no single instrument failure precludes RCIC initiation.

SR 3.3.5.2.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.5.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements, for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.6.1 Primary Containment Isolation Instrumentation

As stated in the TS Bases, the primary containment isolation instrumentation automatically initiates closure of appropriate primary containment isolation valves (PCIVs). The Function of the PCIVs, in combination with other accident mitigation systems, is to limit fission product release during and following postulated DBAs. Primary containment isolation, within the time limits specified for those isolation valves designed to close, automatically ensures the release of radioactive material to the environment will be consistent with the assumptions used in the analyses for a DBA.

The following SRs were evaluated with respect to extending their respective testing intervals. The subject SRs ensure the Primary Containment Isolation Systems will function as designed during an analyzed event. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 1 Main Steam Line Isolation

As stated in the TS Bases, most MSL Isolation Functions receive inputs from four channels. The outputs from these channels are combined in a one-out-of-two taken twice logic to initiate isolation of all MSIVs. The outputs from the same channels are arranged into 2 two-out-of-two logic trip systems to isolate all MSL drain valves and reactor water sample valves. The MSL drain line has two isolation valves with 1 two-out-of-two logic system associated with each valve. The reactor water sample line also has two isolation valves with similar logic.

The exceptions to this arrangement are the Main Steam Line Flow - High Function and Area Temperature Functions. The Main Steam Line Flow - High Function uses 16 flow channels, four for each steam line. One channel from each steam line inputs to one of the four trip strings. Two trip strings make up each trip system and both trip systems must trip to cause an MSL isolation. Each trip string has four inputs (one per MSL), any one of which will trip the trip string. The trip strings are arranged in a one-out-of-two taken twice logic. This is effectively a one-out-of-eight taken twice logic arrangement to initiate isolation of the MSIVs. Similarly, the 16 flow channels are connected into 2 two-out-of-two logic trip systems (effectively, 2 one-out-of-four twice logic), with each trip system isolating one of the two MSL drain valves and one of the two reactor water sample valves.

The Main Steam Tunnel Temperature - High Function receives input from 16 channels. The logic is arranged similar to the Main Steam Line Flow - High Function. The Turbine Building Area Temperature - High Function receives input from 64 channels. Four channels from each steam line inputs to one of the four trip strings. Two trip strings make up each trip system and both trip systems must trip to cause an MSL isolation. Each trip string has 16 inputs (4 per MSL), any one of which will trip the trip string. The trip strings are arranged in a one-out-of-two taken twice logic. This is effectively a one-out-of-thirty-two taken twice logic trip system to isolate all MSIVs. Similarly, the inputs are arranged in 2 one-out-of-sixteen twice logic trip systems, with each trip system isolating one of the two MSL drain valves and one of the two reactor water sample valves.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 1.a MSL Isolation - Reactor Vessel Water Level - Low Low Low, Level 1

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, isolation of the MSIVs and other interfaces with the reactor vessel occurs to prevent offsite dose limits from being exceeded. The Reactor Vessel Water Level - Low Low Low, Level 1 Function is one of the many Functions assumed to be OPERABLE and capable of providing isolation signals. The Reactor Vessel Water Level - Low Low Low, Level 1 Function associated with isolation is assumed in the analysis of the recirculation line break. The isolation of the MSLs on Level 1 supports actions to ensure offsite dose limits are not exceeded for a DBA.

Four channels of the Reactor Vessel Water Level - Low Low Low, Level 1 Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 1.b MSL Isolation - Main Steam Line Pressure – Low

As stated in the TS Bases, low MSL pressure with the reactor at power indicates there may be a problem with the turbine pressure regulation, which can result in a low reactor vessel water level condition and the RPV cooling down more than 100°F/hour if the pressure loss is allowed to continue. The Main Steam Line Pressure - Low Function is directly assumed in the analysis of the pressure regulator failure. For this event, the closure of the MSIVs ensures the RPV temperature change limit (100°F/hour) is not reached. In addition, this Function supports actions to ensure SL 2.1.1.1 is not exceeded. (This Function closes the MSIVs prior to pressure decreasing below 785 psig, which results in a scram due to MSIV closure, thus reducing reactor power to < 25% of RTP.)

Four channels of Main Steam Line Pressure - Low Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.3 Perform CHANNEL CALIBRATION.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) Barksdale pressure switches are used to perform this function. The drift associated with the pressure switches was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a pressure switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these pressure switches. Therefore, operators can detect certain circuit failures and pressure switch failures, through known false alarm conditions.

A review of the surveillance test history provides a high degree of confidence that the pressure switches will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the continual monitoring of the system alarms, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 1.c MSL Isolation - Main Steam Line Flow - High

As stated in the TS Bases, Main Steam Line (MSL) Flow - High is provided to detect a break of the MSL and to initiate closure of the MSIVs. If the steam were allowed to continue flowing out of the break, the reactor would depressurize and the core could uncover. If the RPV water level decreases too far, fuel damage could occur. Therefore, the isolation is initiated on high flow to prevent or minimize core damage. The Main Steam Line Flow - High Function is directly assumed in the analysis of the main steam line break (MSLB). The isolation action, along with the scram Function of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46 and offsite doses do not exceed the 10 CFR 100 limits.

The MSL flow signals are initiated from 16 transmitters that are connected to the four MSLs. The transmitters are arranged such that, even though physically separated from each other, all four connected to one MSL would be able to detect the high flow. Four channels of the Main Steam Line Flow - High Function for each unisolated MSL (two channels per trip system) are available and are required to be OPERABLE so that no single instrument failure will preclude detecting a break in any individual MSL.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design (two channels per trip system) for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 1.d MSL Isolation - Condenser Vacuum - Low

As stated in the TS Bases, the Condenser Vacuum - Low Function is provided to prevent overpressurization of the main condenser in the event of a loss of the main condenser vacuum. Since the integrity of the condenser is an assumption in offsite dose calculations, the Condenser Vacuum - Low Function is assumed to be OPERABLE and capable of initiating closure of the MSIVs. The closure of the MSIVs is initiated to prevent the addition of steam that would lead to additional condenser pressurization and possible rupture of the diaphragm installed to protect the turbine exhaust hood, thereby preventing a potential radiation leakage path following an accident.

Four channels of Condenser Vacuum - Low Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.3 Perform CHANNEL CALIBRATION.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) Barksdale vacuum switches are used to perform this function. The drift associated with the vacuum switches was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a pressure switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these pressure switches. Therefore, operators can detect certain circuit failures and pressure switch failures, through known false alarm conditions.

