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May 6, 2010

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

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station, Units 1, 2 and 3
Renewed Facility Operating Licenses Numbers DPR-38, -47, -55;
Docket Number 50-269, 50-270 and 50-287;
License Amendment Request to Change Technical Specification Surveillance Requirement Frequencies to Support 24-Month Fuel Cycles
License Amendment Request No. 2010-001

References:

1. Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

2. Regulatory Guide 1.52, "Design, Inspection and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Revision 2, dated March 1978.

3. Letter from Dave Baxter, Site Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, to U. S. Nuclear Regulatory Commission, "Application for Technical Specification Change Regarding Risk -Informed Justification for the Relocation of Specific Surveillance Frequency Requirements to a Licensee Controlled Program," (LAR 2009-10) dated March 17, 2010.

In accordance with 10 CFR 50.90, Duke Energy Carolinas, LLC (Duke Energy) proposes to amend the Technical Specifications (TS) of Renewed Facility Operating License Nos. DPR-38, -47 and -55 to support 24-month fuel cycle operations. Specifically, this change requests Nuclear Regulatory Commission (NRC) approval for certain Oconee Nuclear Station (ONS) TS Surveillance Requirement frequencies that are specified as "18 months" by revising them to "24 months" in accordance with the guidance of Reference 1. Also, consistent with this guidance, approval is requested for a change to Administrative Controls Section 5.5.12, "Ventilation Filter Testing Program," for changes to the 18-month frequencies that are specified by Reference 2. The request for changing the 18-month frequency of one SR assumes the approval of Oconee LAR 2008-04 submitted on August 6, 2009.

The information supporting the proposed TS changes is subdivided as follows:

Enclosure 1	provides Duke Energy's evaluation supporting the proposed changes
Attachment 1	contains copies of the marked- up TS pages
Attachment 2	contains copies of the reprinted TS pages
Attachment 3	contains copies of the marked-up TS Bases pages (for information only)
Attachment 4	contains copies of the reprinted TS Bases pages (for information only)

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Attachment 5 summarizes the formal licensee commitments pending NRC approval of the proposed amendment
Attachment 6 provides detailed GL 91-04 evaluation results
Attachment 7 provides the detailed evaluation methods utilized

Regulatory evaluation (including the significant hazards consideration) and environmental considerations are provided in Sections 5 and 6 of Enclosure 1. Enclosure 5 provides a list of regulatory commitments being made as a result of this LAR.

In accordance with Duke Energy administrative procedures that implement the Quality Assurance Program Topical Report, these proposed changes have been reviewed and approved by the Plant Operations Review Committee. A copy of this LAR is being sent to the State of South Carolina in accordance with 10 CFR 50.91 requirements.

Duke Energy requests approval of this amendment request by April 30, 2011 to allow sufficient time to complete changes necessary for implementation after the Fall 2011 refueling outage for Unit 2 (U2EOC25). Duke Energy also requests NRC approval of this amendment request prior to the March 17, 2010 amendment request requesting relocation of surveillance frequency requirements to a licensee controlled program (Reference 3). Once approved, the amendment will be implemented prior to startup from the Fall 2011 refueling outage. Duke will also update applicable sections of the ONS UFSAR, as necessary, and submit these per 10 CFR 50.71(e).

Inquiries on this proposed amendment request should be directed to Boyd Shingleton of the Oconee Regulatory Compliance Group at (864) 885-4716.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 6, 2010.

Sincerely,

Dave Baxter, Vice President,
Oconee Nuclear Station

Enclosure:
1. Evaluation of Proposed Changes

Attachments:
1. Technical Specifications – Marked-up Pages
2. Technical Specifications – Reprinted Pages
3. Technical Specification Bases – Marked-up Pages
4. Technical Specification Bases – Reprinted Pages
5. List of Regulatory Commitments
6. Detailed GL 91-04 Evaluation Results
7. Detailed Evaluation Methods

cc w/attachments:

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ENCLOSURE 1

EVALUATION OF PROPOSED CHANGES

Subject: Proposed License Amendment Request to Change Technical Specification Surveillance Requirement Frequencies to Support 24-Month Fuel Cycles in Accordance with the Guidance of GL 91-04

1 SUMMARY DESCRIPTION

In accordance with 10 CFR 50.90, Duke Energy Carolinas, LLC (Duke Energy) proposes to amend the Technical Specifications (TS) of Renewed Facility Operating License Nos. DPR-38, -47 and -55 to extend certain 18-month TS Surveillance Requirement (SR) frequencies to 24 months to accommodate a 24-month fuel cycle in accordance with the guidance of Generic Letter (GL) 91-04 (Reference 1). Also, consistent with this guidance, a change is proposed to Administrative Controls Section 5.5.12, "Ventilation Filter Testing Program," to change the 18-month frequencies that are specified by Regulatory Guide 1.52 (Reference 2) to 24 months.

Duke Energy requests approval of this amendment request by April 30, 2011 to allow sufficient time to complete changes necessary for implementation after the Fall 2011 refueling outage for Unit 2 (U2EOC25). Approval by this date will also support scheduling and planning for the refueling outage based on 24-month Surveillance Frequency requirements.

2 BACKGROUND

Improved reactor fuels have allowed licensees to increase the duration of the fuel cycle for their facilities. A number of SRs are performed during a refueling outage. The current Oconee Nuclear Station (ONS) TSs require these SRs to be performed on an 18-month frequency, consistent with the 18-month fuel cycle. To synchronize these requirements with a 24-month fuel cycle, it is necessary to extend the existing 18-month surveillance frequencies to 24 months. This change will allow ONS to take advantage of improved fuel designs which support a 24-month refueling interval.

The Nuclear Regulatory Commission (NRC) has provided generic guidance in GL 91-04 (Reference 1) for license amendment requests for individual plants to modify surveillance intervals to be compatible with a 24-month fuel cycle. GL 91-04 identifies the types of information that must be addressed when proposing extensions of TS SR frequency intervals from 18 months to 24 months. The proposed changes associated with this submittal were evaluated in accordance with that guidance. Section 4 of this Enclosure defines each step outlined by the Nuclear Regulatory Commission (NRC) in Reference 1 and provides a description of the methodology used by Duke Energy to complete the evaluation for the extension of specific TS SR frequencies from 18 months to 24 months.

GL 91-04 also addresses steam generator inspections and interval extensions to the 24 month leak rate testing requirements of 10 CFR 50 Appendix J. Duke has already addressed the steam generator integrity issues by implementation of Oconee Amendment Nos. 355, 357, and 356 (adopted Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-449, revision 4, "Steam Generator Tube Integrity"). Since GL 91-04 was issued, NRC has revised 10 CFR 50 Appendix J to allow licensees to adopt performance based testing requirements (Option B) that allow intervals to exceed the prescriptive 24 month testing requirements (Option A). Duke is in the process of requesting a change to adopt Option B for LLRT and expects to receive approval of that

change prior to the next required performance after implementation of this change. Therefore, Duke does not anticipate needing an exemption to the 24 month testing requirements of Appendix J Option A.

3 DETAILED DESCRIPTION OF PROPOSED CHANGES

To accommodate a 24-month fuel cycle for ONS, Duke Energy proposes to extend certain 18-month TS SR frequencies to 24 months. The proposed changes were evaluated in accordance with the guidance provided in GL 91-04 (Reference 1). The SR frequencies Duke Energy proposes to change to 24 months are for the SRs listed below:

TS 3.3.1 Reactor Protective System (RPS) Instrumentation

SR 3.3.1.7[1] Perform CHANNEL CALIBRATION.

TS 3.3.5 Engineered Safeguards Protective System (ESPS) Input Instrumentation

SR 3.3.5.4[1] Perform CHANNEL CALIBRATION.

TS 3.3.6 Engineered Safeguards Protection System (ESPS) Manual Initiation

SR 3.3.6.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.7 Engineered Safeguards Protection System (ESPS) Automatic Actuation Output Logic Channels

SR 3.3.7.2[1] Perform automatic actuation output logic CHANNEL FUNCTIONAL TEST.

TS 3.3.8 Post Accident Monitoring Instrumentation

SR 3.3.8.3 Perform CHANNEL CALIBRATION.

TS 3.3.9 Source Range Neutron Flux

SR 3.3.9.2 Perform CHANNEL CALIBRATION.

TS 3.3.10 Wide Range Neutron Flux

SR 3.3.10.2 Perform CHANNEL CALIBRATION.

[1] SR number based on Amendment Nos. 366, 368, and 367 which was issued on January 28, 2010 and will be implemented prior to this change

TS 3.3.11 Automatic Feedwater Isolation System (AFIS) Instrumentation

SR 3.3.11.3 Perform CHANNEL CALIBRATION.

TS 3.3.12 Automatic Feedwater Isolation System (AFIS) Manual Initiation

SR 3.3.12.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.13 Automatic Feedwater Isolation System (AFIS) Digital Channels

SR 3.3.13.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.14 Emergency Feedwater (EFW) Pump Initiation Circuitry

SR 3.3.14.3 Perform CHANNEL FUNCTIONAL TEST For each automatic initiation circuit.
SR 3.3.14.4 Perform CHANNEL CALIBRATION for each LOMF pump instrumentation channel

TS 3.3.16 Reactor Building (RB) Purge Isolation

SR 3.3.16.3 Perform CHANNEL CALIBRATION.

TS 3.3.17 Emergency Power Switching Logic (EPSL) Automatic Transfer Function

SR 3.3.17.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.18 Emergency Power Switching Logic (EPSL) Voltage Sensing Circuits

SR 3.3.18.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.19 Emergency Power Switching Logic (EPSL) 230 KV Switchyard Degraded Grid Voltage Protection (DGVP)

SR 3.3.19.1 Perform CHANNEL FUNCTIONAL TEST.
SR 3.3.19.2 Perform CHANNEL CALIBRATION of voltage sensing channel with setpoint allowable value as follows:....

TS 3.3.20 Emergency Power Switching Logic (EPSL) CT-5 Degraded Grid Voltage Protection (DGVP)

SR 3.3.20.1 Perform CHANNEL FUNCTIONAL TEST.
SR 3.3.20.2 Perform CHANNEL CALIBRATION of voltage sensing channel with setpoint allowable value as follows:.....

TS 3.3.21 Emergency Power Switching Logic (EPSL) Keowee Emergency Start Function

SR 3.3.21.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.23 Main Feeder Bus Monitor Panel (MFBMP)

SR 3.3.23.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.27 Low Pressure Service Water (LPSW) Reactor Building (RB) Waterhammer Prevention Circuitry

SR 3.3.27.3 Perform CHANNEL CALIBRATION.

TS 3.3.28 Low Pressure Service Water (LPSW) Standby Pump Auto-Start Circuitry

SR 3.3.28.1 Perform CHANNEL FUNCTIONAL TEST.
SR 3.3.28.2 Perform CHANNEL CALIBRATION.

TS 3.4.1 RCS pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

SR 3.4.1.4. Verify by measurement RCS total flow rate is within limit specified in the COLR.

TS 3.4.9 Pressurizer

SR 3.4.9.2 Verify capacity of required pressurizer heaters and associated power supplies are ≥ 400 kW.

TS 3.4.12 Low Temperature Overpressure Protection (LTOP) System

SR 3.4.12.7[2] Perform CHANNEL CALIBRATION for PORV.

TS 3.4.14 Reactor Coolant System (RCS) Pressure Isolation Valve (PIV) Leakage

SR 3.4.14.1 Verify leakage from each required RCS PIV is equivalent to ≤ 0.5 gpm per nominal inch of valve size up to a maximum of 5 gpm at an RCS pressure ≥ 2150 psia and ≤ 2190 psia.

TS 3.4.15 Reactor Coolant System (RCS) Leakage Detection Instrumentation

SR 3.4.15.3 Perform CHANNEL CALIBRATION of required containment sump level detection indications.

[2] The request for extending the 18 month surveillance test interval assumes the approval of Oconee LAR 2008-04 submitted on August 6, 2009.

SR 3.4.15.4 Perform CHANNEL CALIBRATION of required containment atmosphere radioactivity monitor.

TS 3.5.2 High Pressure Injection (HPI)

SR 3.5.2.4 Verify each HPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.5.2.5 Verify each HPI pump starts automatically on an actual or simulated actuation signal.

SR 3.5.2.6 Verify, by visual inspection, each HPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.

SR 3.5.2.7 Cycle each HPI discharge crossover valve and LPI-HPI flow path discharge valve.

TS 3.5.3 Low Pressure Injection (LPI)

SR 3.5.3.4 Verify each LPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.5.3.5 Verify each LPI pump starts automatically on an actual or simulated actuation signal.

SR 3.5.3.6 Verify, by visual inspection, each LPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.

TS 3.6.2 Containment Air Locks

SR 3.6.2.2 Verify only one door in the air lock can be opened at a time.

TS 3.6.3 Containment Isolation Valves

SR 3.6.3.5 Verify each automatic containment isolation valve that is not locked, sealed, or otherwise secured in position, actuates to the isolation position on an actual or simulated actuation signal.

TS 3.6.5 Reactor Building Spray and Cooling Systems

SR 3.6.5.4 Verify that the containment heat removal capability is sufficient to maintain post-accident conditions within design limits.

SR 3.6.5.5 Verify each automatic reactor building spray and cooling valve in each required flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.6.5.6 Verify each required reactor building spray pump starts automatically on an actual or simulated actuation signal.

SR 3.6.5.7 Verify each required reactor building cooling train starts automatically on an actual or simulated actuation signal.

TS 3.7.2 Turbine Stop Valves (TSVs)

SR 3.7.2.1 Verify closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel A.

SR 3.7.2.2 Verify closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel B.

TS 3.7.4 Atmospheric Dump Valve (ADV) Flow paths

SR 3.7.4.1 Cycle the valves that comprise the ADV flow paths.

TS 3.7.5 Emergency Feedwater (EFW) System

SR 3.7.5.3 Verify each EFW automatic valve that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.7.5.4 Verify each EFW pump starts automatically on an actual or simulated actuation signal.

TS 3.7.7 Low Pressure Service Water (LPSW) System

SR 3.7.7.3 Verify each LPSW automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.7.7.4 Verify each LPSW pump starts automatically on an actual or simulated actuation signal.

SR 3.7.7.5 Verify LPSW leakage accumulator is able to provide makeup flow lost due to boundary valve leakage on Units with LPSW RB Waterhammer modification installed.

SR 3.7.7.6 Verify LPSW WPS boundary valve leakage is ≤ 20 gpm for Units with LPSW RB Waterhammer modification installed.

TS 3.7.8 Emergency Condenser Circulating Water (ECCW) System

SR 3.7.8.9 Verify upon an actual or simulated trip of the CCW pumps and ESV pumps that the rate of water level drop in the ECCW siphon header is within limits.

TS 3.7.9 Control Room Ventilation System (CRVS) Booster Fans

SR 3.7.9.3 Verify two CRVS Booster Fan trains can maintain the Control Room at a positive pressure.

TS 3.8.1 AC Sources – Operating

SR 3.8.1.14 Verify each closed SL and closed N breaker opens on an actuation of each redundant trip coil.

SR 3.8.1.15 Verify each 230 kV switchyard circuit breaker actuates to the correct position on a switchyard isolation actuation signal.

SR 3.8.1.17 Verify each KHU's Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers. The allowable values with a time delay of 5 seconds ± 1 second shall be as follows: ...

TS 3.9.2 Nuclear Instrumentation

SR 3.9.2.2 Perform CHANNEL CALIBRATION.

TS 3.10.1 Standby Shutdown Facility (SSF)

SR 3.10.1.13 Perform CHANNEL CALIBRATION for each required SSF instrument channel.

TS 5.5.12 Ventilation Filter Testing Program (VFTP)

Also, consistent with Reference 1 guidance, a change is proposed to Administrative Controls Section 5.5.12, "Ventilation Filter Testing Program (VFTP)," to address changes to the 18-month frequencies that are specified in Reference 2. This change incorporates an explicit exception to the 18-month interval recommended by Reference 2, by revising the first paragraph of TS 5.5.12 as follows (added words shown underlined):

5.5.12 A program shall be established to implement the following required testing of filter ventilation systems at the frequencies specified in Regulatory Guide 1.52, Revision 2, <u>except that the testing specified at a frequency of 18 months is required at a frequency of 24 months</u>.

4 TECHNICAL EVALUATION

To accommodate a 24-month fuel cycle for ONS, Duke Energy proposes to extend certain 18-month TS SR frequencies to 24 months. The proposed TS changes were evaluated in accordance with the guidance provided in GL 91-04 (Reference 1). The proposed TS changes, based on Reference 1, have been divided into two categories. The categories are: (1) changes to surveillance frequencies other than channel calibrations, identified as

"Non-Calibration Changes"; and (2) changes involving the channel calibration frequency identified as "Channel Calibration Changes."

4.1 Non-Calibration Changes

Reference 1 identifies three steps to evaluate non-calibration changes:

Step 1:

Licensees should evaluate the effect on safety of the change in surveillance intervals to accommodate a 24-month fuel cycle. This evaluation should support a conclusion that the effect on safety is small.

Evaluation:

Each non-calibration SR frequency proposed to be changed has been evaluated with respect to the effect on plant safety. The methodology utilized to justify the conclusion that extending the testing interval has a minimal impact on safety was based on the fact the function/feature is:

(1) Tested on a more frequent basis during the operating cycle by other plant programs;
(2) Designed to have redundant counterparts or be single failure proof; or
(3) Highly reliable.

A summary of the evaluation of the effect on safety for each non-calibration SR frequency being changed is presented in Attachment 6.

Step 2:

Licensees should confirm that historical maintenance and surveillance data support the conclusion.

Evaluation:

The surveillance test history of the affected SRs has been evaluated. This evaluation consisted of a review of available surveillance test results and associated maintenance records for at least the last five cycles (beginning with Unit 1 Spring 2002 outage, Unit 2 Spring 2001 outage, and Unit 3 Fall 2001 outage). With the extension of the testing frequency to 24 months, there will be a longer period between each surveillance performance. If a failure that results in the loss of the associated safety function occurs during the operating cycle that would only be detected by the performance of the 18-month TS SR, then the increase in the surveillance testing interval might result in a decrease in the associated function's availability. In addition to evaluating these surveillance failures, potential common features of similar components tested by different surveillances were also evaluated. This additional evaluation determined whether there is evidence of repetitive failures among similar plant components.