A review of the surveillance test history provides a high degree of confidence that the pressure switches will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the continual monitoring of the system alarms, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 1.e MSL Isolation - Main Steam Tunnel Temperature - High

As stated in the TS Bases, area temperature is provided to detect a leak in the RCPB and provides diversity to the high flow instrumentation. The isolation occurs when a very small leak has occurred. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. However, credit for these instruments is not taken in any transient or accident analysis in the FSAR, since bounding analyses are performed for large breaks, such as MSLBs. Area temperature signals are initiated from RTDs located in the area being monitored.

For the Main Steam Tunnel Temperature – High Function, area temperature signals are initiated from RTDs located in the area being monitored. While 16 channels of Main Steam Tunnel Temperature - High Function are available, only 12 channels (6 per trip system) are required to be OPERABLE. This ensures no single instrument failure precludes the isolation function, assuming a line break on any line. The instruments assigned to monitor one line can still detect a leak on another line due to their close proximity to one another and the small confines of the area.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The 16-channel design (8 per trip system and only 6 channels per trip system required to be OPERABLE) for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the 16-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 1.f MSL Isolation - Turbine Building Area Temperature - High

As stated in the TS Bases, area temperature is provided to detect a leak in the RCPB and provides diversity to the high flow instrumentation. The isolation occurs when a very small leak has occurred. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. However, credit for these instruments is not taken in any transient or accident analysis in the FSAR, since bounding analyses are performed for large breaks, such as MSLBs. For the Turbine Building Area Temperature - High Function, area temperature signals are initiated from temperature switches, with elements located in the area being monitored. While 64 channels of Turbine Building Area Temperature - High Function are available, only 32 channels are required to be OPERABLE to ensure no single instrument failure precludes the isolation function, assuming a line break on any line.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] This Function is performed with Fenwal temperature switches in Unit 1 and with Transmation temperature

switches and L&N temperature elements in Unit 2. The setpoints associated with these temperature switches are established using instrument uncertainty that considers instrument drift for the calibration interval, which corresponds to the refueling interval. Therefore, extension of the surveillance interval for this SR does not affect the drift associated with these devices.

The 64-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a temperature switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these temperature switches. Therefore, operators can detect certain circuit failures and temperature switch/element failures, through known false-alarm conditions.

A review of the surveillance test history provides a high degree of confidence that the temperature switches will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the 64-channel system design, and

2. the failure-detection capability due to the continual monitoring of the system alarms;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

There were 2048 CHANNEL FUNCTIONAL TESTS performed, with 4 failures identified. The following specific functional failures were noted:

A. On March 25, 1999, temperature switch 1U61-N113B would not repeat during the calibration. It was also discovered that temperature switch 1U61-N114B had insulation damage on its external wiring. The switches were replaced, calibrated and returned to service. Failure of these temperature switches is rare, considering the volume of switches in service. Insulation damage was only observed as a failure once in this surveillance test history.

   Each failure is unique, with no time-based failure mechanisms. Therefore, these failures do not invalidate the conclusion that the effect, if any, of this proposed change on system availability is minimal.

B. On October 4, 1997, temperature switch 2U61-N106C as-found data exceeded the TS limit. The switch was subsequently replaced, calibrated and returned to service. Since the switch was replaced, it is postulated that the switch would either not calibrate or that the switch was deemed to be too poor a performer to leave in service.

   This rare occurrence is a unique failure, considering the number of tests run on these types of switches in the review period. No time-based failure mechanism exists for this failure; thus, this failure does not invalidate the conclusion that the effect, if any, of this proposed change on system availability is minimal.

C. On February 23, 1999, temperature switch 2U61-N105B as-found data exceeded the TS limit. The switch was subsequently recalibrated and returned to service. Because no repair was necessary, this failure is only attributed to excessive drift, a time based failure mechanism that is only an issue with CHANNEL CALIBRATION Frequency, not CHANNEL FUNCTIONAL TEST Frequency. This data was used as input to the drift calculation, which is used to establish the setpoints and calibration frequencies for these switches.

   Therefore, this failure does not invalidate the conclusion that the effect, if any, of this proposed change on system availability is minimal.

D. On February 8, 2000, temperature switch 2U61-N105B as-found data exceeded the TS limit. The switch was subsequently recalibrated and returned to service. Because no repair was necessary, this failure is only attributed to excessive drift, a time-based failure mechanism that is only an issue with CHANNEL CALIBRATION Frequency, not CHANNEL FUNCTIONAL TEST Frequency. This data was used as input to the drift calculation, which is used to establish the setpoints and calibration frequencies for these switches.

   Therefore, this failure does not invalidate the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 2 Primary Containment Isolation

As stated in the TS Bases, most Primary Containment Isolation Functions receive inputs from four channels. The outputs from these channels are arranged into 2 two-out-of-two logic trip systems. One trip system initiates isolation of all inboard primary containment isolation valves, while the other trip system initiates isolation of all outboard primary containment isolation valves. Each logic closes one of the two valves on each penetration, so that operation of either logic isolates the penetration. The traversing incore probe (TIP) ball valves isolation does not occur until the TIPs are fully retracted. (The logic also sends a TIP retraction signal.)

The exception to this arrangement is the Drywell Radiation - High Function. This Function has two channels, whose outputs are arranged in 2 one-out-of-one logic trip systems. Each trip system isolates one valve per associated penetration, similar to the two-out-of-two logic described above.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 2.a Primary Containment Isolation - Reactor Vessel Water Level – Low, Level 3

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. The valves whose penetrations communicate with the primary containment are isolated to limit the release of fission products. The isolation of the primary containment on Level 3 supports actions to ensure offsite dose limits of 10 CFR 100 are not exceeded. The

Reactor Vessel Water Level - Low, Level 3 Function associated with isolation is implicitly assumed in the FSAR analysis, as these leakage paths are assumed to be isolated post LOCA. Four channels of Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check and adjustment, if necessary, for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 2.b Primary Containment Isolation - Drywell Pressure - High

As stated in the TS Bases, high drywell pressure can indicate a break in the RCPB inside the primary containment. The isolation of some of the primary containment isolation valves on high drywell pressure supports actions to ensure offsite dose limits of 10 CFR 100 are not exceeded. The Drywell Pressure - High Function, associated with isolation of the primary containment, is implicitly assumed in the FSAR accident analysis, as these leakage paths are assumed to be isolated post LOCA.

Four channels of Drywell Pressure - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 2.c Primary Containment Isolation - Drywell Radiation - High

As stated in the TS Bases, high drywell radiation indicates possible gross failure of the fuel cladding. Therefore, when Drywell Radiation - High is detected, isolation is initiated to limit the release of fission products. However, this Function is not assumed in any accident or transient analysis in the FSAR because other leakage paths (e.g., MSIVs) are more limiting.

The drywell radiation signals are initiated from radiation detectors that are located in the drywell. Two channels of Drywell Radiation - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel will perform the intended function. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] For the Drywell Radiation - High instruments, a CHANNEL CHECK confirms proper operation every 12 hours, which will detect most equipment failures or malfunctions. The radiation detector is calibrated using a calibrated source as an input signal to the detector. The source check is performed by exposing the sensor-converter to a known source in a constant geometry. Source checks of radiation monitors are subject to far more uncertainties than electronic calibration checks because of source decay problems, positioning of the sources, signal strength, and the sensor response curves of that particular monitoring system. Because of the uncertainties associated with the calibration methods for these devices, any drift evaluation will provide no true indication of the instruments performance over time. Therefore, extension of this surveillance interval will not significantly affect the instrument uncertainty of the associated instrumentation.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for any instrument can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel components with the exception of the trip circuitry. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components except for the trip circuitry, through significant changes in indication or deviations among channels.

A review of the surveillance test history provides a high degree of confidence that the trip circuitry will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design, and

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 2.d Primary Containment Isolation - Reactor Building Exhaust Radiation – High

As stated in the TS Bases, high secondary containment exhaust radiation indicates possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB. When Exhaust Radiation - High is detected, valves whose penetrations communicate with the primary containment atmosphere are isolated to limit the release of fission products. The Exhaust Radiation - High signals are initiated from radiation detectors located near the ventilation exhaust ductwork coming from the reactor building.

Four channels of the Reactor Building Exhaust - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.3 Perform CHANNEL CALIBRATION.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) For the Reactor Building Exhaust Radiation - High instruments, a CHANNEL CHECK confirms proper operation every 12 hours, which will detect most equipment failures or malfunctions. The radiation detector is calibrated using a calibrated source as an input signal to the detector. The source check is performed by exposing the sensor-converter to a known source in a constant geometry. Source checks of radiation monitors are subject to far more uncertainties than electronic calibration checks because of source decay problems, positioning of the sources, signal strength, and the sensor response curves of that particular monitoring system. Because of the uncertainties associated with the calibration methods for these devices, any drift evaluation will provide no true indication of the instruments performance over time. Therefore, extension of this surveillance interval will not significantly affect the instrument uncertainty of the associated instrumentation.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for any instrumentation can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel components with the exception of the trip circuitry. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components except for the trip circuitry, through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip circuitry will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design, and

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 112 CHANNEL CALIBRATIONS performed since January 1, 1997, only two failures affecting the safety function were observed. On April 8, 1998, the as-found Hi-Hi trip setpoint for the 1D11-K609A and 1D11-K609C channels exceeded the TS limit. The root cause was determined to be setpoint drift. The drift on 1D11-K609A was possibly attributed to by a change in the output of the channel power supply. The drift on 1D11-K609C was classified as an aberration. At the time, the fact that the trip setpoint was set at the TS limit did not provide any allowance for setpoint drift. The fact that the setpoint was set at the TS limit is the real cause of this failure, considering the inherent inaccuracy of these devices. As explained above, the accuracy of these devices is not significantly time based and, therefore, will not be significantly affected due to a surveillance interval extension. The setpoints were changed such that the as-left setpoint will always be conservative with respect to the TS limit, with margin. Therefore, this is classified as a unique failure, the cause of which was corrected.

Therefore, no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 2.e Primary Containment Isolation - Refueling Floor Exhaust Radiation – High

As stated in the TS Bases, high secondary containment exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB. When Exhaust Radiation - High is detected, valves whose penetrations communicate with the primary containment atmosphere are isolated to limit the release of fission products. The Exhaust Radiation - High signals are initiated from radiation detectors that are located near the ventilation exhaust ductwork coming from the refueling floor.

Four channels of the Refueling Floor Exhaust - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.3 Perform CHANNEL CALIBRATION.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) For the Refueling Floor Exhaust Radiation - High instruments, a CHANNEL CHECK confirms proper operation every 12 hours, which will detect most equipment failures or malfunctions. The radiation detector is calibrated using a calibrated source as an input signal to the detector. The source check is performed by exposing the sensor-converter to a known source in a constant geometry. Source checks of radiation monitors are subject to far more uncertainties than electronic calibration checks because of source decay problems, positioning of the sources, signal strength, and the sensor response curves of that particular monitoring system. Because of the uncertainties associated with the

calibration methods for these devices, any drift evaluation will provide no true indication of the instruments performance over time. Therefore, extension of this surveillance interval will not significantly affect the instrument uncertainty of the associated instrumentation.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for any instrumentation can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel components with the exception of the trip circuitry. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components except for the trip circuitry, through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip circuitry will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design, and

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation; the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 100 CHANNEL CALIBRATIONS performed since January 1, 1997, only two failures that affect the safety function were observed.

A. On February 25, 1998, the as-found Hi-Hi setpoints for 2D11-K611A, 2D11-K611B and 2D11-K611D exceeded the TS limit. The setpoints were adjusted back within tolerance and the systems returned to service. Since no repair was necessary, the failure was due to instrument error, which as explained above for these types of devices, has no significant time-based components, such as drift.

   Therefore, this failure is unique, without any time-based failure mechanisms, and does not invalidate the conclusion that the effect, if any, of this proposed change on system availability is minimal.

B. On October 30, 1998, while performing the surveillance procedure, the Hi-Hi alarm from recorder 2D11-R607 was received before the High alarm. The recorder was calibrated and returned to service. Trip unit 2D11-K611D was replaced, and the new unit was bench calibrated and installed. This appears to be a failure of the trip unit associated with the radiation monitor.

   Since only one instance of this failure was observed in the analyzed time period, this failure is considered a unique failure, without any time-based failure mechanisms, and does not invalidate the conclusion that the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3 High Pressure Coolant Injection (HPCI) System Isolation

As stated in the TS Bases, most Functions that isolate HPCI and RCIC receive input from two channels, with each channel in one trip system using a one-out-of-one logic. Each of the two trip systems in each isolation group is connected to one of the two valves on each associated penetration.

The exceptions are the HPCI and RCIC Turbine Exhaust Diaphragm Pressure - High and Steam Supply Line Pressure - Low Functions. These Functions receive inputs from four turbine exhaust diaphragm pressure and four steam supply pressure channels for each system. The outputs from the turbine exhaust diaphragm pressure and steam supply pressure channels are each connected to 2 two-out-of-two trip systems. Additionally, each trip system of the Steam Line Flow - High Functions receives input from a low differential pressure channel. The low differential pressure channels are not required for OPERABILITY. Each trip system isolates one valve per associated penetration.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3.a HPCI System Isolation - HPCI Steam Line Flow – High

As stated in the TS Bases, the HPCI Steam Line Flow - High Function is provided to detect a break of the HPCI steam lines and initiate closure of HPCI's steam line isolation valve. If the steam is allowed to continue flowing out of the break, the reactor will depressurize and the core can uncover. Therefore, the isolation is initiated on high flow to prevent or minimize core damage. The isolation action, along with the scram Function of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. Specific credit for these Functions is not assumed in any FSAR accident analyses, since the bounding analysis is performed for large breaks such as recirculation and MSL breaks. However, these instruments prevent the HPCI steam line breaks from becoming bounding.