The surveillance failures that are detailed in Attachment 6 exclude failures that:

(1) Did not impact a TS safety function or TS operability
(2) Are detectable by required testing performed more frequently than the 18-month surveillance being extended; or
(3) Where the cause can be attributed to an associated event such as a preventative maintenance task, human error, previous modification, or previously existing design deficiency, or that were subsequently re-performed successfully with no intervening corrective maintenance (e.g., plant conditions or malfunctioning measurement and test equipment may have caused aborting the test performance).

These categories of failures are not related to potential unavailability due to testing interval extension and therefore are not listed or further evaluated in this submittal.

The review of surveillance test history validated the conclusion that the impact, if any, on system availability will be minimal as a result of the change to a 24-month testing frequency. Specific SR test failures and justification for this conclusion are discussed in Attachment 6.

Step 3:

Licensees should confirm that the performance of surveillances at the bounding surveillance interval limit provided to accommodate a 24-month fuel cycle would not invalidate any assumption in the plant licensing basis.

Evaluation:

As part of the evaluation of each affected SR, the impact of the changes against the assumptions in the ONS licensing basis was reviewed. In general, testing interval changes have no impact on the plant licensing basis. In some cases, the change to a 24-month fuel cycle may require a change to licensing basis information as described in the Updated Final Safety Analysis Report (UFSAR). However, since no changes requiring NRC review and approval have been identified, the UFSAR changes associated with fuel cycle extension to 24 months will be drafted in accordance with ONS procedures that implement 10 CFR 50.59 and will be submitted in accordance with 10 CFR 50.71, Paragraph (e).

The performance of surveillances extended for a 24-month fuel cycle will be trended as a part of the ongoing ONS corrective maintenance and corrective action programs. Any degradation in performance will be evaluated to verify that the degradation is not due to surveillance extension or maintenance activities.

4.2 Channel Calibration Changes

Reference 1 identifies seven steps to evaluate channel calibration 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.

Evaluation:

The effect of longer calibration intervals on the TS instrumentation was evaluated by performing a review of the surveillance test history for the affected instrumentation including, where appropriate, an instrument drift study. An As-Found/As-Left (AFAL) Drift Analysis was not appropriate or not feasible in some cases (e.g. new instrumentation with insufficient historical data, rate of change instrumentation for which drift is not applicable, instrumentation for which no uncertainty calculation/analytical limit is required, and functions with obvious margin). As a result, Duke Energy performed an evaluation to justify why an AFAL Drift Analysis is not required for certain instrument functions. This justification is provided in Attachment 6 of this submittal.

In performing the historical evaluation, an effort was made to retrieve recorded channel calibration data for associated instruments for at least the last seven[3] operating cycles (Unit 1 from June 1999 to April 2008, Unit 2 from April 1998 to May 2007, Unit 3 from November 1998 to November 2007[4]). By obtaining this past recorded calibration data, an acceptable basis for drawing conclusions about the expectation of satisfactory performance can be made.

The failure history evaluation and drift study demonstrates that, except on rare occasions, instrument drift has not exceeded the current acceptable limits. Specific SR test failures and the specific evaluation basis supporting this conclusion are discussed in Attachment 6.

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.

Evaluation

The effect on longer calibration intervals for the TS instrumentation was evaluated by performing an instrument drift study. In performing the drift study, an effort was made to retrieve recorded channel calibration data for associated instruments for at least seven[3] operating cycles (Unit 1 from June 1999 to April 2008, Unit 2 from April 1998 to May 2007, Unit 3 from November 1998 to November 2007[4]). By obtaining this past recorded

[3] A minimum of seven cycles were required to obtain enough calibration data to allow a valid statistical determination of instrument drift.
[4] Most common retrieval dates, specific dates for each function are in AFAL Drift Analysis calculation

calibration data, a true representation of instrument drift was determined (except in cases where all collected data still resulted in insufficient data for valid statistical analysis).

The methodology used to perform the drift studies of the plant instrument surveillance data is documented in the ONS Instrument Drift Analysis Methodology in Support of 24-month Surveillance Interval (Attachment 7). This methodology is based on EPRI Technical Report TR-103335-R1 (Reference 3), which is consistent with the ISA Standards (References 5 and 6) and the Duke Energy Setpoint Methodology (Reference 7). The NRC Status Report providing comments on revision 0 of the referenced EPRI technical report was also used in developing the ONS methodology document. Duke Energy provided a summary of the ONS methodology during a meeting with the NRC on July 1, 2009. Duke Energy revised the methodology document to address NRC comments made during the meeting. The methodology, which is used to determine instrument drift based on historical plant calibration data, ensures that AFAL drift values are determined with a high probability and a high degree of confidence.

An AFAL Drift Analysis was not appropriate or not feasible in some cases (e.g. new instrumentation with insufficient historical data, rate of change instrumentation for which drift is not applicable, instrumentation for which no uncertainty calculation/analytical limit is required, and functions with obvious margin). As a result, Duke Energy performed an evaluation to justify why an AFAL Drift Analysis is not required for certain instrument functions. This justification is provided in Attachment 6 of this submittal.

In summary, the ONS Instrument Drift Analysis Methodology consists of the following seven steps.

1) Data Gathering. This includes not only the retrieval of the historical plant calibration data but proper grouping of instruments based on manufacturer, model, location, function, etc.
2) Determination of AFAL Data Initial and Final Statistics (i.e., identification and removal of corrupt data and outliers, if any).
3) Normality Testing.
4) Determination of Analyzed Drift Bias (if any).
5) Determination of Tolerance Intervals and overall Analyzed Drift.
6) Determination of AFAL Data time dependency.
7) Determination of extended cycle Analyzed Drift. This is the final product of the methodology. That is, AFAL drift based on historical plant calibration data with a high probability and a high degree of confidence extrapolated for a maximum 30 month calibration interval.

The typical method of calibration at ONS is calibration by instrument string. Therefore, there is insufficient data to determine device AFAL drift terms for most applications and string AFAL drift terms are determined instead. The primary exception to performing string AFAL drift studies is for Reactor Protection and Engineered Safeguards System applications where AFAL data is recorded for the process sensor or the process sensor and the buffer amplifier module combination. In these cases, an AFAL drift study was

performed at the component or partial string level. To provide an adequate basis for the plant drift studies, the data for loops and components with similar characteristics may be combined.

In cases where there was insufficient data to perform a statistical evaluation, other methods (vendor data, existing generic studies, comparison to similar devices or strings, etc.) were used to conservatively determine if the instrument calibration interval could be extended. The specific cases and the methods are described in the detailed GL 91-04 evaluation provided in Attachment 6 of this submittal.

Additional Considerations

The NRC Status Report on the NRC Staff review of EPRI Topical Report, TR-103335 (Reference 4) was evaluated to determine if additional information and analyses were warranted. A summary of ONS positions relative to the Staff review comments is included in Attachment 7.

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 and range) and application that performs a safety function. Provide a list of the channels by TS sections that identifies these instrument applications.

Evaluation:

In accordance with the methodology described in the previous section, the magnitude of instrument drift was determined to a high degree of probability and a high degree of confidence for a calibration interval of 18 months for each instrument string. From this necessary first step, the instrument AFAL drift requires only proper extension/extrapolation from an 18-month calibration interval to a 30 month calibration interval to provide drift of a high probability and a high degree of confidence for a bounding calibration interval of 30 months. In other words, if the 18-month AFAL drift performance was predicted with a 95%/95% confidence level and, the results conservatively extrapolated, then the 30 month AFAL drift values will be predicted with greater than a 95%/95% confidence level.

The ONS Instrument Drift Analysis Methodology (Attachment 7) assumes moderate time dependency for the AFAL drift data (i.e., that drift varies with the square root of time). This assumption is conservative based on the preponderance of industry data concerning AFAL drift studies as discussed in Section 9 of the EPRI Guidelines (Reference 3). Also note that the proposed method for dealing with moderate time dependency is more conservative than the EPRI Guidelines recommends. In addition, the ONS Instrument Drift Analysis Methodology also recognizes the potential for strong time dependency (i.e., that drift varies linearly with time) which provides more conservative extrapolated drift values.

The determination of moderate or strong time dependency is based on a comparison of single cycle AFAL drift data and multi-cycle AFAL drift data. Use of multi-cycle data in evaluating time dependency was one recommended approach discussed in the NRC Status Report (Reference 4 and Attachment 7). The purpose of this comparison is not to determine the extended cycle Analyzed Drift. There is insufficient multi-cycle data to make this determination. The purpose of the comparison is to support the standard assumption of moderate time dependency (i.e., square-root extrapolation) and where this support is not compelling, to apply an additional conservatism through application of a strong time dependency (i.e., linear extrapolation).

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) because the 18-month AFAL Drift values were determined using standard industry practices to a high probability and a high degree of confidence and the 18-month data was extrapolated to 30 months using conservative methods.

A list of applicable instruments by TS section that identifies these instrument applications is provided in Attachment 7.

In cases where there was insufficient data to perform a statistical evaluation, other methods (vendor data, existing generic studies, comparison to similar devices or strings, etc.) were used to conservatively determine if the instrument calibration interval could be extended. The specific cases and the methods are described in the detailed GL 91-04 evaluation provided in Attachment 6 of this submittal.

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 a 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.

Evaluation:

The projected drift values were compared to design allowances as calculated in the associated instrument setpoint analyses. In all cases, the 30 month projected drift value for the instrument could be accommodated within the existing setpoint analysis and the SR frequency was changed to "24 months" with no change to the TS allowable value or licensing basis analytical limit.

Step 5:

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

Evaluation:

As discussed in previous sections, the analyzed drift determined for 30 months was compared to drift allowances in the instrument setpoint and uncertainty calculations. All required revisions to these calculations and associated plant setpoints will be completed prior to implementation of 24-month cycles. The drift studies performed included instrument loops that provide process variable indication as shown in Attachment 7 (Reference 3). In no case was a change to the safe shutdown analysis required to account for extended cycle 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.

Evaluation:

The drift studies of the plant surveillance data and the setpoint analyses have been fully verified. Results of instrument setpoint and uncertainty calculation revisions will be incorporated into plant surveillance procedures prior to 24-month cycle operation.

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.

Evaluation:

Instruments with TS calibration surveillance frequencies extended to 24 months will be monitored and trended. As-found and as-left calibration data will be recorded for each 24-month calibration activity. As-found calibration tolerances are conservatively set equal to As-left tolerances. All out of tolerance conditions exceeding notification limits require engineering evaluation and trending per the Duke corrective action program. The out of tolerance notification limits are conservative as compared to the 30 month limits documented in the associated instrument setpoint and uncertainty calculation. This will identify occurrences of instruments found outside of their allowable value and 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 in accordance with the ONS corrective action program to evaluate the effect on plant safety.

This evaluation will be conducted to ensure the assumptions in the setpoint calculations continue to be valid. If this evaluation indicates that instrument performance is not consistent with assumptions, corrective actions will be taken in accordance with station corrective action requirements.

5 REGULATORY EVALUATION

5.1 Significant Hazards Consideration

Duke Energy has evaluated whether or not a significant hazards consideration is involved with the proposed amendment to ONS Facility Operating Licenses DPR-38, -47, and -55 by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below.

The requested change would affect certain Technical Specification Surveillance Requirement frequencies that are specified as "18 months" by revising them to "24 months" in accordance with the guidance of GL 91-04 (Reference 1). Also, consistent with this guidance, a change is proposed to Administrative Controls Section 5.5.12, "Ventilation Filter Testing Program," to address changes to 18-month frequencies that are specified in Regulatory Guide 1.52 (Reference 2).

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed amendment changes the surveillance frequency from 18 months to 24 months for Surveillance Requirements in the Technical Specifications that are normally a function of the refueling interval. Surveillance Requirement 3.0.2 would allow a maximum surveillance interval of 30 months for these surveillances. Duke Energy's evaluations have shown that the reliability of protective instrumentation and equipment will be preserved for the maximum allowable surveillance interval.

   The proposed change does not involve any change to the design or functional requirements of the associated systems. That is, the proposed Technical Specification (TS) change neither degrades the performance of, nor increases the challenges to any safety systems assumed to function in the plant safety analysis. The proposed change will not give rise to any increase in operation power level, fuel operating limits or effluents. The proposed change does not affect any accident precursors since no accidents previously evaluated relate to the frequency of surveillance testing and the revision to the frequency does not introduce any accident initiators. The proposed change does not impact the usefulness of the Surveillance Requirements (SRs) in evaluating the operability of required systems and components or the manner in which the surveillances are performed.

   In addition, evaluation of the proposed TS change demonstrates that the availability of equipment and systems required to prevent or mitigate the radiological consequences of an accident is not significantly affected because of the availability of redundant systems and equipment or the high reliability of the equipment. Since the impact on the systems

is minimal, it is concluded that the overall impact on the plant safety analysis is negligible.

Furthermore, an historical review of surveillance test results and associated maintenance records indicates there is no evidence of any failure that would invalidate the above conclusions. Therefore, the proposed TS change does not significantly increase the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   The proposed amendment does not require a change to the plant design nor the mode of plant operation. No new or different equipment is being installed. No installed equipment is being operated in a different manner. As a result, no new failure modes are being introduced. In addition, the proposed change does not impact the usefulness of the SRs in evaluating the operability of required systems and components or the manner in which the surveillances are performed. Furthermore, an historical review of surveillance test results and associated maintenance records indicates there is no evidence of any failure that would invalidate the above conclusions. Therefore, the implementation of the proposed change will not create the possibility for an accident of a new or different type than previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

   Response: No

   The proposed amendment changes the surveillance frequency from 18 months to 24 months for Surveillance Requirements in the Technical Specifications that are normally a function of the refueling interval. Surveillance Requirement 3.0.2 would allow a maximum surveillance interval of 30 months for these surveillances. Although the proposed change will result in an increase in the interval between surveillance tests, the impact on system availability is small based on other, more frequent testing that is performed, the existence of redundant systems and equipment or overall system reliability. There is no evidence of any time-dependent failures that would impact the availability of the systems. The proposed change does not significantly impact the condition or performance of structures, systems and components relied upon for accident mitigation. This change does not alter the existing TS allowable values or analytical limits. The existing operating margin between plant conditions and actual plant setpoints is not significantly reduced due to these changes. The assumptions and results in any safety analyses are not significantly impacted. Therefore, the proposed change does not involve a significant reduction in margin of safety.

Based on the above, Duke Energy concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

10 CFR 50.36, "Technical Specifications," provides the content required in a licensee's TS. Specifically, 10 CFR 50.36(c)(3) requires that the TS include surveillance requirements. The proposed SR frequency changes continue to support the requirements of 10 CFR 50.36(c)(3) to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits and that the limiting conditions for operation are met.

NRC GL 91-04 provides generic guidance for evaluating a 24-month surveillance test interval for TS SRs. This request for a license amendment provides the ONS specific evaluation of each step outlined in GL 91-04 and provides a description of the methodology used by ONS to complete the evaluation for each specific TS SR being revised. Duke Energy's monitoring program is adequate for assessing the effects of the extended instrument calibration surveillance intervals on future instrument drift.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or the health and safety of the public.

5.3 Precedent

This request is similar in format and content to the following three submittals:

1. Southern Nuclear Operating Company, Inc. submittal for the Hatch Nuclear Plant, which was reviewed and approved by the NRC through a Safety Evaluation and License Amendment dated July 12, 2002 (Accession No. ML0220400850)
2. AmerGen Energy Company submittal for the Clinton Power Station, Unit 1, which was reviewed and approved by the NRC through a Safety Evaluation and License Amendment dated October 21, 2005 (Accession No. ML052940480).
3. Tennessee Valley Authority submittal for the Browns Ferry Nuclear Plant, Unit 1, which was reviewed and approved by the NRC through a Safety Evaluation and License Amendment dated September 28, 2006 (Accession No. ML062780135).

5.4 Conclusions

Duke has made the determination that this amendment request involves a No Significant Hazards Consideration by applying the standards established by the NRC regulations in 10 CFR 50.92 in Section 5.1 of this Enclosure.

The regulatory requirements and guidance applicable to this LAR are identified in Section 5.2 above.

Duke identified several LARs, as indicated in Section 5.3 above, requesting the extension of 18 month SR frequencies to 24 months to support transition to a 24 month fuel cycle. These LARs used the applicable regulatory requirements of Section 5.2 above to provide a basis for NRC review and approval. Duke used these LARS to the extent practical and applicable for developing this LAR.

6 ENVIRONMENTAL CONSIDERATION

Duke Energy has evaluated this license amendment request against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21. Duke Energy has determined that this license amendment request meets the criteria for a categorical exclusion as set forth in 10 CFR 51.22(c)(9). This determination is based on the fact the this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50 that changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or that changes an inspection or a surveillance requirement, and the amendment meets the following specific criteria:

(1) The amendment involves no significant hazard consideration as demonstrated in Section 5.1.

(2) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite. The principal barriers to the release of radioactive materials are not modified or affected by this change and no significant increases in the amounts of any effluent that could be released offsite will occur as a result of this change.

(3) There is no significant increase in individual or cumulative occupational radiation exposure. Because the principal barriers to the release of radioactive materials are not modified or affected by this change, there will be no significant increase in individual or cumulative occupational radiation exposure resulting from this change.

Therefore, no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment pursuant to 10 CFR 51.22(b).

7 REFERENCES

(1) NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle," dated April 2, 1991.

(2) Regulatory Guide 1.52, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Revision 2, dated March 1978.

(3) EPRI TR-103335-R1, "Guidelines for Instrument Calibration Extension/Reduction Statistical Analysis of Instrument Calibration Data", Final Report, October 1998.

(4) NRC Status Report dated December 1, 1997, on the Staff review of EPRI Technical Report (TR)-103335, "Guidelines for the Instrument Calibration Extension / Reduction Programs."

(5) ANSI/ISA–S67.04, Part 1 - 1994, "Setpoints for Nuclear Safety - Related Instrumentation".