Two channels of the HPCI Steam Line Flow - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3.b HPCI System Isolation - HPCI Steam Supply Line Pressure – Low

As stated in the TS Bases, low MSL pressure to HPCI indicates the pressure of the steam in the HPCI turbine may be too low to continue operation of the HPCI turbine. These isolations are for equipment protection and are not assumed in any transient or accident analysis in the FSAR. However, they also provide a diverse signal to indicate a possible system break. These instruments are included in TS because of the potential for risk due to possible failure of the instruments preventing HPCI initiations.

Four channels of the HPCI Steam Supply Line Pressure - Low Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1)

The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3.c HPCI System Isolation - HPCI Turbine Exhaust Diaphragm Pressure – High

As stated in the TS Bases, HPCI high turbine exhaust diaphragm pressure indicates the pressure may be too high to continue operation of the HPCI turbine. That is, one of two exhaust diaphragms has ruptured and pressure is reaching turbine casing pressure limits. This isolation is for equipment protection and is not assumed in any transient or accident analysis in the FSAR. These instruments are included in the TS because of the potential for risk due to possible failure of the instruments preventing HPCI initiations.

Four channels of the HPCI Turbine Exhaust Diaphragm Pressure - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3.d HPCI System Isolation - Drywell Pressure – High

As stated in the TS Bases, high drywell pressure can indicate a break in the RCPB. The HPCI isolation of the turbine exhaust vacuum breakers is provided to prevent communication with the drywell when high drywell pressure exists. A potential leakage path exists via the turbine exhaust. The isolation is delayed until the system becomes unavailable for injection (i.e., low steam line pressure). The isolation of HPCI turbine exhaust by Drywell Pressure - High is indirectly assumed in the FSAR accident analysis because the turbine exhaust leakage path is not assumed to contribute to offsite doses.

Two channels of the HPCI Drywell Pressure - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

<u>Table 3.3.6.1-1</u> <u>Primary Containment Isolation System Instrumentation</u>
Function 3.e HPCI System Isolation - HPCI Pipe Penetration Room Temperature - High

As stated in the TS Bases, area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and Differential Temperature - High signals are initiated from RTDs that are appropriately located to protect the system that is being monitored. Two instruments monitor each area.

Two channels for each HPCI Area Temperature - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3.f HPCI System Isolation - Suppression Pool Area Ambient Temperature - High

As stated in the TS Bases, area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and Differential Temperature - High signals are initiated from RTDs that are appropriately located to protect the system that is being monitored. Two instruments monitor each area.

Two channels for each HPCI Suppression Pool Area Ambient Temperature - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function. The Suppression Pool Area Ambient Temperature - High Function is delayed by the Suppression Pool Area Temperature - Time Delay Relays.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3.h HPCI System Isolation - Suppression Pool Area Differential Temperature - High

As stated in the TS Bases, area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and Differential Temperature - High signals are initiated from RTDs that are appropriately located to protect the system that is being monitored. Two instruments monitor each area.

Two channels of each HPCI Suppression Pool Area Differential Temperature - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function. The Suppression Pool Area Differential Temperature - High Function is delayed by the Suppression Pool Area Temperature - Time Delay Relays.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units that provide the contact outputs. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 3.i HPCI System Isolation - Emergency Area Cooler Temperature - High

As stated in the TS Bases, area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high-flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and Differential Temperature - High signals are initiated from RTDs that are appropriately located to protect the system that is being monitored. Two instruments monitor each area.

Two channels of each HPCI Emergency Area Cooler Temperature - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation System Instrumentation
Function 4 Reactor Core Isolation Cooling (RCIC) System Isolation

As stated in the TS Bases, most Functions that isolate RCIC receive input from two channels, with each channel in one trip system using a one-out-of-one logic. Each of the two trip systems in each isolation group is connected to one of the two valves on each associated penetration.

The exceptions are the RCIC Turbine Exhaust Diaphragm Pressure - High and Steam Supply Line Pressure - Low Function. This Function receives inputs from four turbine exhaust diaphragm pressure and four steam supply pressure channels. The outputs from the turbine exhaust diaphragm pressure and steam supply pressure channels are each connected to 2 two-out-of-two trip systems. Additionally, each trip system of the Steam Line Flow - High Function receives input from a low differential pressure channel. The low differential pressure channels are not required for OPERABILITY. Each trip system isolates one valve per associated penetration.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 4.a RCIC System Isolation - RCIC Steam Line Flow – High

As stated in the TS Bases, the RCIC Steam Line Flow - High Function is provided to detect a break of the RCIC steam lines and initiate closure of the RCIC steam line isolation valves. If the steam is allowed to continue flowing out of the break, the reactor will depressurize and the core can uncover. Therefore, the isolations are initiated on high flow to prevent or minimize core damage. The isolation action, along with the scram Function of the RPS, ensures the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. Specific credit for these

Functions is not assumed in any FSAR accident analyses, since the bounding analysis is performed for large breaks such as recirculation and MSL breaks. However, these instruments prevent the RCIC steam line breaks from becoming bounding.

Two channels of the RCIC Steam Line Flow - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 4.b RCIC System Isolation - RCIC Steam Supply Line Pressure – Low

As stated in the TS Bases, low MSL pressure indicates the pressure of the steam in the RCIC turbine may be too low to continue operation of the RCIC turbine. These isolations are for equipment protection and are not assumed in any transient or accident analysis in the FSAR. However, they also provide a diverse signal to indicate a possible system break. These instruments are included in the TS because of the potential for risk due to possible failure of the instruments preventing RCIC initiations.

Four channels of the RCIC Steam Supply Line Pressure - Low Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 4.c RCIC System Isolation - RCIC Turbine Exhaust Diaphragm Pressure – High

As stated in the TS Bases, high turbine exhaust diaphragm pressure indicates the pressure may be too high to continue operation of the RCIC turbine. That is, one of two exhaust diaphragms has ruptured and pressure is reaching turbine casing pressure limits. These isolations are for equipment protection and are not assumed in any transient or accident analysis in the FSAR. These instruments are included in the TS because of the potential for risk due to possible failure of the instruments preventing RCIC initiations.