(6) ISA–RP67.04, Part 2 - 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation".

(7) Duke Energy Procedure EDM–102, "Instrument Setpoint/Uncertainty Calculations", Revision 3.

ATTACHMENT 1

MARKED-UP TECHNICAL SPECIFICATION PAGES

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.4	----------NOTE---------- Not applicable to Unit(s) with RPS digital upgrade complete. ---------- Perform CHANNEL FUNCTIONAL TEST.	45 days on a STAGGERED TEST BASIS
SR 3.3.1.5	----------NOTE---------- Only applicable to Unit(s) with RPS digital upgrade complete. ---------- Manually verify the setpoints are correct.	92 days
SR 3.3.1.6	----------NOTE---------- Only applicable to Unit(s) with RPS digital upgrade complete. ---------- Manually actuate the output channel interposing relays.	92 days
SR 3.3.1.7	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	~~18 months~~24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.5.2	----------NOTE---------- Only applicable to Unit(s) with ESPS digital upgrade complete. ---------- Manually verify that the setpoints are correct.	92 days
SR 3.3.5.3	----------NOTE---------- Not applicable to Unit(s) with ESPS digital upgrade complete. ---------- Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.4	Perform CHANNEL CALIBRATION.	~~18 months~~24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	12 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.6.1	Perform CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.7.1	----------NOTE---------- Only applicable to Unit(s) with the ESPS digital upgrade complete ---------- Manually actuate the output channel interposing relays.	92 days
SR 3.3.7.2	Perform automatic actuation output logic CHANNEL FUNCTIONAL TEST.	92 days for Unit(s) with the ESPS digital upgrade not complete. AND ~~18 months~~ 24 months for Unit(s) with the ESPS digital upgrade complete.

SURVEILLANCE REQUIREMENTS

----------NOTE----------
These SRs apply to each PAM instrumentation Function in Table 3.3.8-1 except where indicated.

SURVEILLANCE		FREQUENCY
SR 3.3.8.1	Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.8.2	----------NOTE---------- Only applicable to PAM Functions 7 and 22. ---------- Perform CHANNEL CALIBRATION.	 12 months
SR 3.3.8.3	----------NOTES---------- 1. Neutron detectors are excluded from CHANNEL CALIBRATION. 2. Not applicable to PAM Functions 7 and 22. ---------- Perform CHANNEL CALIBRATION.	 ~~18 months~~ 24 months

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.4 Verify SDM to be within the limit specified in the COLR.	1 hour AND Once per 12 hours thereafter
C. One or more required source range neutron flux channel(s) inoperable with THERMAL POWER level > 4E-4% RTP on the wide range neutron flux channels.	C.1 Initiate action to restore affected channel(s) to OPERABLE status.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.9.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.9.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.10.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.10.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	 ~~18 months~~ 24 months
SR 3.3.10.3	Verify at least one decade overlap between source range and wide range neutron flux channels.	Once each reactor startup prior to the source range indication exceeding 10^5 cps if not performed within the previous 7 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 3. AND C.2 Reduce main steam header pressure to <700 psig.	12 hours 18 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.11.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.11.2	Perform CHANNEL FUNCTIONAL TEST.	31 days
SR 3.3.11.3	Perform CHANNEL CALIBRATION.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.12.1	Perform CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months

3.3 INSTRUMENTATION

3.3.13 Automatic Feedwater Isolation System (AFIS) Digital Channels

LCO 3.3.13 Two AFIS digital channels per steam generator (SG) shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One digital channel inoperable.	A.1 Restore digital channel to OPERABLE status.	72 hours
B. Two digital channels inoperable. OR Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Reduce main steam header pressure to < 700 psig	12 hours 18 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.13.1	Perform CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.14.1	Perform CHANNEL FUNCTIONAL TEST for each LOMF pump instrumentation channel.	31 days
SR 3.3.14.2	Perform CHANNEL FUNCTIONAL TEST for each manual initiation circuit.	92 days
SR 3.3.14.3	Perform CHANNEL FUNCTIONAL TEST for each automatic initiation circuit.	~~18 months~~ 24 months
SR 3.3.14.4	Perform CHANNEL CALIBRATION for each LOMF pump instrumentation channel.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.16.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.16.2	Perform CHANNEL FUNCTIONAL TEST.	Once each refueling outage prior to movement of recently irradiated fuel assemblies within containment
SR 3.3.16.3	Perform CHANNEL CALIBRATION.	~~18 months~~ 24 months

3.3 INSTRUMENTATION

3.3.17 Emergency Power Switching Logic (EPSL) Automatic Transfer Function

LCO 3.3.17 Two channels of the EPSL Automatic Transfer Function shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One channel inoperable.	A.1	----------NOTE---------- The Completion Time is reduced when in Condition L of LCO 3.8.1. ---------- Restore channel to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	12 hours
	AND		
	B.2	Be in MODE 5.	84 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.17.1	Perform CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met in MODES 1, 2, 3, and 4.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	12 hours 84 hours
C. Two or more channels of a required circuit inoperable when not in MODES 1, 2, 3, and 4. OR Required Action and associated Completion Time not met when not in MODES 1, 2, 3, and 4.	C.1 Declare affected AC power source(s) inoperable.	Immediately
D. Required Action and associated Completion Time not met during movement of irradiated fuel assemblies.	D.1 Suspend movement of irradiated fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.18.1	Perform CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Two or more voltage sensing channels inoperable. OR Two actuation logic channels inoperable.	D.1 Declare the overhead emergency power path inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.19.1	Perform a CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months
SR 3.3.19.2	Perform a CHANNEL CALIBRATION of the voltage sensing channel with the setpoint allowable value as follows: Degraded voltage ≥ 226 kV and ≤ 229 kV with a time delay of 9 seconds ± 1 second.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.20.1	Perform a CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months
SR 3.3.20.2	Perform a CHANNEL CALIBRATION of the voltage sensing channel with the setpoint allowable value as follows: a. Degraded voltage ≥ 4143 V and ≤ 4185 V with a time delay of 9 seconds ± 1 second for the first level undervoltage inputs; and b. Degraded voltage ≥ 3871 V and ≤ 3901 V for the second level undervoltage inputs.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.21.1	Perform CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time not met.	D.1 Initiate action in accordance with Specification 5.6.6.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.23.1	Perform a CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.27.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.27.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.27.3	Perform CHANNEL CALIBRATION.	~~18 months~~ 24 months

3.3 INSTRUMENTATION

3.3.28 Low Pressure Service Water (LPSW) Standby Pump Auto-Start Circuitry

LCO 3.3.28 LPSW Standby Pump Auto-Start Circuitry shall be OPERABLE.

----------NOTE----------
LPSW Standby Pump auto-start circuit is not required to be OPERABLE on running LPSW pumps.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LPSW standby pump auto-start circuitry inoperable.	A.1 Restore LPSW standby pump auto-start circuitry to OPERABLE status.	7 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	12 hours 60 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.28.1	Perform CHANNEL FUNCTIONAL TEST.	~~18 months~~ 24 months
SR 3.3.28.2	Perform CHANNEL CALIBRATION.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	----------NOTE---------- With three RCPs operating, the limits are applied to the loop with the highest pressure. ---------- Verify RCS loop pressure is within limits specified in the COLR.	12 hours
SR 3.4.1.2	----------NOTE---------- With three RCPs operating, the limits are applied to the loop with the lowest loop average temperature for the condition where there is a 0°F ΔTc setpoint. ---------- Verify RCS loop average temperature is within limits specified in the COLR.	12 hours
SR 3.4.1.3	Verify RCS total flow is within limits specified in the COLR.	12 hours
SR 3.4.1.4	----------NOTE---------- Not required to be performed until 7 days after stable thermal conditions are established in the higher power range of MODE 1. ---------- Verify by measurement RCS total flow rate is within limit specified in the COLR.	~~18 months~~ 24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Required Action and associated Completion Time of Condition C not met.	D.1	Be in MODE 3.	12 hours
	AND		
	D.2	Reduce RCS temperature to ≤ 325°F.	18 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.9.1	Verify pressurizer water level ≤ 285 inches.	12 hours
SR 3.4.9.2	Verify capacity of required pressurizer heaters and associated power supplies are ≥ 400 kW.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.12.6	Verify Administrative Controls, other than limits for pressurizer level, that assure ≥ 10 minutes are available for operator action to mitigate an LTOP event are implemented for the following: a. RCS pressure when RCS temperature is < 325°F; b. Makeup flow rate; c. Alarms; d. High pressure Nitrogen System; and e. Verify pressurizer heater bank 3 or 4 is deactivated	12 hours
SR 3.4.12.7	Perform CHANNEL CALIBRATION for PORV.	~~18 months~~24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.14.1	----------NOTE---------- Not required to be performed in MODES 3 and 4. ---------- Verify leakage from each required RCS PIV is equivalent to ≤ 0.5 gpm per nominal inch of valve size up to a maximum of 5 gpm at an RCS pressure ≥ 2150 psia and ≤ 2190 psia.	~~18 months~~ 24 months AND Prior to entering MODE 2 whenever the unit has been in MODE 5 for ≥ 7 days, if leakage testing has not been performed in the previous 9 months.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of required containment atmosphere radioactivity monitor.	12 hours
SR 3.4.15.2	Perform CHANNEL FUNCTIONAL TEST of required containment atmosphere radioactivity monitor.	92 days
SR 3.4.15.3	Perform CHANNEL CALIBRATION of required containment sump level indication.	~~18 months~~ 24 months
SR 3.4.15.4	Perform CHANNEL CALIBRATION of required containment atmosphere radioactivity monitor.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.3	Verify each HPI pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.2.4	Verify each HPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.5.2.5	Verify each HPI pump starts automatically on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.5.2.6	Verify, by visual inspection, each HPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.	~~18 months~~ 24 months
SR 3.5.2.7	Cycle each HPI discharge crossover valve and LPI-HPI flow path discharge valve.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.3.2	----------NOTE---------- Not applicable to operating LPI pump(s). ---------- Vent each LPI pump casing.	31 days
SR 3.5.3.3	Verify each LPI pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.3.4	Verify each LPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.5.3.5	Verify each LPI pump starts automatically on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.5.3.6	Verify, by visual inspection, each LPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.2.1	----------NOTES---------- 1. An inoperable air lock door does not invalidate the previous successful performance of the overall air lock leakage test. 2. Results shall be evaluated against acceptance criteria of SR 3.6.1.2 in accordance with 10 CFR 50, Appendix J, Option A, as modified by approved exemptions. ---------- Perform required air lock leakage rate testing in accordance with 10 CFR 50, Appendix J, Option A, as modified by approved exemptions.	----------NOTE---------- SR 3.0.2 is not applicable ---------- In accordance with 10 CFR 50, Appendix J, Option A, as modified by approved exemptions
SR 3.6.2.2	Verify only one door in the air lock can be opened at a time.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.3.4	Verify the isolation time of each automatic power operated containment isolation valve is within limits.	In accordance with the Inservice Testing Program
SR 3.6.3.5	Verify each automatic containment isolation valve that is not locked, sealed, or otherwise secured in position, actuates to the isolation position on an actual or simulated actuation signal.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	----------NOTE---------- Applicable for RB cooling system after the completion of the LPSW RB Waterhammer Modification on the respective Unit. ---------- Verify each reactor building spray and cooling manual and non-automatic power operated valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.5.2	Operate each required reactor building cooling train fan unit for ≥ 15 minutes.	31 days
SR 3.6.5.3	Verify each required reactor building spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.5.4	Verify that the containment heat removal capability is sufficient to maintain post accident conditions within design limits.	~~18 months~~ 24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.5.5	----------NOTE---------- Applicable for RB cooling system after the completion of the LPSW RB Waterhammer Modification on the respective Unit. ---------- Verify each automatic reactor building spray and cooling valve in each required flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.6.5.6	Verify each required reactor building spray pump starts automatically on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.6.5.7	Verify each required reactor building cooling train starts automatically on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.6.5.8	Verify each spray nozzle is unobstructed.	10 years

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.2.1	----------NOTE---------- Only required to be performed in MODES 1 and 2. ---------- Verify closure time of each TSV is ≤ 1.0 seconds on an actual or simulated actuation signal from Channel A.	~~18 months~~ 24 months
SR 3.7.2.2	----------NOTE---------- Only required to be performed in MODES 1 and 2. ---------- Verify closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel B.	~~18 months~~ 24 months

3.7 PLANT SYSTEMS

3.7.4 Atmospheric Dump Valve (ADV) Flow Paths

LCO 3.7.4 The ADV flow path for each steam generator shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3, and MODE 4 when steam generator is relied upon for heat removal.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or both ADV flow path(s) inoperable.	A.1 Be in MODE 3.	12 hours
	AND	
	A.2 Be in MODE 4 without reliance upon steam generator for heat removal.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.4.1	Cycle the valves that comprise the ADV flow paths.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.1	Verify each EFW manual, and non-automatic power operated valve in each water flow path and in the steam supply flow path to the turbine driven pump, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.5.2	Verify the developed head of each EFW pump at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.7.5.3	----------NOTE---------- Not required to be met in MODES 3 and 4. ---------- Verify each EFW automatic valve that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.7.5.4	----------NOTE---------- Not required to be met in MODES 3 and 4. ---------- Verify each EFW pump starts automatically on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.7.5.5	Verify proper alignment of the required EFW flow paths by verifying valve alignment from the upper surge tank to each steam generator.	Prior to entering MODE 2 whenever unit has been in MODE 5 or 6 for > 30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.7.1	Verify LPSW leakage accumulator level is within Water levels between 20.5" to 41" for Units with LPSW RB Waterhammer modification installed. During LPSW testing, accumulator level > 41" is acceptable.	12 hours
SR 3.7.7.2	----------NOTE---------- Isolation of LPSW flow to individual components does not render the LPSW System inoperable. ---------- Verify each LPSW manual, and non-automatic power operated valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.7.3	Verify each LPSW automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.7.7.4	Verify each LPSW pump starts automatically on an actual or simulated actuation signal.	~~18 months~~ 24 months
SR 3.7.7.5	Verify LPSW leakage accumulator is able to provide makeup flow lost due to boundary valve leakage on Units with LPSW RB Waterhammer modification installed.	~~18 months~~ 24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.7.6	Verify LPSW WPS boundary valve leakage is ≤ 20 gpm for Units with LPSW RB Waterhammer modification installed.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.8.8	Verify each required ESV pump automatically starts in ≤ 1200 seconds upon an actual or simulated restoration of emergency power.	92 days
SR 3.7.8.9	----------NOTE---------- Not required to be performed for Units 1 and 2 with the shared Unit 1 and 2 LPSW System taking suction from the siphon. ---------- Verify upon an actual or simulated trip of the CCW pumps and ESV pumps that the rate of water level drop in the ECCW siphon header is within limits.	~~18 months~~ 24 months

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time not met in MODE 1, 2, 3, or 4.	D.1 Be in MODE 3. AND D.2 Be in MODE 5	12 hours 36 hours
E. Required Action and associated Completion Time not met during movement of recently irradiated fuel assemblies.	E.1 Suspend movement of recently irradiated fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.9.1	Operate each CRVS Booster Fan train for ≥ 1 hour.	92 days
SR 3.7.9.2	Perform required CRVS Booster Fan train filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.7.9.3	Verify two CRVS Booster Fan trains can maintain the Control Room at a positive pressure.	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	Verify each KHU's battery cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.	12 months
SR 3.8.1.13	----------NOTE---------- Only applicable when the overhead electrical disconnects for the KHU associated with the underground emergency power path are closed. ---------- Verify on an actual or simulated zone overlap fault signal each KHU's overhead tie breaker and underground tie breaker actuate to the correct position.	12 months
SR 3.8.1.14	----------NOTE---------- Not required to be performed for an SL breaker when its standby bus is energized from a LCT via an isolated power path. ---------- Verify each closed SL and closed N breaker opens on an actuation of each redundant trip coil.	~~18 months~~ 24 months
SR 3.8.1.15	----------NOTE---------- Redundant breaker trip coils shall be verified on a STAGGERED TEST BASIS. ---------- Verify each 230 kV switchyard circuit breaker actuates to the correct position on a switchyard isolation actuation signal.	~~18 months~~ 24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.16	----------NOTE---------- Only applicable when complying with Required Action C.2.2.4. ---------- Verify one KHU provides an alternate manual AC power source capability by manual or automatic KHU start with manual synchronize, or breaker closure, to energize its non-required emergency power path.	As specified by Required Action C.2.2.4
SR 3.8.1.17	Verify each KHU's Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers. The allowable values with a time delay of 5 seconds ± 1 second shall be as follows: a. Undervoltage ≥ 12.42 kV and ≤ 12.63 kV b. Overvoltage ≥ 14.90 kV and ≤ 15.18 kV c. Underfrequency ≥ 53.992 hz and ≤ 54.008 hz d. Overfrequency ≥ 65.992 hz and ≤ 66.008 hz	~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.9.2.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	 ~~18 months~~ 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.10.1.11	Verify for required SSF battery that the cell to cell and terminal connections are clean, tight and coated with anti-corrosion material.	12 months
SR 3.10.1.12	Verify battery capacity of required battery is adequate to supply, and maintain in OPERABLE status, the required maximum loads for the design duty cycle when subjected to a battery service test.	12 months
SR 3.10.1.13	Perform CHANNEL CALIBRATION for each required SSF instrument channel.	~~18 months~~ 24 months
SR 3.10.1.14	Verify OPERABILITY OF SSF valves in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program
SR 3.10.1.15	----------NOTE---------- Not applicable to the SSF submersible pump. ---------- Verify the developed head of each required SSF pump at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.10.1.16	Verify the developed head of the SSF submersible pump at the flow test point is greater than or equal to the required developed head.	2 years

5.5 Programs and Manuals (continued)

5.5.11 Secondary Water Chemistry

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables;

b. Identification of the procedures used to measure the values of the critical variables;

c. Identification of process sampling points;

d. Procedures for the recording and management of data;

e. Procedures defining corrective actions for all off control point chemistry conditions; and

f. A procedure identifying the authority responsible for the interpretation of the data and the sequence and timing of administrative events, which is required to initiate corrective action.

5.5.12 Ventilation Filter Testing Program (VFTP)

A program shall be established to implement the following required testing of filter ventilation systems at the frequencies specified in Regulatory Guide 1.52, Revision 2, except that the testing specified at a frequency of 18 months is required at a frequency of 24 months.

The VFTP is applicable to the Control Room Ventilation System (CRVS) Booster Fan Trains and the Spent Fuel Pool Ventilation System (SFPVS).

a. Demonstrate, for the CRVS Booster Fan Trains, that a DOP test of the HEPA filters shows ≥ 99.5% removal when tested in accordance with ANSI N510-1975 at the system design flow rate ± 10%.

b. Demonstrate, for the CRVS Booster Fan Trains, that a halogenated hydrocarbon test of the carbon adsorber shows ≥ 99% removal when tested in accordance with ANSI N510-1975 at the system design flow rate ± 10%.

ATTACHMENT 2

REPRINTED TECHNICAL SPECIFICATION PAGES

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.4	----------NOTE---------- Not applicable to Unit(s) with RPS digital upgrade complete. ---------- Perform CHANNEL FUNCTIONAL TEST.	45 days on a STAGGERED TEST BASIS
SR 3.3.1.5	----------NOTE---------- Only applicable to Unit(s) with RPS digital upgrade complete. ---------- Manually verify the setpoints are correct.	92 days
SR 3.3.1.6	----------NOTE---------- Only applicable to Unit(s) with RPS digital upgrade complete. ---------- Manually actuate the output channel interposing relays.	92 days
SR 3.3.1.7	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.5.2	----------NOTE---------- Only applicable to Unit(s) with ESPS digital upgrade complete. ---------- Manually verify that the setpoints are correct.	92 days
SR 3.3.5.3	----------NOTE---------- Not applicable to Unit(s) with ESPS digital upgrade complete. ---------- Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.5.4	Perform CHANNEL CALIBRATION.	24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	12 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.6.1	Perform CHANNEL FUNCTIONAL TEST.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.7.1	----------NOTE---------- Only applicable to Unit(s) with the ESPS digital upgrade complete ---------- Manually actuate the output channel interposing relays.	92 days
SR 3.3.7.2	Perform automatic actuation output logic CHANNEL FUNCTIONAL TEST.	92 days for Unit(s) with the ESPS digital upgrade not complete. AND 24 months for Unit(s) with the ESPS digital upgrade complete.

SURVEILLANCE REQUIREMENTS

----------NOTE----------
These SRs apply to each PAM instrumentation Function in Table 3.3.8-1 except where indicated.

SURVEILLANCE		FREQUENCY
SR 3.3.8.1	Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.8.2	----------NOTE---------- Only applicable to PAM Functions 7 and 22. ---------- Perform CHANNEL CALIBRATION.	12 months
SR 3.3.8.3	----------NOTES---------- 1. Neutron detectors are excluded from CHANNEL CALIBRATION. 2. Not applicable to PAM Functions 7 and 22. ---------- Perform CHANNEL CALIBRATION.	24 months

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.4 Verify SDM to be within the limit specified in the COLR.	1 hour AND Once per 12 hours thereafter
C. One or more required source range neutron flux channel(s) inoperable with THERMAL POWER level > 4E-4% RTP on the wide range neutron flux channels.	C.1 Initiate action to restore affected channel(s) to OPERABLE status.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.9.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.9.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.10.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.10.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	 24 months
SR 3.3.10.3	Verify at least one decade overlap between source range and wide range neutron flux channels.	Once each reactor startup prior to the source range indication exceeding 10^5 cps if not performed within the previous 7 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 3. AND C.2 Reduce main steam header pressure to <700 psig.	12 hours 18 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.11.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.11.2	Perform CHANNEL FUNCTIONAL TEST.	31 days
SR 3.3.11.3	Perform CHANNEL CALIBRATION.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.12.1	Perform CHANNEL FUNCTIONAL TEST.	24 months

3.3 INSTRUMENTATION

3.3.13 Automatic Feedwater Isolation System (AFIS) Digital Channels

LCO 3.3.13 Two AFIS digital channels per steam generator (SG) shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODE 3 with main steam header pressure ≥ 700 psig.

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each SG.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One digital channel inoperable.	A.1 Restore digital channel to OPERABLE status.	72 hours
B. Two digital channels inoperable. OR Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Reduce main steam header pressure to < 700 psig	12 hours 18 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.13.1	Perform CHANNEL FUNCTIONAL TEST.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.14.1	Perform CHANNEL FUNCTIONAL TEST for each LOMF pump instrumentation channel.	31 days
SR 3.3.14.2	Perform CHANNEL FUNCTIONAL TEST for each manual initiation circuit.	92 days
SR 3.3.14.3	Perform CHANNEL FUNCTIONAL TEST for each automatic initiation circuit.	24 months
SR 3.3.14.4	Perform CHANNEL CALIBRATION for each LOMF pump instrumentation channel.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.16.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.16.2	Perform CHANNEL FUNCTIONAL TEST.	Once each refueling outage prior to movement of recently irradiated fuel assemblies within containment
SR 3.3.16.3	Perform CHANNEL CALIBRATION.	24 months

3.3 INSTRUMENTATION

3.3.17 Emergency Power Switching Logic (EPSL) Automatic Transfer Function

LCO 3.3.17 Two channels of the EPSL Automatic Transfer Function shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One channel inoperable.	A.1 ----------NOTE---------- The Completion Time is reduced when in Condition L of LCO 3.8.1. ---------- Restore channel to OPERABLE status.	24 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	AND	
	B.2 Be in MODE 5.	84 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.17.1	Perform CHANNEL FUNCTIONAL TEST.	24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time not met in MODES 1, 2, 3, and 4.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	12 hours 84 hours
C. Two or more channels of a required circuit inoperable when not in MODES 1, 2, 3, and 4. OR Required Action and associated Completion Time not met when not in MODES 1, 2, 3, and 4.	C.1 Declare affected AC power source(s) inoperable.	Immediately
D. Required Action and associated Completion Time not met during movement of irradiated fuel assemblies.	D.1 Suspend movement of irradiated fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.18.1	Perform CHANNEL FUNCTIONAL TEST.	24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Two or more voltage sensing channels inoperable. OR Two actuation logic channels inoperable.	D.1 Declare the overhead emergency power path inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.19.1	Perform a CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.19.2	Perform a CHANNEL CALIBRATION of the voltage sensing channel with the setpoint allowable value as follows: Degraded voltage ≥ 226 kV and ≤ 229 kV with a time delay of 9 seconds ± 1 second.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.20.1	Perform a CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.20.2	Perform a CHANNEL CALIBRATION of the voltage sensing channel with the setpoint allowable value as follows: a. Degraded voltage ≥ 4143 V and ≤ 4185 V with a time delay of 9 seconds ± 1 second for the first level undervoltage inputs; and b. Degraded voltage ≥ 3871 V and ≤ 3901 V for the second level undervoltage inputs.	24months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.21.1	Perform CHANNEL FUNCTIONAL TEST.	24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time not met.	D.1 Initiate action in accordance with Specification 5.6.6.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.23.1	Perform a CHANNEL FUNCTIONAL TEST.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.27.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.27.2	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.27.3	Perform CHANNEL CALIBRATION.	24 months

3.3 INSTRUMENTATION

3.3.28 Low Pressure Service Water (LPSW) Standby Pump Auto-Start Circuitry

LCO 3.3.28 LPSW Standby Pump Auto-Start Circuitry shall be OPERABLE.

----------NOTE----------
LPSW Standby Pump auto-start circuit is not required to be OPERABLE on running LPSW pumps.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LPSW standby pump auto-start circuitry inoperable.	A.1 Restore LPSW standby pump auto-start circuitry to OPERABLE status.	7 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	12 hours 60 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.28.1	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.28.2	Perform CHANNEL CALIBRATION.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	----------NOTE---------- With three RCPs operating, the limits are applied to the loop with the highest pressure. ---------- Verify RCS loop pressure is within limits specified in the COLR.	12 hours
SR 3.4.1.2	----------NOTE---------- With three RCPs operating, the limits are applied to the loop with the lowest loop average temperature for the condition where there is a 0°F ΔTc setpoint. ---------- Verify RCS loop average temperature is within limits specified in the COLR.	12 hours
SR 3.4.1.3	Verify RCS total flow is within limits specified in the COLR.	12 hours
SR 3.4.1.4	----------NOTE---------- Not required to be performed until 7 days after stable thermal conditions are established in the higher power range of MODE 1. ---------- Verify by measurement RCS total flow rate is within limit specified in the COLR.	24 months

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Required Action and associated Completion Time of Condition C not met.	D.1	Be in MODE 3.	12 hours
	AND		
	D.2	Reduce RCS temperature to ≤ 325°F.	18 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.9.1	Verify pressurizer water level ≤ 285 inches.	12 hours
SR 3.4.9.2	Verify capacity of required pressurizer heaters and associated power supplies are ≥ 400 kW.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.12.6	Verify Administrative Controls, other than limits for pressurizer level, that assure ≥ 10 minutes are available for operator action to mitigate an LTOP event are implemented for the following: a. RCS pressure when RCS temperature is < 325°F; b. Makeup flow rate; c. Alarms; d. High pressure Nitrogen System; and e. Verify pressurizer heater bank 3 or 4 is deactivated	12 hours
SR 3.4.12.7	Perform CHANNEL CALIBRATION for PORV.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.14.1	----------NOTE---------- Not required to be performed in MODES 3 and 4. ---------- Verify leakage from each required RCS PIV is equivalent to ≤ 0.5 gpm per nominal inch of valve size up to a maximum of 5 gpm at an RCS pressure ≥ 2150 psia and ≤ 2190 psia.	24 months <u>AND</u> Prior to entering MODE 2 whenever the unit has been in MODE 5 for ≥ 7 days, if leakage testing has not been performed in the previous 9 months.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of required containment atmosphere radioactivity monitor.	12 hours
SR 3.4.15.2	Perform CHANNEL FUNCTIONAL TEST of required containment atmosphere radioactivity monitor.	92 days
SR 3.4.15.3	Perform CHANNEL CALIBRATION of required containment sump level indication.	24 months
SR 3.4.15.4	Perform CHANNEL CALIBRATION of required containment atmosphere radioactivity monitor.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.3	Verify each HPI pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.2.4	Verify each HPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.5.2.5	Verify each HPI pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.5.2.6	Verify, by visual inspection, each HPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.	24 months
SR 3.5.2.7	Cycle each HPI discharge crossover valve and LPI-HPI flow path discharge valve.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.3.2	----------NOTE---------- Not applicable to operating LPI pump(s). ---------- Vent each LPI pump casing.	31 days
SR 3.5.3.3	Verify each LPI pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.3.4	Verify each LPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.5.3.5	Verify each LPI pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.5.3.6	Verify, by visual inspection, each LPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.2.1	----------NOTES---------- 1. An inoperable air lock door does not invalidate the previous successful performance of the overall air lock leakage test. 2. Results shall be evaluated against acceptance criteria of SR 3.6.1.2 in accordance with 10 CFR 50, Appendix J, Option A, as modified by approved exemptions. ----------	----------NOTE---------- SR 3.0.2 is not applicable ----------
	Perform required air lock leakage rate testing in accordance with 10 CFR 50, Appendix J, Option A, as modified by approved exemptions.	In accordance with 10 CFR 50, Appendix J, Option A, as modified by approved exemptions
SR 3.6.2.2	Verify only one door in the air lock can be opened at a time.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.3.4	Verify the isolation time of each automatic power operated containment isolation valve is within limits.	In accordance with the Inservice Testing Program
SR 3.6.3.5	Verify each automatic containment isolation valve that is not locked, sealed, or otherwise secured in position, actuates to the isolation position on an actual or simulated actuation signal.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	----------NOTE---------- Applicable for RB cooling system after the completion of the LPSW RB Waterhammer Modification on the respective Unit. ---------- Verify each reactor building spray and cooling manual and non-automatic power operated valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days
SR 3.6.5.2	Operate each required reactor building cooling train fan unit for ≥ 15 minutes.	31 days
SR 3.6.5.3	Verify each required reactor building spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.5.4	Verify that the containment heat removal capability is sufficient to maintain post accident conditions within design limits.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.5.5	----------NOTE---------- Applicable for RB cooling system after the completion of the LPSW RB Waterhammer Modification on the respective Unit. ---------- Verify each automatic reactor building spray and cooling valve in each required flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.6.5.6	Verify each required reactor building spray pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.5.7	Verify each required reactor building cooling train starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.5.8	Verify each spray nozzle is unobstructed.	10 years

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.2.1	----------NOTE---------- Only required to be performed in MODES 1 and 2. ---------- Verify closure time of each TSV is ≤ 1.0 seconds on an actual or simulated actuation signal from Channel A.	24 months
SR 3.7.2.2	----------NOTE---------- Only required to be performed in MODES 1 and 2. ---------- Verify closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel B.	24months

3.7 PLANT SYSTEMS

3.7.4 Atmospheric Dump Valve (ADV) Flow Paths

LCO 3.7.4 The ADV flow path for each steam generator shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3, and MODE 4 when steam generator is relied upon for heat removal.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or both ADV flow path(s) inoperable.	A.1 Be in MODE 3.	12 hours
	AND	
	A.2 Be in MODE 4 without reliance upon steam generator for heat removal.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.4.1	Cycle the valves that comprise the ADV flow paths.	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.1	Verify each EFW manual, and non-automatic power operated valve in each water flow path and in the steam supply flow path to the turbine driven pump, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.5.2	Verify the developed head of each EFW pump at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.7.5.3	----------NOTE---------- Not required to be met in MODES 3 and 4. ---------- Verify each EFW automatic valve that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.7.5.4	----------NOTE---------- Not required to be met in MODES 3 and 4. ---------- Verify each EFW pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.7.5.5	Verify proper alignment of the required EFW flow paths by verifying valve alignment from the upper surge tank to each steam generator.	Prior to entering MODE 2 whenever unit has been in MODE 5 or 6 for > 30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.7.1	Verify LPSW leakage accumulator level is within Water levels between 20.5" to 41" for Units with LPSW RB Waterhammer modification installed. During LPSW testing, accumulator level > 41" is acceptable.	12 hours
SR 3.7.7.2	----------NOTE---------- Isolation of LPSW flow to individual components does not render the LPSW System inoperable. ---------- Verify each LPSW manual, and non-automatic power operated valve in the flow path servicing safety related equipment, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.7.3	Verify each LPSW automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.7.7.4	Verify each LPSW pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.7.7.5	Verify LPSW leakage accumulator is able to provide makeup flow lost due to boundary valve leakage on Units with LPSW RB Waterhammer modification installed.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.7.6	Verify LPSW WPS boundary valve leakage is ≤ 20 gpm for Units with LPSW RB Waterhammer modification installed.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.7.8.8	Verify each required ESV pump automatically starts in ≤ 1200 seconds upon an actual or simulated restoration of emergency power.	92 days
SR 3.7.8.9	----------NOTE---------- Not required to be performed for Units 1 and 2 with the shared Unit 1 and 2 LPSW System taking suction from the siphon. ---------- Verify upon an actual or simulated trip of the CCW pumps and ESV pumps that the rate of water level drop in the ECCW siphon header is within limits.	24 months

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time not met in MODE 1, 2, 3, or 4.	D.1 Be in MODE 3. AND D.2 Be in MODE 5	12 hours 36 hours
E. Required Action and associated Completion Time not met during movement of recently irradiated fuel assemblies.	E.1 Suspend movement of recently irradiated fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.9.1	Operate each CRVS Booster Fan train for ≥ 1 hour.	92 days
SR 3.7.9.2	Perform required CRVS Booster Fan train filter testing in accordance with the Ventilation Filter Testing Program (VFTP).	In accordance with the VFTP
SR 3.7.9.3	Verify two CRVS Booster Fan trains can maintain the Control Room at a positive pressure.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	Verify each KHU's battery cell to cell and terminal connections are clean and tight, and are coated with anti-corrosion material.	12 months
SR 3.8.1.13	----------NOTE---------- Only applicable when the overhead electrical disconnects for the KHU associated with the underground emergency power path are closed. ---------- Verify on an actual or simulated zone overlap fault signal each KHU's overhead tie breaker and underground tie breaker actuate to the correct position.	12 months
SR 3.8.1.14	----------NOTE---------- Not required to be performed for an SL breaker when its standby bus is energized from a LCT via an isolated power path. ---------- Verify each closed SL and closed N breaker opens on an actuation of each redundant trip coil.	24 months
SR 3.8.1.15	----------NOTE---------- Redundant breaker trip coils shall be verified on a STAGGERED TEST BASIS. ---------- Verify each 230 kV switchyard circuit breaker actuates to the correct position on a switchyard isolation actuation signal.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.16	----------NOTE---------- Only applicable when complying with Required Action C.2.2.4. ---------- Verify one KHU provides an alternate manual AC power source capability by manual or automatic KHU start with manual synchronize, or breaker closure, to energize its non-required emergency power path.	As specified by Required Action C.2.2.4
SR 3.8.1.17	Verify each KHU's Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers. The allowable values with a time delay of 5 seconds ± 1 second shall be as follows: a. Undervoltage ≥ 12.42 kV and ≤ 12.63 kV b. Overvoltage ≥ 14.90 kV and ≤ 15.18 kV c. Underfrequency ≥ 53.992 hz and ≤ 54.008 hz d. Overfrequency ≥ 65.992 hz and ≤ 66.008 hz	24 months

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.9.2.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	 24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.10.1.11	Verify for required SSF battery that the cell to cell and terminal connections are clean, tight and coated with anti-corrosion material.	12 months
SR 3.10.1.12	Verify battery capacity of required battery is adequate to supply, and maintain in OPERABLE status, the required maximum loads for the design duty cycle when subjected to a battery service test.	12 months
SR 3.10.1.13	Perform CHANNEL CALIBRATION for each required SSF instrument channel.	24 months
SR 3.10.1.14	Verify OPERABILITY OF SSF valves in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program
SR 3.10.1.15	----------NOTE---------- Not applicable to the SSF submersible pump. ---------- Verify the developed head of each required SSF pump at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.10.1.16	Verify the developed head of the SSF submersible pump at the flow test point is greater than or equal to the required developed head.	2 years

5.5 Programs and Manuals (continued)

5.5.11 Secondary Water Chemistry

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables;

b. Identification of the procedures used to measure the values of the critical variables;

c. Identification of process sampling points;

d. Procedures for the recording and management of data;

e. Procedures defining corrective actions for all off control point chemistry conditions; and

f. A procedure identifying the authority responsible for the interpretation of the data and the sequence and timing of administrative events, which is required to initiate corrective action.