Four channels of the RCIC Turbine Exhaust Diaphragm Pressure - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 4.d RCIC System Isolation - Drywell Pressure – High

As stated in the TS Bases, high drywell pressure can indicate a break in the RCPB. The RCIC isolation of the turbine exhaust vacuum breakers is provided to prevent communication with the drywell when high drywell pressure exists. A potential leakage path exists via the turbine exhaust. The isolation is delayed until the system becomes unavailable for injection (i.e., low steam line pressure). The isolation of the RCIC turbine exhaust by Drywell Pressure - High is indirectly assumed in the FSAR accident analysis because the turbine exhaust leakage path is not assumed to contribute to offsite doses.

Two channels of the RCIC Drywell Pressure - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 4.e RCIC System Isolation - RCIC Suppression Pool Ambient Area Temperature - High

As stated in the TS Bases, area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and Differential Temperature-High signals are initiated from RTDs that are appropriately located to protect the system that is being monitored. Two instruments monitor each area.

Two channels of each RCIC Suppression Pool Ambient Area Temperature - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function. The Suppression Pool Area Ambient Temperature - High Function is delayed by the Suppression Pool Area Temperature - Time Delay Relays.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 4.g RCIC System Isolation - RCIC Suppression Pool Area Differential Temperature - High

As stated in the TS Bases, area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and Differential Temperature - High signals are initiated from RTDs that are appropriately located to protect the system that is being monitored. Two instruments monitor each area.

Two channels of each RCIC Suppression Pool Area Differential Temperature - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function. The Suppression Pool Area Differential Temperature - High Function is delayed by the Suppression Pool Area Temperature - Time Delay Relays.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units that provide the contact output. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift

for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 4.h RCIC System Isolation - Emergency Area Cooler Temperature - High

As stated in the TS Bases, area and differential temperatures are provided to detect a leak from the associated system steam piping. The isolation occurs when a very small leak has occurred and is diverse to the high flow instrumentation. If the small leak is allowed to continue without isolation, offsite dose limits may be reached. These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and Differential Temperature - High signals are initiated from RTDs that are appropriately located to protect the system that is being monitored. Two instruments monitor each area.

Two channels of each RCIC Area Temperature - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except

for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 5 Reactor Water Cleanup (RWCU) System Isolation

As stated in the TS Bases, the Reactor Vessel Water Level - Low Low, Level 2 Isolation Function receives input from four reactor vessel water level channels. The outputs from the reactor vessel water level channels are connected into 2 two-out-of-two trip systems. The Area Temperature - High Function receives input from six temperature monitors, three to each trip system. The Area Ventilation Differential Temperature - High Function receives input from six differential temperature monitors, three in each trip system. These are configured so that any one input will trip the associated trip system. Each of the two trip systems is connected to one of the two valves on the RWCU penetration.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 5.a RWCU System Isolation - Area Temperature - High

As stated in the TS Bases, RWCU area temperatures are provided to detect a leak from the RWCU System. The isolation occurs even when very small leaks have occurred. If the small leak continues without isolation, offsite dose limits may be reached. Credit for these instruments is not taken in any transient or accident analysis in the FSAR, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area temperature signals are initiated from temperature elements that are located in the area that is being monitored. Six RTDs provide input to the Area Temperature-High Function (two per area). Six channels are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The six-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the six-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 5.b RWCU System Isolation - Area Ventilation Differential Temperature - High

As stated in the TS Bases, RWCU area ventilation differential temperatures are provided to detect a leak from the RWCU System. The isolation occurs even when very small leaks have occurred. If the small leak continues without isolation, offsite dose limits may be reached. Credit for these instruments is not taken in any transient or accident analysis in the FSAR, since bounding analyses are performed for large breaks such as recirculation or MSL breaks. Area and area ventilation differential temperature signals are initiated from temperature elements that are located in the area that is being monitored. Twelve RTDs provide input to the Area Ventilation Differential Temperature - High Function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units that provide the contact outputs. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The six-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the six-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 5.d RWCU System Isolation - Reactor Vessel Water Level – Low Low, Level 2

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, isolation of some interfaces with the reactor vessel occurs to isolate the potential sources of a break. The isolation of the RWCU System on Level 2 supports actions to ensure the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU isolation is not directly assumed in the FSAR safety analyses because the RWCU System line break is bounded by breaks of larger systems (recirculation and MSL breaks are more limiting).

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.(2) The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 6 RHR Shutdown Cooling System Isolation

As stated in the TS Bases, the Reactor Vessel Water Level - Low, Level 3 Function receives input from four reactor vessel water level channels. The outputs from the reactor vessel water level channels are connected to 2 two-out-of-two trip systems. The Reactor Vessel Pressure - High Function receives input from two channels, with each channel in one trip system using a one-out-of-one logic. Each of the two trip systems is connected to one of the two valves on the shutdown cooling penetration.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 6.a RHR Shutdown Cooling System Isolation - Reactor Steam Dome Pressure – High

As stated in the TS Bases, the Reactor Steam Dome Pressure - High Function is provided to isolate the shutdown cooling portion of the RHR System. This interlock is provided only for equipment protection to prevent an intersystem LOCA scenario, and credit for the interlock is not assumed in the accident or transient analysis in the FSAR.

Two channels of Reactor Steam Dome Pressure - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 46 CHANNEL FUNCTIONAL TESTS since January 1, 1997, only one failure was observed which affected the safety function. A trip relay contact failed for trip unit 1B31-N679A, and was subsequently repaired. The failed relay contact did not affect operation of the trip unit. Only two trip relay failures were observed in the entire quarterly surveillance test history, and the other case involved an improperly seated relay, not a contact failure. Therefore, this is considered a unique failure, which has no time based failure mechanisms. Therefore, extension of this surveillance interval will have no affect on system availability, with respect to failures of this type.

Based upon the above discussion, the review of the surveillance test history demonstrates that only one unique failure affected the safety function during this surveillance activity and no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.1-1 Primary Containment Isolation Instrumentation
Function 6.b RHR Shutdown Cooling System Isolation - Reactor Vessel Water Level – Low, Level 3

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. Therefore, isolation of some reactor vessel interfaces occurs to begin isolating the potential sources of a break. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR Shutdown Cooling System isolation is not directly assumed in safety analyses because a break of the RHR Shutdown Cooling System is bounded by breaks of the recirculation and MSL. The RHR Shutdown Cooling System isolation on Level 3 supports actions to ensure the RPV water level does not drop below the top of the active fuel during a vessel draindown event caused by a leak (e.g., pipe break or inadvertent valve opening) in the RHR Shutdown Cooling System.