5.5.12 Ventilation Filter Testing Program (VFTP)

A program shall be established to implement the following required testing of filter ventilation systems at the frequencies specified in Regulatory Guide 1.52, Revision 2, except that the testing specified at a frequency of 18 months is required at a frequency of 24 months.

The VFTP is applicable to the Control Room Ventilation System (CRVS) Booster Fan Trains and the Spent Fuel Pool Ventilation System (SFPVS).

a. Demonstrate, for the CRVS Booster Fan Trains, that a DOP test of the HEPA filters shows ≥ 99.5% removal when tested in accordance with ANSI N510-1975 at the system design flow rate ± 10%.

b. Demonstrate, for the CRVS Booster Fan Trains, that a halogenated hydrocarbon test of the carbon adsorber shows ≥ 99% removal when tested in accordance with ANSI N510-1975 at the system design flow rate ± 10%.

ATTACHMENT 3

MARKED-UP TECHNICAL SPECIFICATION BASES PAGES

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.6

The SR is modified by a Note indicating that it is only applicable to Unit(s) with the RPS digital upgrade complete. This SR requires manual actuation of the output channel interposing relays to demonstrate OPERABILITY of the relays. The proper functioning of the processor portion of the channel is continuously checked by an automatic cyclic self monitoring.

The Frequency of 92 days is considered adequate based on operating experience that demonstrates the rarity of more than one channel's relay failing within the same interval.

SR 3.3.1.7

A Note to the Surveillance indicates that neutron detectors are excluded from CHANNEL CALIBRATION. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure virtually instantaneous response.

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and **bistable** *(or processor output trip device for Unit(s) with the RPS digital upgrade complete)* setpoint errors are within the assumptions of the uncertainty analysis. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the resistance temperature detectors (RTD) sensors is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element.

24

The ~~18~~ month frequency for the CHANNEL FUNCTIONAL TEST is based on design capabilities and reliability of the digital RPS. Since the CHANNEL FUNCTIONAL TEST is a part of the CHANNEL CALIBRATION a separate SR is not retained. The digital RPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continuous online hardware monitoring. The CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.7 (continued)

For Unit(s) with the RPS digital upgrade complete, the digital processors shall be rebooted as part of the calibration. This verifies that the software and setpoints have not changed. a 24

The Frequency is justified by the assumption of ~~an 18~~ month calibration interval in the determination of the magnitude of equipment drift in the uncertainty analysis. *For Unit(s) with the digital upgrade complete, the ~~18~~ 24 month calibration interval is also justified by the reliability of components whose failure modes are not automatically detected or indicated.*

REFERENCES

1. UFSAR, Chapter 7.
2. UFSAR, Chapter 15.
3. 10 CFR 50.49.
4. EDM-102, "Instrument Setpoint/Uncertainty Calculations."
5. NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1979.
6. BAW-10167, May 1986.
7. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.4

CHANNEL CALIBRATION is a complete check of the input instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION assures that measurement errors and **bistable** *(or processor output trip device for Unit(s) with the ESPS digital upgrade complete)* setpoint errors are within the assumptions of the unit specific uncertainty analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the uncertainty analysis.

24

The ~~18~~ month frequency for the CHANNEL FUNCTIONAL TEST is based on design capabilities and reliability of the digital ESPS. Since the CHANNEL FUNCTIONAL TEST is a part of the CHANNEL CALIBRATION a separate SR is not retained. The digital ESPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continuous online hardware monitoring. The CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function.

For Unit(s) with the ESPS digital upgrade complete, the digital processors shall be rebooted as part of the calibration. This verifies that the software and setpoints have not changed.

a 24

This Frequency is justified by the assumption of an ~~18~~ month calibration interval to determine the magnitude of equipment drift in the uncertainty analysis. *For Unit(s) with the digital upgrade complete, the ~~18~~ month calibration interval is justified by the reliability of components whose failure modes are not automatically detected or indicated.*

24

REFERENCES

1. UFSAR, Chapter 7.
2. 10 CFR 50.49.
3. EDM-102, "Instrument Setpoint/Uncertainty Calculations."
4. UFSAR, Chapter 15.
5. 10 CFR 50.36.

BASES

ACTIONS

B.1 and B.2 (continued)

With the Required Action and associated Completion Time not met, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 12 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.6.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST of the ESPS manual initiation. This test verifies that the initiating circuitry is OPERABLE and will actuate the automatic actuation output logic channels. The ~~18~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency is demonstrated to be sufficient, based on operating experience, which shows these components usually pass the Surveillance when performed on the ~~18~~ 24 month Frequency.

REFERENCES

1. 10 CFR 50.36.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.7.1

The SR is modified by a Note indicating that it is only applicable to Unit(s) with the ESPS digital upgrade complete. This SR requires manual actuation of the output channel interposing relays to demonstrate OPERABILITY of the relays. The proper functioning of the processor portion of the channel is continuously checked by automatic cyclic self monitoring.

The Frequency of 92 days is considered adequate based on operating experience that demonstrates the rarity of more than one channel's relay failing within the same interval.

SR 3.3.7.2

SR 3.3.7.2 is the performance of a CHANNEL FUNCTIONAL TEST on a 92 day Frequency for Unit(s) with the ESPS digital upgrade not complete *and ~~an 18~~ month Frequency for Unit(s) with the ESPS digital upgrade complete. For Unit(s) with the ESPS digital upgrade complete, the digital processors shall be rebooted as part of the functional test. This verifies that the software and setpoints have not changed.*

a 24

For Unit(s) with the ESPS digital upgrade not complete, the 92 day Frequency is based on operating experience that demonstrates the rarity of more than one channel failing within the same interval.

24

For Unit(s) with the ESPS digital upgrade complete, the ~~18~~ month Frequency is based on the design capabilities and reliability of the new digital ESPS. The digital ESPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continual online hardware monitoring. The CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function. The reliability of components whose failure modes are not automatically detected or indicated also support a test frequency of ~~18~~ months.

24

REFERENCES

1. 10 CFR 50.46.

2. UFSAR, Chapter 15.

3. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.9.1 (continued)

the channels are normally off scale during times when surveillance is required, the CHANNEL CHECK will only verify that they are off scale in the same direction.

The Frequency, equivalent to every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel OPERABILITY during normal operational use of the displays associated with the LCO's required channels. When operating in Required Action A.1, CHANNEL CHECK is still required. However, in this condition, a redundant source range may not be available for comparison. CHANNEL CHECK may still be performed via comparison with wide range detectors, if available, and verification that the OPERABLE source range channel is energized and indicating a value consistent with current unit status.

SR 3.3.9.2

For source range neutron flux channels, CHANNEL CALIBRATION is a complete check and readjustment of the channels from the preamplifier input to the indicators. This test verifies the channel responds to measured parameters within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests.

The SR is modified by a Note excluding neutron detectors from CHANNEL CALIBRATION. It is not necessary to test the detectors because generating a meaningful test signal is difficult. The detectors are of simple construction, and any failures in the detectors will be apparent as change in channel output.

The Frequency of ~~18 months~~ 24 months is based on demonstrated instrument CHANNEL CALIBRATION reliability over ~~an 18 month~~ a 24 month interval, such that the instrument is not adversely affected by drift.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.10.2 (continued)

The SR is modified by a Note excluding neutron detectors from CHANNEL CALIBRATION. It is not necessary to test the detectors because generating a meaningful test signal is difficult. In addition, the detectors are of simple construction, and any failures in the detectors will be apparent as a change in channel output. The Frequency is based on operating experience and consistency with the typical industry refueling cycle and is justified by demonstrated instrument reliability over ~~an 18 month~~ a 24 month interval such that the instrument is not adversely affected by drift.

SR 3.3.10.3

SR 3.3.10.3 is the verification once each reactor startup of one decade of overlap with the source range neutron flux instrumentation. The wide range detector should be on scale and indicating ≥ 1E-8% of RTP when the source range detector is indicating ≤ 10^4 counts per second in order for the wide range detector to indicate a one decade change prior to the source range detector going off scale. This ensures a continuous source of power indication during the approach to criticality.

The test may be omitted if performed within the previous 7 days based on operating experience, which shows that source range and wide range instrument overlap does not change appreciably within this test interval.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.11.1 (continued)

The frequency, about once every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel OPERABILITY during normal operational use of the displays associated with the LCO required channels.

SR 3.3.11.2

A CHANNEL FUNCTIONAL TEST is performed by comparing the test input signal to the value transmitted to the Calibration and Test Computer. This enables verification of the voltage references and the signal commons. This will ensure the channel will perform its intended function.

The Frequency of 31 days is based on operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel in any 31 day interval is a rare event.

SR 3.3.11.3

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The test verifies the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is based on the assumption of ~~an 18 month~~ a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. 10 CFR 50.36.

BASES (continued)

ACTIONS

A Note has been added to the ACTIONS indicating that a separate Condition entry is allowed for manual initiation switches associated with each SG.

A.1

With one manual initiation switch per steam generator inoperable, the manual initiation switch must be restored to OPERABLE status within 72 hours. The Completion Time of 72 hours is based on unit operating experience and administrative controls, which provide alternative means of AFIS initiation via individual component controls. The 72 hour Completion Time is consistent with the allowed outage time for the components actuated by the AFIS.

B.1

With both manual initiation switches per steam generator inoperable or the Required Action and associated Completion Time of Condition A not met, the Unit must be placed in MODE 3 within 12 hours and the main steam header pressure reduced to less than 700 psig within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging Unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.12.1

This SR requires the performance of a digital CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during unit operation is avoided.

REFERENCES

1. IEEE-279-1971, April 1972.

2. 10 CFR 50.36.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.13.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the digital channels can perform their intended functions. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during Unit operation is avoided.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.14.3 (continued)

circuit and verifies successful operation of the automatic initiation circuit. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during operation are avoided.

SR 3.3.14.4

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The test verifies the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is based on the assumption of ~~an 18 month~~ a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. UFSAR, Chapters 7 and 15.

2. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.16.1 (continued)

radiation monitoring instrumentation channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. Performance of the CHANNEL CHECK helps to ensure that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared to similar unit instruments located throughout the unit. If the radiation monitor uses keep alive sources or check sources OPERABLE from the control room, the CHANNEL CHECK should also note the detector's response to these sources.

Agreement criteria are based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the transmitter or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE. The 12 hour Frequency, about once every shift, is based on operating experience that demonstrates channel failure is rare. Additionally, control room alarms and annunciators are provided to alert the operator to various "trouble" conditions associated with the instrument.

SR 3.3.16.2

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channel can perform its intended function. The frequency requires the isolation capability of the reactor building purge valves to be verified functional once each refueling outage prior to movement of recently irradiated fuel assemblies within containment. This ensures that this function is verified prior to recently irradiated fuel assembly handling within containment. This test verifies the capability of the instrumentation to provide the RB isolation.

SR 3.3.16.3

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy.

The ~~18 month~~ 24 month Frequency is based on engineering judgment and industry accepted practice.

BASES

ACTIONS

A.1 (continued)

Required Action A.1 is modified by a Note which indicates that the Completion Time is reduced when in Condition L of LCO 3.8.1. Condition L limits the Completion Time for restoring an inoperable channel to 4 hours when emergency power source(s) or offsite power source(s) are inoperable for extended time periods or for specific reasons.

B.1 and B.2

With the Required Action and associated Completion Time not met, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 in 12 hours and to MODE 5 within 84 hours. The allowed Completion Times are reasonable, based on operating experience, to allow for a controlled shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.3.17.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST of the EPSL automatic transfer function. The ES inputs to the Load Shed and Transfer to Standby function and the Retransfer to Startup function are verified to operate properly during an automatic transfer of the Main Feeder Buses to the Startup Transformer, Standby Buses, and retransfer to the Startup Transformers. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

REFERENCES

1. UFSAR, Chapters 6 and 15.
2. 10 CFR 50.36.

BASES (continued)

ACTIONS (continued)

D.1

With the Required Action and associated Completion Time not met during movement of irradiated fuel assemblies, movement of fuel assemblies must be suspended immediately. Suspension does not preclude completion of actions to establish a safe conservative condition. This action minimizes the probability or the occurrence of postulated events. The Completion Time of immediately is consistent with the required times for actions requiring prompt attention

SURVEILLANCE REQUIREMENTS

SR 3.3.18.1

A CHANNEL FUNCTIONAL TEST is performed on each voltage sensing circuit channel to ensure the channel will perform its function. A circuit is defined as three channels, one for each phase. Each channel consists of components from the sensing power transformer through the circuit auxiliary relays which operate contacts in the EPSL logic and breaker trip circuits. Minimum requirements consist of individual channel relay operation causing appropriate contact responses within associated loadshed/breaker circuits, alarm activations, and proper indications for the sensing circuit control power status. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

REFERENCES

1. UFSAR, Chapters 6 and 15.
2. 10 CFR 50.36.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.19.1

A CHANNEL FUNCTIONAL TEST is performed on each DGVP voltage sensing channel and DGVP actuation logic channel to ensure the entire channel will perform its intended function. Any setpoint adjustments shall be consistent with the assumptions of the setpoint analysis. The CHANNEL FUNCTIONAL TEST of the DGVP actuation logic channels includes verifying actuation of the switchyard isolation circuitry. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

SR 3.3.19.2

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is justified by the assumption of ~~an 18 month~~ a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. UFSAR, Chapter 8.

2. 10 CFR 50.36.

BASES

ACTIONS

B.1 (continued)

capable of providing the CT-5 DGVP function. The 72 hour completion time is based on engineering judgement taking into consideration the infrequency of actual grid system voltage degradation and the probability of an event requiring an ES actuation.

C.1 and C.2

If two or more voltage sensing relay channels or two actuation logic channels are inoperable, automatic protection from degraded grid voltage for the standby buses powered from the 100 kV transmission system is not available. Continued operation is allowed provided that the SL breakers are opened within one hour.

Additionally, with the Required Action and associated Completion Time of Condition A or B not met, the SL breakers must be opened within one hour. This arrangement provides a high degree of reliability for the emergency power system. The one hour Completion Time is based on engineering judgement taking into consideration the infrequency of actual grid system voltage degradation and the probability of an event requiring an ES actuation.

SURVEILLANCE REQUIREMENTS

SR 3.3.20.1

A CHANNEL FUNCTIONAL TEST is performed on each CT-5 DGVP voltage sensing channel and each CT-5 DGVP actuation logic channel to ensure the entire channel will perform its intended function. Any setpoint adjustments shall be consistent with the assumptions of the setpoint analysis. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

SR 3.3.20.2

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.20.2 (continued)

between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is justified by the assumption of ~~an 18 month~~ a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. UFSAR, Chapter 8.
2. 10 CFR 50.36.

BASES

ACTIONS

B.1 and B.2 (continued)

hours and to MODE 5 within 84 hours. The allowed Completion Times are reasonable, based on operating experience, to allow for a controlled shutdown.

C.1

With both channels of the Keowee Emergency Start function inoperable then both Keowee Hydro Units must be declared inoperable immediately. The appropriate Required Actions will be implemented in accordance with LCO 3.8.1, "AC Sources–Operating."

SURVEILLANCE REQUIREMENTS

SR 3.3.21.1

A CHANNEL FUNCTIONAL TEST is performed on each Keowee Emergency Start channel to ensure the channel will perform its function during an automatic transfer of the Main Feeder Buses to the Startup Transfer, Standby Buses, and retransfer to the Startup Transformers. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

REFERENCES

1. UFSAR, Chapters 6 and 15.
2. 10 CFR 50.36.

BASES

ACTIONS (continued)

C.1 and C.2

With two or more voltage sensing channels or both actuation logic channels inoperable, automatic protection for LOOP events is no longer available. This places additional burden on the operators, even though they are still the credible resource for restoring power in a LOOP event. EPSL response from ES events are not affected. Therefore, allowable time for this condition is limited to 24 hours. The completion time is based on engineering judgement and the availability of adequate time for operator response to a LOOP.

The Condition is modified by a Note indicating that this condition may be entered independently for each set of channels associated with a main feeder bus. The Condition may also be entered independently for inoperable logic channels or inoperable voltage sensing channels. The Completion Time(s) are tracked separately from the time the Condition is entered for each.

D.1

With the Required Action and associated Completion Time not met, Required Action D.1 specifies initiation of action described in Specification 5.6.6 that requires a written report to be submitted to the NRC. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. This action is appropriate since the MFBMP does not provide the only layer of protection in any DBE, but does provide defense-in-depth for any scenario which results in loss of power to the Main Feeder Busses. Operator actions are credited for SBO mitigation. The Completion Time of "Immediately" for Required Action D.1 ensures the requirements of Specification 5.6.6 are initiated.

SURVEILLANCE REQUIREMENTS

SR 3.3.23.1

A CHANNEL FUNCTIONAL TEST is performed on each MFBMP voltage sensing channel and MFBMP actuation logic channel to ensure the MFBMP will perform its intended function. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience that determined testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.27.1 (continued)

period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel operability during normal operational use of the displays associated with the LCO's required channels.

SR 3.3.27.2

A CHANNEL FUNCTIONAL TEST is performed on each channel to ensure the circuitry will perform its intended function. The Frequency of 92 days is based on engineering judgment and operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel in any 92 day interval is a rare event.

SR 3.3.27.3

A CHANNEL CALIBRATION is a complete check of the analog instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. The CHANNEL CALIBRATION leaves the components adjusted to account for instrument drift to ensure that the circuitry remains operational between successive tests. The ~~18-month~~ 24-month Frequency is justified by the assumption of ~~an 18-month~~ a 24-month calibration interval in the setpoint analysis determination of instrument drift during that interval.

REFERENCES

1. 10 CFR 50.36.

BASES

ACTIONS

B.1 and B.2 (continued)

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.28.1

A CHANNEL FUNCTIONAL TEST is performed on each LPSW Pump to ensure the auto-start circuit will perform its intended function. The Frequency of ~~18 months~~ 24 months is based on engineering judgment and operating experience. Testing on ~~an 18 month~~ a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

SR 3.3.28.2

A CHANNEL CALIBRATION is performed to verify that the components respond to the measured parameter within the necessary range and accuracy. The CHANNEL CALIBRATION leaves the components adjusted to account for instrument drift to ensure that the auto-start circuitry remains operational between successive tests. The Frequency is justified by the assumption of ~~an 18 month~~ a 24 month calibration interval in the determination of the drift in the setpoint analysis.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1 (continued)

restored to a normal operation, steady state condition following load changes and other expected transient operations. The RCS pressure value specified in the COLR is dependent on the number of pumps in operation and has been adjusted to account for the pressure loss difference between the core exit and the measurement location. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify operation is within safety analysis assumptions. A Note has been added to indicate the pressure limits for three pumps operating is applied to the loop with the highest pressure.

SR 3.4.1.2

Since Required Action A.1 allows a Completion Time of 2 hours to restore parameters that are not within limits, the 12 hour Surveillance Frequency for loop average temperature is sufficient to ensure that the RCS coolant temperature can be restored to a normal operation, steady state condition following load changes and other expected transient operations. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify that operation is within safety analysis assumptions. A Note has been added to indicate the temperature limits for three pumps operating are applied to the loop with the lowest loop average temperature for the condition in which there is a 0°F ΔTc setpoint.

SR 3.4.1.3

The 12 hour Surveillance Frequency for RCS total flow rate is performed using the installed flow instrumentation. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify that operation is within safety analysis assumptions.

SR 3.4.1.4

Measurement of RCS total flow rate by performance of a calorimetric heat balance once every ~~18 months~~ 24 months allows the installed RCS flow instrumentation to be calibrated and verifies that the actual RCS flow is greater than or equal to the minimum required RCS flow rate specified in the COLR.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.4 (continued)

The Frequency of ~~18 months~~ 24 months reflects the importance of verifying flow after a refueling outage when the core has been altered or RCS flow characteristics may have been modified, which may have caused change of flow. The Surveillance is modified by a Note that indicates the SR does not need to be performed until 7 days after stable thermal conditions are established at higher power levels. The Note is necessary to allow measurement of the flow rate at normal operating conditions at power in MODE 1. The Surveillance cannot be performed at low power or in MODE 2 or below because at low power the ΔT across the core may be too small to provide meaningful test results.

REFERENCES

1. UFSAR, Chapter 15.

2. 10 CFR 50.36

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

or by performing an electrical check on heater element continuity and resistance.) The Frequency of ~~18 months~~ 24 months is considered adequate to detect heater degradation and has been shown by operating experience to be acceptable.

REFERENCES

1. 10 CFR 50.36.

2. NUREG-0737, November 1980.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.12.6 (continued)

The Frequency is shown by operating practice sufficient to regularly assess indications of potential degradation and verify operation within the safety analysis.

SR 3.4.12.7

The performance of a CHANNEL CALIBRATION is required every ~~18 months~~24 months. The CHANNEL CALIBRATION for the LTOP setpoint ensures that the PORV will be actuated at the appropriate RCS pressure by verifying the accuracy of the instrument string.

REFERENCES

1. 10 CFR 50, Appendix G.
2. Generic Letter 88-11.
3. UFSAR, 5.2.3.7.
4. 10 CFR 50.36.

BASES

ACTIONS

A.1 and A.2 (continued)

Required Action A.2 specifies that the double isolation barrier of two valves be restored by closing some other valve qualified for isolation. The 72 hour time after exceeding the limit considers the time required to complete the Action and the low probability of a second valve failing during this time period.

B.1 and B.2

If Required Actions and associated Completion Times are not met, the unit must be brought to a MODE in which the requirement does not apply. To achieve this status, the unit must be brought to MODE 3 within 12 hours and to MODE 5 within 36 hours. This Required Action may reduce the leakage and also reduces the potential for a LOCA outside the containment. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.14.1

Performance of leakage testing on each required RCS PIV or isolation valve used to satisfy Required Action A.1 or A.2 is required to verify that leakage is below the specified limit and to identify each leaking valve. The leakage limit of 0.5 gpm per inch of nominal valve diameter up to 5 gpm maximum applies to each valve. Leakage testing requires a stable pressure condition.

For the two PIVs in series, the leakage requirement applies to each valve individually and not to the combined leakage across both valves. If the PIVs are not individually leakage tested, one valve may have failed completely and not detected if the other valve in series meets the leakage requirement. In this situation, the protection provided by redundant valves would be lost.

Testing is to be performed every ~~18 months~~ 24 months, a typical refueling cycle, if the unit does not go into MODE 5 for at least 7 days. The ~~18 month~~ 24 month Frequency is consistent with 10 CFR 50.55a(g) (Ref. 8) as contained in the Inservice Testing Program, is within frequency allowed by the American Society of Mechanical Engineers (ASME) Code, Section XI (Ref. 7), and is based on the need to perform such surveillances under conditions that apply during an outage and the potential for an unplanned transient if the Surveillance were performed with the unit at power.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a CHANNEL FUNCTIONAL TEST of the required containment atmosphere radioactivity monitor. The test ensures that the monitor can perform its function in the desired manner. The test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency of 92 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.15.3 and SR 3.4.15.4

These SRs require the performance of a CHANNEL CALIBRATION for each of the required RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of ~~18 months~~ 24 months is a typical refueling cycle and considers channel reliability. Industry operating experience has proven this Frequency is acceptable.

REFERENCES

1. UFSAR, Section 3.1.
2. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.4 and SR 3.5.2.5

These SRs demonstrate that each automatic HPI valve actuates to the required position on an actual or simulated ESPS signal and that each HPI pump starts on receipt of an actual or simulated ESPS signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The test will be considered satisfactory if control board indication verifies that all components have responded to the ESPS actuation signal properly (all appropriate ESPS actuated pump breakers have opened or closed and all ESPS actuated valves have completed their travel). The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The ~~18 month~~ 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of the ESPS testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.6

Periodic inspections of the reactor building sump suction inlet (for LPI-HPI flow path) ensure that it is unrestricted and stays in proper operating condition. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage, on the need to preserve access to the location, and on the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency has been found to be sufficient to detect abnormal degradation and has been confirmed by operating experience.

SR 3.5.2.7

Periodic stroke testing of the HPI discharge crossover valves (HP-409 and HP-410) and LPI-HPI flow path discharge valves (LP-15 and LP-16) is required to ensure that the valves can be manually cycled from the Control Room. This test is performed on ~~an 18 month~~ a 24 month Frequency. Operating experience has shown that these components usually pass the surveillance ~~when performed at this Frequency~~. Therefore, the Frequency is acceptable from a reliability standpoint.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.3.2 (continued)

cavitation, and pumping of noncondensible gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an ESPS signal or during shutdown cooling. This Surveillance is modified by a Note that indicates it is not applicable to operating LPI pump(s). The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the LPI piping and the existence of procedural controls governing system operation.

SR 3.5.3.3

Periodic surveillance testing of LPI pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code (Ref. 6). SRs are specified in the Inservice Testing Program, which encompasses Section XI of the ASME Code.

SR 3.5.3.4 and SR 3.5.3.5

These SRs demonstrate that each automatic LPI valve actuates to the required position on an actual or simulated ESPS signal and that each LPI pump starts on receipt of an actual or simulated ESPS signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The test will be considered satisfactory if control board indication verifies that all components have responded to the ESPS actuation signal properly (all appropriate ESPS actuated pump breakers have opened or closed and all ESPS actuated valves have completed their travel). The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The ~~18 month~~ 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment.

The actuation logic is tested as part of the ESPS testing, and equipment performance is monitored as part of the Inservice Testing Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.3.6

Periodic inspections of the reactor building sump suction inlet ensure that it is unrestricted and stays in proper operating condition. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage, on the need to preserve access to the location, and on the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency has been found to be sufficient to detect abnormal degradation and has been confirmed by operating experience.

REFERENCES

1. 10 CFR 50.46.
2. UFSAR, Section 15.14.3.3.6.
3. UFSAR, Section 15.14.3.3.5.
4. 10 CFR 50.36.
5. NRC Memorandum to V. Stello, Jr., from R.L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
6. ASME, Boiler and Pressure Vessel Code, Section XI, Inservice Inspection, Article IWV-3400.
7. NRC Safety Evaluation of Babcock & Wilcox Owners Group (B&WOG) Topical Report BAW-2295, Revision 1, "Justification for the Extension of Allowed Outage Time for Low Pressure Injection and Reactor Building Spray systems," (TAC No. MA3807) dated June 30, 1999.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.2.2 (continued)

the interlock will function as designed and that simultaneous opening of the inner and outer doors will not inadvertently occur. Due to the purely mechanical nature of this interlock, and given that the interlock mechanism is not normally challenged when the containment air lock door is used for entry or exit (procedures require strict adherence to single door opening), this test is only required to be performed every ~~18 months~~ 24 months. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage, and the potential loss of containment OPERABILITY if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance ~~when performed at the 18 month Frequency~~. The ~~18 month~~ 24 month Frequency is based on engineering judgment and is considered adequate given that the interlock is not challenged during use of the air lock.

REFERENCES

1. 10 CFR 50, Appendix J, Option A and B.
2. UFSAR, Section 15.14.
3. UFSAR, Section 6.2.
4. 10 CFR 50.36.
5. Duke Power Company letter from William O. Parker, Jr. to Harold R. Denton (NRC) dated July 24, 1981.
6. NRC Letter from Philip C. Wagner to William O. Parker, Jr., dated November 6, 1981, Issuance of Amendment 104, 104 and 101 to Licenses DPR-38, DPR-47 and DPR-55 for the Oconee Nuclear Station Units Nos 1, 2 and 3.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.3.4

Verifying that the isolation time of each automatic power operated containment isolation valve is within limits is required to demonstrate OPERABILITY. The isolation time and Frequency of this SR are in accordance with the Inservice Testing Program.

SR 3.6.3.5

Automatic containment isolation valves close on a containment isolation signal to prevent leakage of radioactive material from containment following an accident. This SR ensures that each automatic containment isolation valve will actuate to its isolation position on a containment isolation signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass this Surveillance ~~when performed at the 18 month Frequency~~. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. UFSAR, Section 6.2.
2. UFSAR, Section 15.14.
3. 10 CFR 50.36.
4. UFSAR, Table 6-7.
5. Generic Letter 91-08

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.5.5 and 3.6.5.6

These SRs require verification that each automatic reactor building spray and cooling valve actuates to its correct position and that each reactor building spray pump starts upon receipt of an actual or simulated actuation signal. The test will be considered satisfactory if visual observation and control board indication verifies that all components have responded to the actuation signal properly; the appropriate pump breakers have closed, and all valves have completed their travel. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The ~~18 month~~ 24 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances ~~when performed at the 18 month Frequency~~. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.5.5 is modified by a note that states the SR is applicable for Reactor Building Cooling system following completion of the LPSW RB Waterhammer Modification on the respective Unit.

SR 3.6.5.7

This SR requires verification that each required reactor building cooling train actuates upon receipt of an actual or simulated actuation signal. The test will be considered satisfactory if control board indication verifies that all components have responded to the actuation signal properly, the appropriate valves have completed their travel, and fans are running at half speed. The ~~18 month~~ 24 month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.5.5 and SR 3.6.5.6, above, for further discussion of the basis for the ~~18 month~~ 24 month Frequency.

BASES

ACTIONS

C.1 and C.2 (continued)

Inoperable TSVs that cannot be restored to OPERABLE status within the specified Completion Time, but are closed, must be verified on a periodic basis to be closed. This is necessary to ensure that the assumptions in the safety analysis remain valid. The 7 day Completion Time is reasonable, based on engineering judgment, in view of TSV status indications available in the control room, and other administrative controls, to ensure these valves are in the closed position.

D.1 and D.2

If the TSV cannot be restored to OPERABLE status or closed in the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from MODE 2 conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1 and SR 3.7.2.2

These SRs verify that TSV closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel A and Channel B. The 1.0 second TSV closure time is assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage.

The Frequency for this SR is ~~18 months~~ 24 months. The ~~18 month~~ 24 month Frequency to demonstrate valve closure time is based on the refueling cycle. Operating experience has shown that these components usually pass the Surveillance ~~when performed at the 18 month Frequency~~. Therefore, the Frequency is acceptable from a reliability standpoint.

This test is conducted in MODE 3, with the unit at operating temperature and pressure, as discussed in the Reference 5 exercising requirements. This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. This allows delaying testing until MODE 3 in order to establish conditions consistent with those under which the acceptance criterion was generated.

BASES

ACTIONS

A.1 and A.2

With one or both of the ADV flow path(s) inoperable, the Unit must be placed in a condition in which the LCO does not apply. To achieve this status, the Unit must be placed in at least MODE 3 within 12 hours, and at least MODE 4 without reliance on a steam generator for heat removal within 24 hours. The Completion Times are reasonable, based on operating experience, to reach the required Unit conditions from full power conditions in an orderly manner and without challenging Unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

To perform a controlled cool down of the RCS, the valves that comprise the ADV flow path for each steam generator must be able to perform the following functions:

a) the atmospheric dump block valve bypass and the atmospheric vent valve must be capable of being opened and closed; and

b) the atmospheric dump control valve and atmospheric vent block valve must be capable of being opened and throttled through their full range.

This SR ensures that the valves that comprise the ADV flow path for each steam generator are cycled through the full control range at least once per 18 months. Performance of inservice testing or use of an ADV flow path during a unit cool down satisfies this requirement. This surveillance does not require the valves to be tested at pressure. Operating experience has shown that these components usually pass the Surveillance ~~when performed at the 18 month Frequency~~. Therefore, the Frequency is acceptable from a reliability standpoint.

REFERENCES

1. 10 CFR 50.36.

2. UFSAR, Section 10.3.

3. UFSAR, Section 15.9.

4. UFSAR, Section 15.12

5. UFSAR, Section 15.14

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.5.3 (continued)

controls. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The ~~18 month~~ 24 month Frequency is also acceptable based on operating experience and design reliability of the equipment. This SR is modified by a Note which states that the SR is not required in MODES 3 and 4. In MODES 3 and 4, the heat removal requirements would be less, thereby providing more time for operator action to manually start the required EFW pump.

SR 3.7.5.4

This SR verifies that each EFW pump starts in the event of any accident or transient that generates an initiation signal. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This SR is modified by a Note which states that the SR is not required in MODES 3 and 4. In MODE 3 and 4, the heat removal requirements would be less, thereby providing more time for operator action to manually start the required EFW pump.

SR 3.7.5.5

This SR ensures that the EFW System is properly aligned by verifying the flow paths to each steam generator prior to entering MODE 2 after more than 30 days in MODE 5 or 6. OPERABILITY of EFW flow paths must be demonstrated before sufficient core heat is generated that would require the operation of the EFW System during a subsequent shutdown. The Frequency is reasonable, based on engineering judgment, in view of other administrative controls to ensure that the flow paths are OPERABLE. To further ensure EFW System alignment, flow path OPERABILITY is verified, following extended outages to determine no misalignment of valves has occurred. This SR ensures that the flow path from the UST to the steam generator is properly aligned.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.7.2 (continued)

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

This SR is modified by a Note indicating that the isolation of components or systems supported by the LPSW System does not affect the OPERABILITY of the LPSW System.

SR 3.7.7.3

The SR verifies proper automatic operation of the LPSW System valves. The LPSW System is a normally operating system that cannot be fully actuated as part of the normal testing. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance ~~when performed at the 18 month Frequency~~. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.7.4

The SR verifies proper automatic operation of the LPSW System pumps on an actual or simulated actuation signal. The LPSW System is a normally operating system that cannot be fully actuated as part of normal testing during normal operation. The ~~18 month~~ 24 month Frequency is consistent with the Inservice Testing Program. Operating experience has shown that these components usually pass the Surveillance ~~when performed at an 18 month Frequency~~. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.7.5

For Units with LPSW RB Waterhammer Prevention System installed, the SR verifies proper operation of the LPSW RB Waterhammer Prevention System leakage accumulator. Verifying adequate flow from the accumulator will provide assurance that in the event of boundary valve leakage during a LOOP event, there is sufficient water to keep LPSW piping filled.

The ~~18 month~~ 24 month is based on engineering judgment and operating experience.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.7.6

For Units with LPSW RB Waterhammer Prevention System installed, the SR verifies that LPSW WPS boundary valve leakage is ≤ 20 gpm. Verifying boundary valve leakage is within limits will ensure that in the event of a LOOP, a waterhammer will not occur, because the LPSW leakage accumulator will be able to maintain the LPSW piping water solid.

The LPSW Leakage Accumulator is designed to allow up to 25 gpm of aggregate leakage for one minute. The boundary valve leakage is limited to 20 gpm in order to allow five (5) gpm of miscellaneous leakage.

The ~~18 month~~ 24 month Frequency is based on engineering judgment and operating experience.

Justification for performing this surveillance every 24 months is the similarity of the new LPSW equipment being tested (accumulator and check valves) with installed equipment performing similar functions, the modification design and the station's corrective action program for monitoring future performance.

REFERENCES

1. UFSAR, Section 9.2.2.
2. UFSAR, Section 6.3.
3. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.9

This SR verifies the ECCW system functions to supply siphon header flow to the suction of the LPSW pumps during design basis conditions by ensuring air accumulation in the ECCW siphon headers is within the removal capabilities of the ESV System. This SR establishes siphon flow with the ESV pumps off. Air accumulation in the pipe results in a corresponding reduction in water level in the CCW piping over a time period. The rate of water level reduction is recorded and compared to limits established in design basis documents. The limits on the rate of water level reduction over a time period are established to ensure ECCW siphon header air accumulation rate is within the removal capabilities of the ESV System under design basis conditions. The Frequency of ~~18 months~~ 24 months is based on the need to perform this SR when the Unit is shutdown. This SR is not required to be performed with the Unit 3 LPSW System taking suction from the siphon. This is acceptable since aligning the LPSW pumps to the Unit 3 ECCW siphon headers is not necessary to demonstrate that the ECCW air accumulation is within the ESV capacity which is the basic purpose of the test. The flow path from the Unit 3 CCW piping to the suction of the Unit 3 LPSW pumps is demonstrated by normal operation of the LPSW pumps.