Four channels of the Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.1.2 Perform CHANNEL FUNCTIONAL TEST.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.1.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.6.2 Secondary Containment Isolation Instrumentation

As stated in the TS Bases, the secondary containment isolation instrumentation automatically initiates closure of appropriate secondary containment isolation valves (SCIVs) and starts the SGT System. The Function of these systems, in combination with other accident mitigation systems, is to limit fission product release during and following postulated DBAs. Secondary containment isolation and establishment of vacuum with the SGT System within the assumed time limits ensures fission products that leak from primary containment following a DBA, or are released outside primary containment, or are released during certain operations when primary containment is not required to be OPERABLE are maintained within applicable limits. The isolation signals generated by the secondary containment isolation instrumentation are implicitly assumed in safety analyses of the FSAR to initiate closure of valves and start the SGT System to limit offsite doses.

The following SRs were evaluated with respect to extending their respective testing intervals. The subject SRs ensure the Secondary Containment Isolation Systems will function as designed during an analyzed event. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

Table 3.3.6.2-1 Secondary Containment Isolation Instrumentation
Function 1 Reactor Vessel Water Level-Low Low, Level 2

As stated in the TS Bases, low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage can result. An isolation of the secondary containment and actuation of the SGT System are initiated in order to minimize the potential of an offsite dose release. The Reactor Vessel Water Level - Low Low, Level 2 Function is one of the Functions assumed to be OPERABLE and capable of providing isolation and initiation signals. The isolation and initiation systems on Reactor Vessel Water Level - Low Low, Level 2 support actions to ensure any offsite releases are within the limits calculated in the safety analysis.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.2.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[(2)] The drift for the

extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.2-1 Secondary Containment Isolation Instrumentation
Function 2 Drywell Pressure – High

As stated in the TS Bases, high drywell pressure can indicate a break in RCPB. An isolation of the secondary containment and actuation of the SGT System are initiated in order to minimize the potential of an offsite dose release. The isolation on high drywell pressure supports actions to ensure any offsite releases are within the limits calculated in the safety analysis. However, the Drywell Pressure - High Function associated with isolation is not assumed in any FSAR accident or transient analyses. It is retained for the overall redundancy and diversity of the secondary containment isolation instrumentation as required by the NRC approved licensing basis.

High drywell pressure signals are initiated from pressure transmitters that sense the pressure in the drywell. Four channels of Drywell Pressure - High Functions are available and are required to be OPERABLE to ensure no single instrument failure precludes performance of the isolation function.

SR 3.3.6.2.2 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,
2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and
3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.2-1 Secondary Containment Isolation Instrumentation
Function 3 Reactor Building Exhaust Radiation – High

As stated in the TS Bases, high secondary containment exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB or the refueling floor due to a fuel handling accident. When Exhaust Radiation - High is detected, secondary containment isolation and actuation of the SGT System are initiated to limit the release of fission products as assumed in the FSAR safety analyses.

Four channels of Reactor Building Exhaust Radiation - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.2.3 Perform CHANNEL CALIBRATION.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] For the Reactor Building Exhaust Radiation - High instruments, a CHANNEL CHECK confirms proper operation every 12 hours, which will detect most equipment failures or malfunctions. The radiation detector is calibrated using a calibrated source as an input signal to the detector. The source check is performed by exposing the sensor-converter to a known source in a constant geometry. Source checks of radiation monitors are subject to far more uncertainties than electronic calibration checks because of source decay problems, positioning of the sources, signal strength, and the sensor response curves of that particular monitoring system. Because of the uncertainties associated with the calibration methods for these devices, any drift evaluation will provide no true indication of the instruments performance over time. Therefore, extension of this surveillance interval will not significantly affect the instrument uncertainty of the associated instrumentation.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for any instrumentation can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel components with the exception of the trip circuitry. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components except for the trip circuitry, through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip circuitry will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design, and

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation; the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 112 CHANNEL CALIBRATIONS performed since January 1, 1997, only two failures affecting the safety function were observed. On April 8, 1998, the as-found Hi-Hi trip setpoint for the 1D11-K609A and 1D11-K609C channels exceeded the TS Limit. The root cause was determined to be setpoint drift. The drift on 1D11-K609A was possibly attributed to by a change in the output of the channel power supply. The drift on 1D11-K609C was classified as an aberration. At the time, the fact that the trip setpoint was set at the TS Limit did not provide any allowance for setpoint drift. The fact that the setpoint was set at the TS limit is the real cause of this failure, considering the inherent inaccuracy of these devices. As explained above, the accuracy of these devices is not significantly time based, and therefore would not be significantly affected due to a surveillance interval extension. The setpoints were changed such that the as-left setpoint will always be conservative with respect to the TS limit, with margin. Therefore, this is classified as a unique failure, the cause of which was corrected.

Therefore, a review of the surveillance test history demonstrates no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.2-1 Secondary Containment Isolation Instrumentation
Function 4 Refueling Floor Exhaust Radiation – High

As stated in the TS Bases, high secondary containment exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB or the refueling floor due to a fuel handling accident. When Exhaust Radiation - High is detected, secondary containment isolation and actuation of the SGT System are initiated to limit the release of fission products as assumed in the FSAR safety analyses.

Four channels of the Refueling Floor Exhaust Radiation - High Function are available and are required to be OPERABLE to ensure no single instrument failure precludes the isolation function.

SR 3.3.6.2.3 Perform CHANNEL CALIBRATION.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[(1)] For the Refueling Floor Exhaust Radiation-High instruments, a CHANNEL CHECK confirms proper operation every 12 hours, which will detect most equipment failures or malfunctions. The radiation detector is calibrated using a calibrated source as an input signal to the detector. The source check is performed by exposing the sensor-converter to a known source in a constant geometry. Source checks of radiation monitors are subject to far more uncertainties than electronic calibration checks because of source decay problems, positioning of the sources, signal strength, and the sensor response curves of that particular monitoring system. Because of the uncertainties associated with the calibration methods for these devices, any drift evaluation will provide no true indication of the instruments performance over time. Therefore, extension of this surveillance interval will not significantly affect the instrument uncertainty of the associated instrumentation.

The four-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for any instrumentation can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.2.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel components with the exception of the trip circuitry. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components except for the trip circuitry, through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip circuitry will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design, and

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation; the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 100 CHANNEL CALIBRATIONS performed since January 1, 1997, only two failures were observed which would have affected the safety function. On February 25, 1998, the as-found Hi-Hi setpoints for 2D11-K611A, 2D11-K611B and 2D11-K611D exceeded the TS limit. The setpoints were adjusted back within tolerance and the systems returned to service. Since no repair was necessary, the failure was due to instrument error, which as explained above for these types of devices, has no significant time-based components, such as drift.