A Note states that for Units 1 and 2, the SR is not required to be performed with the shared LPSW System for Units 1 and 2 taking suction from the siphon. This is necessary to avoid potential effects on an operating unit and is acceptable since the capability of the LPSW pumps to take suction from the CCW crossover header is demonstrated by normal, day-to-day operation of the LPSW pumps. Although a loss of suction to the LPSW pumps is unlikely during this SR, it is prudent to minimize the potential for jeopardizing the LPSW suction supply to the LPSW pumps when they are supporting an operating Unit.

REFERENCES

1. UFSAR, Chapter 9.
2. 10 CFR 50.36.
3. UFSAR, Chapter 16.
4. ASME, Boiler and Pressure Vessel Code, Section XI.
5. ASME Standard OM-6.

BASES

ACTIONS (continued)

E.1

During movement of recently irradiated fuel assemblies, when one or more CRVS trains are inoperable, action must be taken immediately to suspend activities that could release radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes the accident risk. This does not preclude the movement of fuel to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.9.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not severe, testing each train once every 92 days adequately checks this system. The trains need only be operated for ≥ one hour and all dampers verified to be OPERABLE to demonstrate the function of the system. This test includes an external visual inspection of the CRVS Booster Fan trains. The 92 day Frequency is based on the known reliability of the equipment.

SR 3.7.9.2

This SR verifies that the required CRVS Booster Fan train testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The CRVS Booster Fan train filter test frequencies are in accordance with Regulatory Guide 1.52 (Ref. 4). The VFTP includes testing HEPA filter performance and carbon adsorber efficiency. Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.9.3

This SR verifies the integrity of the Control Room enclosure. The Control Room positive pressure, with respect to potentially contaminated adjacent areas, is periodically tested to verify that the CRVS Booster Fan trains are functioning properly. During the emergency mode of operation, the CRVS Booster Fan trains are designed to pressurize the Control Room to minimize unfiltered inleakage. The CRVS Booster Fan trains are designed to maintain this positive pressure with both trains in operation. The Frequency of ~~18 months~~ 24 months is consistent with industry practice.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.13

The KHU underground ACBs have a control feature which will automatically close the KHU, that is pre-selected to the overhead path, into the underground path upon an electrical fault in the zone overlap region of the protective relaying. This circuitry prevents an electrical fault in the zone overlap region of the protective relaying from locking out both emergency power paths during dual KHU grid generation. In order to ensure this circuitry is OPERABLE, an electrical fault is simulated in the zone overlap region and the associated underground ACBs are verified to operate correctly. This surveillance is required on a 12 month Frequency. The 12 month Frequency is based on engineering judgement and provides reasonable assurance that the zone overlap protection circuitry is operating properly.

This SR is modified by a Note indicating the SR is only applicable when the overhead disconnects to the underground KHU are closed. When the overhead disconnects to the underground KHU are open, the circuitry preventing the zone overlap protective lockout of both KHUs is not needed.

SR 3.8.1.14

This surveillance verifies OPERABILITY of the trip functions of the SL and N breakers. This SR verifies each trip circuit of each breaker independently opens each breaker. Neither of these breakers have any automatic close functions; therefore, only the trip circuits require verification. The ~~18 month~~ 24 month Frequency is based on engineering judgement and provides reasonable assurance that the SL and N breakers will trip when required.

The SR is modified by a Note indicating that the SR is not required for an SL breaker when its standby bus is energized by a LCT via an isolated power path. This is necessary since the standby buses are required to be energized from a LCT by several Required Actions of Specification 3.8.1 and the breakers must remain closed to energize the standby buses from a LCT.

SR 3.8.1.15

This surveillance verifies proper operation of the 230 kV switchyard circuit breakers upon an actual or simulated actuation of the Switchyard Isolation circuitry. This test causes an actual switchyard isolation (by

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.15 (continued)

actuation of degraded grid voltage protection) and alignment of KHUs to the overhead and underground emergency power paths. ~~An 18 month~~ A 24 month Frequency minimizes the impact to the Station and the operating Units which are connected to the 230 kV switchyard. The effect of this SR is not significant because the generator red bus tie breakers and feeders from the Oconee 230 kV switchyard red bus to the system grid remain closed. Either Switchyard Isolation Channel causes full system realignment, which involves a complete switchyard realignment. To avoid excessive switchyard circuit breaker cycling, realignment and KHU emergency start functions, this SR need be performed only once each SR interval.

This SR is modified by a Note. This Note states the redundant breaker trip coils shall be verified on a STAGGERED TEST BASIS. Verifying the trip coils on a STAGGERED TEST BASIS precludes unnecessary breaker operation and minimizes the impact to the Station and the operating Units which are connected to the 230 kV switchyard.

SR 3.8.1.16

This SR verifies by administrative means that one KHU provides an alternate manual AC power source capability by manual or automatic KHU start with manual synchronize, or breaker closure, to energize its non-required emergency power path. That is, when the KHU to the overhead emergency power path is inoperable, the SR verifies by administrative means that the overhead emergency power path is OPERABLE. When the overhead emergency power path is inoperable, the SR verifies by administrative means that the KHU associated with the overhead emergency power path is OPERABLE.

This SR is modified by a Note indicating that the SR is only applicable when complying with Required Action C.2.2.4.

SR 3.8.1.17

This SR verifies the Keowee Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers on an out of tolerance trip signal. The ~~18 month~~ 24 month Frequency is based on engineering judgement and provides reasonable assurance that the Voltage and Frequency out of tolerance logic trips and blocks closure of these breakers when required.

BASES

ACTIONS

B.2 (continued)

made in accordance with Required Actions A.1 and A.2, the core reactivity condition is stabilized until the source range neutron flux monitors are restored to OPERABLE status. This stabilized condition is verified by performing SR 3.9.1.1 to ensure that the required boron concentration exists.

The Completion Time of 4 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration. The Frequency of once per 12 hours ensures that unplanned changes in boron concentration would be identified. The 12 hour Frequency is reasonable, considering the low probability of a change in core reactivity during this time period.

SURVEILLANCE REQUIREMENTS

SR 3.9.2.1

SR 3.9.2.1 is the performance of a CHANNEL CHECK, which is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that the indication channel(s) should be consistent with core conditions. Changes in fuel loading and core geometry can result in significant differences between source range channels, but each channel should be consistent with its local conditions. When in MODE 6 with one channel OPERABLE, a CHANNEL CHECK is still required. However, in this condition, a redundant source range instrument may not be available for comparison. The CHANNEL CHECK provides verification that the OPERABLE source range channel is energized and indicates a value consistent with current unit status.

The Frequency of 12 hours is consistent with the CHANNEL CHECK Frequency specified similarly for the same instruments in LCO 3.3.9.

SR 3.9.2.2

SR 3.9.2.2 is the performance of a CHANNEL CALIBRATION every ~~18 months~~ 24 months. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. The CHANNEL CALIBRATION for the source range nuclear instrument is a complete check and re-adjustment of the channel, from the pre-amplifier input to the indicator. The ~~18 month~~ 24 month Frequency is based on the need to perform this Surveillance during the conditions that apply during a unit outage. Industry experience has shown these components usually pass the Surveillance ~~when performed at the 18 month Frequency~~.

BASES

ACTIONS

F.1 (continued)

year. This includes the 7 day Completion Time that leads to entry into Condition F. For example, if the SSF ASW System is inoperable for 10 days, the 45 day special inoperability period is reduced to 35 days. If the SSF ASW System is inoperable for 6 days, Condition A applies and there is no reduction in the 45 day allowance. The limit of 45 days per calendar year minimizes the number and duration of extended outages associated with exceeding the 7 day Completion Time of a Condition.

G.1 and G.2

If the Required Action and associated Completion Time of Condition F are not met or if the Required Action and associated Completion Time of Condition A, B, C, D, or E are not met for reasons other than Condition F, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours and MODE 4 within 84 hours. The allowed Completion Times are appropriate, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems, considering a three unit shutdown may be required.

SURVEILLANCE REQUIREMENTS

SR 3.10.1.1

Performance of the CHANNEL CHECK once every 7 days for each required instrumentation channel ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel with a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. This SR is modified by a Note to indicate that it is not applicable to the SSF RCS temperature instrument channels, which are common to the RPS RCS temperature instrument channels and are normally aligned through a transfer isolation device to each Unit control room. The instrument string to the SSF control room is checked and calibrated every ~~18 months~~ 24 months

Agreement criteria are determined based on a combination of the channel instrument uncertainties, including indication and readability. If a

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.10.1.12

A battery service test is a special test of the battery capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length correspond to the design duty cycle requirements. The design basis discharge time for the SSF battery is one hour.

The Surveillance Frequency for this test is 12 months. This Frequency is considered acceptable based on operating experience.

SR 3.10.1.13

CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis. This Frequency is justified by the assumption of ~~an 18 month~~ a 24 month calibration interval to determine the magnitude of equipment drift in the setpoint analysis.

SR 3.10.1.14

Inservice Testing of the SSF valves demonstrates that the valves are mechanically OPERABLE and will operate when required. These valves are required to operate to ensure the required flow path.

The specified Frequency is in accordance with the IST Program requirements. Operating experience has shown that these components usually pass the SR when performed at the IST Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

ATTACHMENT 4

REPRINTED TECHNICAL SPECIFICATION BASES PAGES

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.6

The SR is modified by a Note indicating that it is only applicable to Unit(s) with the RPS digital upgrade complete. This SR requires manual actuation of the output channel interposing relays to demonstrate OPERABILITY of the relays. The proper functioning of the processor portion of the channel is continuously checked by an automatic cyclic self monitoring.

The Frequency of 92 days is considered adequate based on operating experience that demonstrates the rarity of more than one channel's relay failing within the same interval.

SR 3.3.1.7

A Note to the Surveillance indicates that neutron detectors are excluded from CHANNEL CALIBRATION. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure virtually instantaneous response.

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and **bistable** *(or processor output trip device for Unit(s) with the RPS digital upgrade complete)* setpoint errors are within the assumptions of the uncertainty analysis. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION of the resistance temperature detectors (RTD) sensors is accomplished by an inplace cross calibration that compares the other sensing elements with the recently installed sensing element.

The 24 month frequency for the CHANNEL FUNCTIONAL TEST is based on design capabilities and reliability of the digital RPS. Since the CHANNEL FUNCTIONAL TEST is a part of the CHANNEL CALIBRATION a separate SR is not retained. The digital RPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continuous online hardware monitoring. The CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.7 (continued)

For Unit(s) with the RPS digital upgrade complete, the digital processors shall be rebooted as part of the calibration. This verifies that the software and setpoints have not changed.

The Frequency is justified by the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the uncertainty analysis. *For Unit(s) with the digital upgrade complete, the 24 month calibration interval is also justified by the reliability of components whose failure modes are not automatically detected or indicated.*

REFERENCES

1. UFSAR, Chapter 7.
2. UFSAR, Chapter 15.
3. 10 CFR 50.49.
4. EDM-102, "Instrument Setpoint/Uncertainty Calculations."
5. NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1979.
6. BAW-10167, May 1986.
7. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.4

CHANNEL CALIBRATION is a complete check of the input instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION assures that measurement errors and **bistable** *(or processor output trip device for Unit(s) with the ESPS digital upgrade complete)* setpoint errors are within the assumptions of the unit specific uncertainty analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the uncertainty analysis.

The 24 month frequency for the CHANNEL FUNCTIONAL TEST is based on design capabilities and reliability of the digital ESPS. Since the CHANNEL FUNCTIONAL TEST is a part of the CHANNEL CALIBRATION a separate SR is not retained. The digital ESPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continuous online hardware monitoring. The CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function.

For Unit(s) with the ESPS digital upgrade complete, the digital processors shall be rebooted as part of the calibration. This verifies that the software and setpoints have not changed.

This Frequency is justified by the assumption of a 24 month calibration interval to determine the magnitude of equipment drift in the uncertainty analysis. *For Unit(s) with the digital upgrade complete, the 24 month calibration interval is justified by the reliability of components whose failure modes are not automatically detected or indicated.*

REFERENCES

1. UFSAR, Chapter 7.
2. 10 CFR 50.49.
3. EDM-102, "Instrument Setpoint/Uncertainty Calculations."
4. UFSAR, Chapter 15.
5. 10 CFR 50.36.

BASES

ACTIONS

B.1 and B.2 (continued)

With the Required Action and associated Completion Time not met, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 12 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.6.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST of the ESPS manual initiation. This test verifies that the initiating circuitry is OPERABLE and will actuate the automatic actuation output logic channels. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency is demonstrated to be sufficient, based on operating experience, which shows these components usually pass the Surveillance when performed on the 24 month Frequency.

REFERENCES

1. 10 CFR 50.36.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.7.1

The SR is modified by a Note indicating that it is only applicable to Unit(s) with the ESPS digital upgrade complete. This SR requires manual actuation of the output channel interposing relays to demonstrate OPERABILITY of the relays. The proper functioning of the processor portion of the channel is continuously checked by automatic cyclic self monitoring.

The Frequency of 92 days is considered adequate based on operating experience that demonstrates the rarity of more than one channel's relay failing within the same interval.

SR 3.3.7.2

SR 3.3.7.2 is the performance of a CHANNEL FUNCTIONAL TEST on a 92 day Frequency for Unit(s) with the ESPS digital upgrade not complete *and a 24 month Frequency for Unit(s) with the ESPS digital upgrade complete. For Unit(s) with the ESPS digital upgrade complete, the digital processors shall be rebooted as part of the functional test. This verifies that the software and setpoints have not changed.*

For Unit(s) with the ESPS digital upgrade not complete, the 92 day Frequency is based on operating experience that demonstrates the rarity of more than one channel failing within the same interval.

For Unit(s) with the ESPS digital upgrade complete, the 24 month Frequency is based on the design capabilities and reliability of the new digital ESPS. The digital ESPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continual online hardware monitoring. The CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function. The reliability of components whose failure modes are not automatically detected or indicated also support a test frequency of 24 months.

REFERENCES

1. 10 CFR 50.46.
2. UFSAR, Chapter 15.
3. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.9.1 (continued)

the channels are normally off scale during times when surveillance is required, the CHANNEL CHECK will only verify that they are off scale in the same direction.

The Frequency, equivalent to every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel OPERABILITY during normal operational use of the displays associated with the LCO's required channels. When operating in Required Action A.1, CHANNEL CHECK is still required. However, in this condition, a redundant source range may not be available for comparison. CHANNEL CHECK may still be performed via comparison with wide range detectors, if available, and verification that the OPERABLE source range channel is energized and indicating a value consistent with current unit status.

SR 3.3.9.2

For source range neutron flux channels, CHANNEL CALIBRATION is a complete check and readjustment of the channels from the preamplifier input to the indicators. This test verifies the channel responds to measured parameters within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests.

The SR is modified by a Note excluding neutron detectors from CHANNEL CALIBRATION. It is not necessary to test the detectors because generating a meaningful test signal is difficult. The detectors are of simple construction, and any failures in the detectors will be apparent as change in channel output.

The Frequency of 24 months is based on demonstrated instrument CHANNEL CALIBRATION reliability over a 24 month interval, such that the instrument is not adversely affected by drift.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.10.2 (continued)

The SR is modified by a Note excluding neutron detectors from CHANNEL CALIBRATION. It is not necessary to test the detectors because generating a meaningful test signal is difficult. In addition, the detectors are of simple construction, and any failures in the detectors will be apparent as a change in channel output. The Frequency is based on operating experience and consistency with the typical industry refueling cycle and is justified by demonstrated instrument reliability over a 24 month interval such that the instrument is not adversely affected by drift.

SR 3.3.10.3

SR 3.3.10.3 is the verification once each reactor startup of one decade of overlap with the source range neutron flux instrumentation. The wide range detector should be on scale and indicating ≥ 1E-8% of RTP when the source range detector is indicating ≤ 10^4 counts per second in order for the wide range detector to indicate a one decade change prior to the source range detector going off scale. This ensures a continuous source of power indication during the approach to criticality.

The test may be omitted if performed within the previous 7 days based on operating experience, which shows that source range and wide range instrument overlap does not change appreciably within this test interval.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.11.1 (continued)

The frequency, about once every shift, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel OPERABILITY during normal operational use of the displays associated with the LCO required channels.

SR 3.3.11.2

A CHANNEL FUNCTIONAL TEST is performed by comparing the test input signal to the value transmitted to the Calibration and Test Computer. This enables verification of the voltage references and the signal commons. This will ensure the channel will perform its intended function.

The Frequency of 31 days is based on operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel in any 31 day interval is a rare event.

SR 3.3.11.3

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The test verifies the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is based on the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. 10 CFR 50.36.

BASES (continued)

ACTIONS

A Note has been added to the ACTIONS indicating that a separate Condition entry is allowed for manual initiation switches associated with each SG.

A.1

With one manual initiation switch per steam generator inoperable, the manual initiation switch must be restored to OPERABLE status within 72 hours. The Completion Time of 72 hours is based on unit operating experience and administrative controls, which provide alternative means of AFIS initiation via individual component controls. The 72 hour Completion Time is consistent with the allowed outage time for the components actuated by the AFIS.

B.1

With both manual initiation switches per steam generator inoperable or the Required Action and associated Completion Time of Condition A not met, the Unit must be placed in MODE 3 within 12 hours and the main steam header pressure reduced to less than 700 psig within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required MODES from full power conditions in an orderly manner and without challenging Unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.12.1

This SR requires the performance of a digital CHANNEL FUNCTIONAL TEST to ensure that the channels can perform their intended functions. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during unit operation is avoided.