Therefore, this is a unique failure, without any time-based failure mechanisms, and does not invalidate the conclusion that the effect, if any, on system availability is minimal from a change to a 184-day surveillance interval.

On October 30, 1998, while performing the surveillance procedure, the Hi-Hi alarm from recorder 2D11-R607 was received before the High alarm. The recorder was calibrated and returned to service. Trip unit 2D11-K611D was replaced and new unit was bench calibrated and installed. This appears to be a failure of the trip unit associated with the radiation monitor. Since only one instance of this failure was observed in the analyzed time period, this is considered a unique failure, without any time-based failure mechanisms and does not invalidate the conclusion that the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.6.3 Low-Low Set (LLS) Instrumentation

As stated in the TS Bases, the LLS logic and instrumentation is designed to mitigate the effects of postulated thrust loads on the S/RV discharge lines by preventing subsequent actuations with an elevated water leg in the S/RV discharge line. It also mitigates the effects of postulated pressure loads on the torus shell or suppression pool by preventing multiple actuations in rapid succession of the S/RVs subsequent to their initial actuation.

Upon initiation, the LLS logic will assign preset opening and closing setpoints to four preselected S/RVs. These setpoints are selected such that the LLS S/RVs will stay open longer; thus, releasing more steam (energy) to the suppression pool, and hence more energy (and time) will be required for repressurization and subsequent S/RV openings. The LLS logic increases the time between (or prevents) subsequent actuations to allow the high water leg created from the initial S/RV opening to return to (or fall below) its normal water level; thus, reducing thrust loads from subsequent actuations to within their design limits. In addition, the

LLS is designed to limit S/RV subsequent actuations to one valve; thus, torus loads will also be reduced.

The LLS instrumentation logic is arranged in two divisions with Logic channels A and C in one division and Logic channels B and D in the other division. Each LLS logic channel (e.g., Logic A channel) controls one LLS valve. The LLS logic channels will not actuate their associated LLS valves at their LLS setpoints until the arming portion of the associated LLS logic is satisfied. Arming occurs when any one of the 11 S/RVs opens, as indicated by a signal from one of the redundant pressure switches located on its tailpipe, coincident with a high reactor pressure signal. Each division receives tailpipe arming signals from dedicated tailpipe pressure switches on each of the 11 S/RVs, six in one LLS logic (e.g., Logic C) and five in the other LLS logic (e.g., Logic A). Each LLS logic (e.g., Logic A) receives the reactor pressure-arming signal from a different reactor pressure transmitter and trip unit. These arming signals seal in until reset. The arming signal from one logic is sent to the other logic within the same division and performs the same Function as the tailpipe-arming signal (i.e., Logic A will arm if it has received a high reactor pressure signal and Logic C has armed).

After arming, opening of each LLS valve is by a two-out-of-two logic from two reactor pressure transmitters and two trip units set to trip at the required LLS opening setpoint. The LLS valve recloses when reactor pressure has decreased to the reclose setpoint of one of the two trip units used to open the valve (one-out-of-two logic). This logic arrangement prevents single instrument failures from precluding the LLS S/RV Function.

The following SRs were evaluated with respect to extending their respective testing intervals. These SRs ensure the availability of safety functions that respond to plant transients and design basis events. Potential time-based considerations, such as instrument drift, failure types and frequencies, as well as other qualitative measures of system availability, were evaluated during this effort. The evaluation results and an explanation of how the results justify the surveillance interval extension, are detailed in the discussed below.

Table 3.3.6.3-1 Low-Low Set Instrumentation
Function 1 Reactor Steam Dome Pressure - High

As stated in the TS Bases, the Reactor Steam Dome Pressure - High Function is used in conjunction with the tailpipe pressure signal to arm the LLS logic. Arming occurs when any one of the 11 S/RVs opens, as indicated by a signal from one of the redundant pressure switches located on its tailpipe, coincident with a Reactor Steam Dome Pressure - High signal.

SR 3.3.6.3.4 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated Rosemount and GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the Rosemount and GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The

drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The four-channel design for these protective circuits (two channels per division for two divisions) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.3.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the four-channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 86 CHANNEL FUNCTIONAL TESTS performed since January 1, 1997, only one failure that affected the safety function was observed.

On May 26, 1999, when testing trip unit 1B21-N620D, a valve position indication light failed to illuminate. Further investigation revealed that a trip relay was not properly seated. Upon reseating the relay, the problem was solved. Only two trip relay failures were observed in the entire quarterly surveillance test history, and the other case involved a contact failure, not an improperly seated relay. Therefore, this is a unique failure with no time-based failure mechanisms. Therefore, extension of this surveillance interval will have no affect on system availability, with respect to failures of this type.

A review of the surveillance test history demonstrates no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.3-1 Low-Low Set Instrumentation
Function 2 Low-Low Set Pressure Setpoints

As stated in the TS Bases, after arming, opening of each LLS valve is by a two-out-of-two logic from two reactor pressure transmitters and two trip units set to trip at the required LLS opening setpoint. The LLS valve recloses when reactor pressure has decreased to the reclose setpoint of one of the two trip units used to open the valve (one-out-of-two logic).

SR 3.3.6.3.4 Perform CHANNEL FUNCTIONAL TEST.
The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. The CHANNEL FUNCTIONAL TEST is performed to ensure the entire channel, except for the transmitters, will perform the intended function. This test includes a setpoint check, and adjustment if necessary for the associated GE trip units. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] The drift associated with the GE trip units was evaluated, applying an HNP-specific methodology, based upon the recommendations of EPRI TR-103335.[2] The drift for the extended surveillance interval was appropriately considered in the development of the associated plant setpoints.

The eight channel design for these protective circuits (two per channel, with two channels for each of two divisions) ensures no single failure or out-of-tolerance condition for a trip unit can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.6.3.1) confirms proper operation of channel instrumentation every 12 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel instrumentation, with the exception of the trip unit. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components through significant changes in indication or deviations among channels.

A review of the surveillance test history and a drift analysis provide a high degree of confidence that the trip units will operate reliably and within the accuracy requirements for the extended surveillance interval. Based upon:

1. the high degree of reliability of the eight channel system design,

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation, and

3. establishment of instrument setpoints based upon drift analysis for the extended surveillance interval;

the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 132 CHANNEL FUNCTIONAL TESTS performed since January 1, 1997, only two failures that affected the safety function were observed.

A. On June 25, 1998, trip unit 1B21-N622A failed and was replaced.

B. On May 14, 2000, trip unit 1B21-N622B failed and was replaced.

Because these trip units are similar to many different trip units that were studied, and because of the extremely low overall failure rates observed in the surveillance history for all trip units, these two failures are considered to be unique, with no time-based failure mechanisms.

A review of the surveillance test history demonstrates no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

Table 3.3.6.3-1 Low-Low Set Instrumentation
Function 3 Tailpipe Pressure Switch

As stated in the TS Bases, the LLS logic channels will not actuate their associated LLS valves at their LLS setpoints until the arming portion of the associated LLS logic is satisfied. Arming occurs when any one of the 11 S/RVs opens, as indicated by a signal from one of the redundant pressure switches located on its tailpipe, coincident with a high reactor pressure signal. Each division receives tailpipe arming signals from dedicated tailpipe pressure switches on each of the 11 S/RVs, six in one LLS logic (e.g., Logic C) and five in the other LLS logic (e.g., Logic A).

SR 3.3.6.3.2 Perform CHANNEL FUNCTIONAL TEST for the portion of the channel outside primary containment.

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.(1) This CHANNEL FUNCTIONAL TEST is performed to ensure the portions of the channel outside primary containment will perform the intended function. Pressure controls Model A17-1P pressure switches perform this function. The portion of the channel outside containment contains no instrumentation subject to drift. Therefore, drift does not apply to evaluation of this SR extension.

The two-channel per S/RV design for these protective circuits ensures no single failure or out-of-tolerance condition for a pressure switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these pressure switches. Therefore, operators can detect certain circuit failures and pressure switch failures, through known false alarm conditions.

A review of the surveillance test history provides a high degree of confidence that the pressure switches will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel per S/RV system design, and

2. the failure-detection capability due to continual monitoring of the system alarms; the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

SR 3.3.6.3.3 Perform CHANNEL FUNCTIONAL TEST for portions of the channel inside primary containment. [NOTE: Only required to be performed prior to entering MODE 2 during each scheduled outage > 72 hours when entry is made into primary containment.]

The surveillance test interval for this SR, as applied to this Function, is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] This CHANNEL FUNCTIONAL TEST is performed to ensure the portions of the channel inside primary containment will perform the intended function. Pressure Controls Model A17-1P pressure switches perform this function. These switches are factory set, and are not field adjustable. Therefore, a rigorous drift study was not performed for these instruments.

The two-channel per S/RV design for these protective circuits ensures no single failure or out-of-tolerance condition for a pressure switch can prevent the proper operation of the protective function. Also, Operations personnel continually monitor the alarms associated with these pressure switches. Therefore, operators can detect certain circuit failures and pressure switch failures, through known false alarm conditions.

A review of the surveillance test history provides a high degree of confidence that the pressure switches will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel per S/RV system design, and

2. the failure-detection capability due to continual monitoring of the system alarms; the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history demonstrates that no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

TS 3.3.7.1 Main Control Room Environmental Control (MCREC) System Instrumentation

As stated in the TS Bases, the MCREC System is designed to provide a radiologically controlled environment to ensure the habitability of the main control room (MCR) for the safety of control room operators under all plant conditions. Two independent MCREC subsystems are each capable of fulfilling the stated safety function. The instrumentation and controls for the MCREC System automatically initiate action to pressurize the MCR to minimize the consequences of radioactive material in the control room environment. In the event of a Control Room Air Inlet Radiation - High signal, the MCREC System is automatically started in the pressurization mode. The air is then recirculated through the charcoal filter, and sufficient outside air is drawn in through the normal intake to maintain the MCR slightly pressurized with respect to the turbine building.

The Control Room Air Inlet Radiation - High Function consists of two independent monitors. Two channels of Control Room Air Inlet Radiation - High are available and are required to be OPERABLE to ensure no single instrument failure precludes MCREC System initiation.

SR 3.3.7.1.3 Perform CHANNEL CALIBRATION. The Allowable Value shall be ≤ 1 mr/hour.

The surveillance test interval for this SR is being changed from once every 92 days to every 92 days on a STAGGERED TEST BASIS, including the 25% grace period. An evaluation of the surveillance interval extension was performed, based upon the same approach described in GL 91-04.[1] For the Control Room Air Inlet Radiation - High instruments, a CHANNEL CHECK confirms proper operation every 24 hours, and a CHANNEL FUNCTIONAL TEST ensures overall operation every 31 days. These tests will detect most equipment failures, malfunctions, or performance degradation. The radiation detector is calibrated using a calibrated source as an input signal to the detector. The source check is performed by exposing the sensor-converter to a known source in a constant geometry. Source checks of radiation monitors are subject to far more uncertainties than electronic calibration checks because of source decay problems, positioning of the sources, signal strength, and the sensor response curves of that particular monitoring system. Because of the uncertainties associated with the calibration methods for these devices, any drift evaluation will provide no true indication of the instruments performance over time. Therefore, extension of this surveillance interval will not significantly affect the uncertainty of the associated instrumentation.

The two-channel design for these protective circuits ensures no single failure or out-of-tolerance condition for the trip circuitry can prevent the proper operation of the protective function. For this Function, a CHANNEL CHECK (SR 3.3.7.1.1) confirms proper operation of channel instrumentation every 24 hours. This check verifies agreement among the different channels of indication and confirms operation of all channel components with the exception of the trip circuitry. Also, Operations personnel continually monitor the indications from these instrument channels. Therefore, except for the trip unit, operators will detect failures in the channel components except for the trip circuitry, through significant changes in indication or deviations among channels.

A review of the surveillance test history provides a high degree of confidence that the trip circuitry will operate reliably for the extended surveillance interval. Based upon:

1. the high degree of reliability of the two-channel system design, and

2. the failure-detection capability due to the required CHANNEL CHECKS and continual monitoring of the instrumentation; the effect, if any, of this proposed change on system availability is minimal.

A review of the surveillance test history was performed, and out of 110 CHANNEL CALIBRATIONS performed since January 1, 1997, only one failure was observed which would have affected the safety function. On April 28, 2000, channel 1Z41-N015B was found inoperable due to a bad connector. The associated MWO found the black wire on pin No. A of the detector connector broken. The connector was cleaned and the wire resoldered. A functional test was performed, and the channel was returned to service, operating properly. No other failures of this kind were identified in any of the surveillance procedure history for radiation monitors in the scope of work. Therefore, this is considered to be a unique failure, with no time-based failure mechanism.

A review of the surveillance test history demonstrates no identified failure invalidates the conclusion that the effect, if any, of this proposed change on system availability is minimal.

REFERENCES:

1. NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Requirements to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

2. EPRI TR-103335, "Statistical Analysis of Instrument Calibration Data - Guidelines for Instrument Calibration Extension/Reduction Programs," Rev. 1, October 1998.