REFERENCES

1. IEEE-279-1971, April 1972.

2. 10 CFR 50.36.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.13.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the digital channels can perform their intended functions. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during Unit operation is avoided.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.14.3 (continued)

circuit and verifies successful operation of the automatic initiation circuit. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function, while the risks of testing during operation are avoided.

SR 3.3.14.4

CHANNEL CALIBRATION is a complete check of the instrument channel including the sensor. The test verifies the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is based on the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. UFSAR, Chapters 7 and 15.

2. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.16.1 (continued)

radiation monitoring instrumentation channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. Performance of the CHANNEL CHECK helps to ensure that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared to similar unit instruments located throughout the unit. If the radiation monitor uses keep alive sources or check sources OPERABLE from the control room, the CHANNEL CHECK should also note the detector's response to these sources.

Agreement criteria are based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the transmitter or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE. The 12 hour Frequency, about once every shift, is based on operating experience that demonstrates channel failure is rare. Additionally, control room alarms and annunciators are provided to alert the operator to various "trouble" conditions associated with the instrument.

SR 3.3.16.2

This SR requires the performance of a CHANNEL FUNCTIONAL TEST to ensure that the channel can perform its intended function. The frequency requires the isolation capability of the reactor building purge valves to be verified functional once each refueling outage prior to movement of recently irradiated fuel assemblies within containment. This ensures that this function is verified prior to recently irradiated fuel assembly handling within containment. This test verifies the capability of the instrumentation to provide the RB isolation.

SR 3.3.16.3

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy.

The 24 month Frequency is based on engineering judgment and industry accepted practice.

BASES

ACTIONS

A.1 (continued)

Required Action A.1 is modified by a Note which indicates that the Completion Time is reduced when in Condition L of LCO 3.8.1. Condition L limits the Completion Time for restoring an inoperable channel to 4 hours when emergency power source(s) or offsite power source(s) are inoperable for extended time periods or for specific reasons.

B.1 and B.2

With the Required Action and associated Completion Time not met, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 in 12 hours and to MODE 5 within 84 hours. The allowed Completion Times are reasonable, based on operating experience, to allow for a controlled shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.3.17.1

This SR requires the performance of a CHANNEL FUNCTIONAL TEST of the EPSL automatic transfer function. The ES inputs to the Load Shed and Transfer to Standby function and the Retransfer to Startup function are verified to operate properly during an automatic transfer of the Main Feeder Buses to the Startup Transformer, Standby Buses, and retransfer to the Startup Transformers. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

REFERENCES

1. UFSAR, Chapters 6 and 15.

2. 10 CFR 50.36.

BASES (continued)

ACTIONS (continued)

D.1

With the Required Action and associated Completion Time not met during movement of irradiated fuel assemblies, movement of fuel assemblies must be suspended immediately. Suspension does not preclude completion of actions to establish a safe conservative condition. This action minimizes the probability or the occurrence of postulated events. The Completion Time of immediately is consistent with the required times for actions requiring prompt attention

SURVEILLANCE REQUIREMENTS

SR 3.3.18.1

A CHANNEL FUNCTIONAL TEST is performed on each voltage sensing circuit channel to ensure the channel will perform its function. A circuit is defined as three channels, one for each phase. Each channel consists of components from the sensing power transformer through the circuit auxiliary relays which operate contacts in the EPSL logic and breaker trip circuits. Minimum requirements consist of individual channel relay operation causing appropriate contact responses within associated loadshed/breaker circuits, alarm activations, and proper indications for the sensing circuit control power status. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

REFERENCES

1. UFSAR, Chapters 6 and 15.

2. 10 CFR 50.36.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.3.19.1

A CHANNEL FUNCTIONAL TEST is performed on each DGVP voltage sensing channel and DGVP actuation logic channel to ensure the entire channel will perform its intended function. Any setpoint adjustments shall be consistent with the assumptions of the setpoint analysis. The CHANNEL FUNCTIONAL TEST of the DGVP actuation logic channels includes verifying actuation of the switchyard isolation circuitry. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

SR 3.3.19.2

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is justified by the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. UFSAR, Chapter 8.

2. 10 CFR 50.36.

BASES

ACTIONS

B.1 (continued)

capable of providing the CT-5 DGVP function. The 72 hour completion time is based on engineering judgement taking into consideration the infrequency of actual grid system voltage degradation and the probability of an event requiring an ES actuation.

C.1 and C.2

If two or more voltage sensing relay channels or two actuation logic channels are inoperable, automatic protection from degraded grid voltage for the standby buses powered from the 100 kV transmission system is not available. Continued operation is allowed provided that the SL breakers are opened within one hour.

Additionally, with the Required Action and associated Completion Time of Condition A or B not met, the SL breakers must be opened within one hour. This arrangement provides a high degree of reliability for the emergency power system. The one hour Completion Time is based on engineering judgement taking into consideration the infrequency of actual grid system voltage degradation and the probability of an event requiring an ES actuation.

SURVEILLANCE REQUIREMENTS

SR 3.3.20.1

A CHANNEL FUNCTIONAL TEST is performed on each CT-5 DGVP voltage sensing channel and each CT-5 DGVP actuation logic channel to ensure the entire channel will perform its intended function. Any setpoint adjustments shall be consistent with the assumptions of the setpoint analysis. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

SR 3.3.20.2

A CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.20.2 (continued)

between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis.

The Frequency is justified by the assumption of a 24 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

REFERENCES

1. UFSAR, Chapter 8.

2. 10 CFR 50.36.

BASES

ACTIONS

B.1 and B.2 (continued)

hours and to MODE 5 within 84 hours. The allowed Completion Times are reasonable, based on operating experience, to allow for a controlled shutdown.

C.1

With both channels of the Keowee Emergency Start function inoperable then both Keowee Hydro Units must be declared inoperable immediately. The appropriate Required Actions will be implemented in accordance with LCO 3.8.1, "AC Sources–Operating."

SURVEILLANCE REQUIREMENTS

SR 3.3.21.1

A CHANNEL FUNCTIONAL TEST is performed on each Keowee Emergency Start channel to ensure the channel will perform its function during an automatic transfer of the Main Feeder Buses to the Startup Transfer, Standby Buses, and retransfer to the Startup Transformers. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

REFERENCES

1. UFSAR, Chapters 6 and 15.
2. 10 CFR 50.36.

BASES

ACTIONS (continued)

C.1 and C.2

With two or more voltage sensing channels or both actuation logic channels inoperable, automatic protection for LOOP events is no longer available. This places additional burden on the operators, even though they are still the credible resource for restoring power in a LOOP event. EPSL response from ES events are not affected. Therefore, allowable time for this condition is limited to 24 hours. The completion time is based on engineering judgement and the availability of adequate time for operator response to a LOOP.

The Condition is modified by a Note indicating that this condition may be entered independently for each set of channels associated with a main feeder bus. The Condition may also be entered independently for inoperable logic channels or inoperable voltage sensing channels. The Completion Time(s) are tracked separately from the time the Condition is entered for each.

D.1

With the Required Action and associated Completion Time not met, Required Action D.1 specifies initiation of action described in Specification 5.6.6 that requires a written report to be submitted to the NRC. This report discusses the results of the root cause evaluation of the inoperability and identifies proposed restorative actions. This action is appropriate since the MFBMP does not provide the only layer of protection in any DBE, but does provide defense-in-depth for any scenario which results in loss of power to the Main Feeder Busses. Operator actions are credited for SBO mitigation. The Completion Time of "Immediately" for Required Action D.1 ensures the requirements of Specification 5.6.6 are initiated.

SURVEILLANCE REQUIREMENTS

SR 3.3.23.1

A CHANNEL FUNCTIONAL TEST is performed on each MFBMP voltage sensing channel and MFBMP actuation logic channel to ensure the MFBMP will perform its intended function. The Frequency of 24 months is based on engineering judgment and operating experience that determined testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.27.1 (continued)

period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but potentially more frequent, checks of channel operability during normal operational use of the displays associated with the LCO's required channels.

SR 3.3.27.2

A CHANNEL FUNCTIONAL TEST is performed on each channel to ensure the circuitry will perform its intended function. The Frequency of 92 days is based on engineering judgment and operating experience, with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel in any 92 day interval is a rare event.

SR 3.3.27.3

A CHANNEL CALIBRATION is a complete check of the analog instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. The CHANNEL CALIBRATION leaves the components adjusted to account for instrument drift to ensure that the circuitry remains operational between successive tests. The 24 month Frequency is justified by the assumption of a 24 month calibration interval in the setpoint analysis determination of instrument drift during that interval.

REFERENCES

1. 10 CFR 50.36.

BASES

ACTIONS

B.1 and B.2 (continued)

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.28.1

A CHANNEL FUNCTIONAL TEST is performed on each LPSW Pump to ensure the auto-start circuit will perform its intended function. The Frequency of 24 months is based on engineering judgment and operating experience. Testing on a 24 month interval provides reasonable assurance that the circuitry is available to perform its safety function.

SR 3.3.28.2

A CHANNEL CALIBRATION is performed to verify that the components respond to the measured parameter within the necessary range and accuracy. The CHANNEL CALIBRATION leaves the components adjusted to account for instrument drift to ensure that the auto-start circuitry remains operational between successive tests. The Frequency is justified by the assumption of a 24 month calibration interval in the determination of the drift in the setpoint analysis.

REFERENCES

1. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1 (continued)

restored to a normal operation, steady state condition following load changes and other expected transient operations. The RCS pressure value specified in the COLR is dependent on the number of pumps in operation and has been adjusted to account for the pressure loss difference between the core exit and the measurement location. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify operation is within safety analysis assumptions. A Note has been added to indicate the pressure limits for three pumps operating is applied to the loop with the highest pressure.

SR 3.4.1.2

Since Required Action A.1 allows a Completion Time of 2 hours to restore parameters that are not within limits, the 12 hour Surveillance Frequency for loop average temperature is sufficient to ensure that the RCS coolant temperature can be restored to a normal operation, steady state condition following load changes and other expected transient operations. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify that operation is within safety analysis assumptions. A Note has been added to indicate the temperature limits for three pumps operating are applied to the loop with the lowest loop average temperature for the condition in which there is a 0°F ΔTc setpoint.

SR 3.4.1.3

The 12 hour Surveillance Frequency for RCS total flow rate is performed using the installed flow instrumentation. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify that operation is within safety analysis assumptions.

SR 3.4.1.4

Measurement of RCS total flow rate by performance of a calorimetric heat balance once every 24 months allows the installed RCS flow instrumentation to be calibrated and verifies that the actual RCS flow is greater than or equal to the minimum required RCS flow rate specified in the COLR.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.4 (continued)

The Frequency of 24 months reflects the importance of verifying flow after a refueling outage when the core has been altered or RCS flow characteristics may have been modified, which may have caused change of flow. The Surveillance is modified by a Note that indicates the SR does not need to be performed until 7 days after stable thermal conditions are established at higher power levels. The Note is necessary to allow measurement of the flow rate at normal operating conditions at power in MODE 1. The Surveillance cannot be performed at low power or in MODE 2 or below because at low power the ΔT across the core may be too small to provide meaningful test results.

REFERENCES

1. UFSAR, Chapter 15.

2. 10 CFR 50.36

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

or by performing an electrical check on heater element continuity and resistance.) The Frequency of 24 months is considered adequate to detect heater degradation and has been shown by operating experience to be acceptable.

REFERENCES

1. 10 CFR 50.36.

2. NUREG-0737, November 1980.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.12.6 (continued)

The Frequency is shown by operating practice sufficient to regularly assess indications of potential degradation and verify operation within the safety analysis.

SR 3.4.12.7

The performance of a CHANNEL CALIBRATION is required every 24 months. The CHANNEL CALIBRATION for the LTOP setpoint ensures that the PORV will be actuated at the appropriate RCS pressure by verifying the accuracy of the instrument string.

REFERENCES

1. 10 CFR 50, Appendix G.
2. Generic Letter 88-11.
3. UFSAR, 5.2.3.7.
4. 10 CFR 50.36.

BASES

ACTIONS

A.1 and A.2 (continued)

Required Action A.2 specifies that the double isolation barrier of two valves be restored by closing some other valve qualified for isolation. The 72 hour time after exceeding the limit considers the time required to complete the Action and the low probability of a second valve failing during this time period.

B.1 and B.2

If Required Actions and associated Completion Times are not met, the unit must be brought to a MODE in which the requirement does not apply. To achieve this status, the unit must be brought to MODE 3 within 12 hours and to MODE 5 within 36 hours. This Required Action may reduce the leakage and also reduces the potential for a LOCA outside the containment. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.14.1

Performance of leakage testing on each required RCS PIV or isolation valve used to satisfy Required Action A.1 or A.2 is required to verify that leakage is below the specified limit and to identify each leaking valve. The leakage limit of 0.5 gpm per inch of nominal valve diameter up to 5 gpm maximum applies to each valve. Leakage testing requires a stable pressure condition.

For the two PIVs in series, the leakage requirement applies to each valve individually and not to the combined leakage across both valves. If the PIVs are not individually leakage tested, one valve may have failed completely and not detected if the other valve in series meets the leakage requirement. In this situation, the protection provided by redundant valves would be lost.

Testing is to be performed every 24 months, a typical refueling cycle, if the unit does not go into MODE 5 for at least 7 days. The 24 month Frequency is consistent with 10 CFR 50.55a(g) (Ref. 8) as contained in the Inservice Testing Program, is within frequency allowed by the American Society of Mechanical Engineers (ASME) Code, Section XI (Ref. 7), and is based on the need to perform such surveillances under conditions that apply during an outage and the potential for an unplanned transient if the Surveillance were performed with the unit at power.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a CHANNEL FUNCTIONAL TEST of the required containment atmosphere radioactivity monitor. The test ensures that the monitor can perform its function in the desired manner. The test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency of 92 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.15.3 and SR 3.4.15.4

These SRs require the performance of a CHANNEL CALIBRATION for each of the required RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of 24 months is a typical refueling cycle and considers channel reliability. Industry operating experience has proven this Frequency is acceptable.

REFERENCES

1. UFSAR, Section 3.1.

2. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.4 and SR 3.5.2.5

These SRs demonstrate that each automatic HPI valve actuates to the required position on an actual or simulated ESPS signal and that each HPI pump starts on receipt of an actual or simulated ESPS signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The test will be considered satisfactory if control board indication verifies that all components have responded to the ESPS actuation signal properly (all appropriate ESPS actuated pump breakers have opened or closed and all ESPS actuated valves have completed their travel). The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of the ESPS testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.6

Periodic inspections of the reactor building sump suction inlet (for LPI-HPI flow path) ensure that it is unrestricted and stays in proper operating condition. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage, on the need to preserve access to the location, and on the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency has been found to be sufficient to detect abnormal degradation and has been confirmed by operating experience.

SR 3.5.2.7

Periodic stroke testing of the HPI discharge crossover valves (HP-409 and HP-410) and LPI-HPI flow path discharge valves (LP-15 and LP-16) is required to ensure that the valves can be manually cycled from the Control Room. This test is performed on a 24 month Frequency. Operating experience has shown that these components usually pass the surveillance. Therefore, the Frequency is acceptable from a reliability standpoint.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.3.2 (continued)

cavitation, and pumping of noncondensible gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an ESPS signal or during shutdown cooling. This Surveillance is modified by a Note that indicates it is not applicable to operating LPI pump(s). The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the LPI piping and the existence of procedural controls governing system operation.

SR 3.5.3.3

Periodic surveillance testing of LPI pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by Section XI of the ASME Code (Ref. 6). SRs are specified in the Inservice Testing Program, which encompasses Section XI of the ASME Code.

SR 3.5.3.4 and SR 3.5.3.5

These SRs demonstrate that each automatic LPI valve actuates to the required position on an actual or simulated ESPS signal and that each LPI pump starts on receipt of an actual or simulated ESPS signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The test will be considered satisfactory if control board indication verifies that all components have responded to the ESPS actuation signal properly (all appropriate ESPS actuated pump breakers have opened or closed and all ESPS actuated valves have completed their travel). The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment.

The actuation logic is tested as part of the ESPS testing, and equipment performance is monitored as part of the Inservice Testing Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.3.6

Periodic inspections of the reactor building sump suction inlet ensure that it is unrestricted and stays in proper operating condition. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage, on the need to preserve access to the location, and on the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency has been found to be sufficient to detect abnormal degradation and has been confirmed by operating experience.

REFERENCES

1. 10 CFR 50.46.
2. UFSAR, Section 15.14.3.3.6.
3. UFSAR, Section 15.14.3.3.5.
4. 10 CFR 50.36.
5. NRC Memorandum to V. Stello, Jr., from R.L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
6. ASME, Boiler and Pressure Vessel Code, Section XI, Inservice Inspection, Article IWV-3400.
7. NRC Safety Evaluation of Babcock & Wilcox Owners Group (B&WOG) Topical Report BAW-2295, Revision 1, "Justification for the Extension of Allowed Outage Time for Low Pressure Injection and Reactor Building Spray systems," (TAC No. MA3807) dated June 30, 1999.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.2.2 (continued)

the interlock will function as designed and that simultaneous opening of the inner and outer doors will not inadvertently occur. Due to the purely mechanical nature of this interlock, and given that the interlock mechanism is not normally challenged when the containment air lock door is used for entry or exit (procedures require strict adherence to single door opening), this test is only required to be performed every 24 months. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage, and the potential loss of containment OPERABILITY if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance. The 24 month Frequency is based on engineering judgment and is considered adequate given that the interlock is not challenged during use of the air lock.

REFERENCES

1. 10 CFR 50, Appendix J, Option A and B.

2. UFSAR, Section 15.14.

3. UFSAR, Section 6.2.

4. 10 CFR 50.36.

5. Duke Power Company letter from William O. Parker, Jr. to Harold R. Denton (NRC) dated July 24, 1981.

6. NRC Letter from Philip C. Wagner to William O. Parker, Jr., dated November 6, 1981, Issuance of Amendment 104, 104 and 101 to Licenses DPR-38, DPR-47 and DPR-55 for the Oconee Nuclear Station Units Nos 1, 2 and 3.

BASES (continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.3.4

Verifying that the isolation time of each automatic power operated containment isolation valve is within limits is required to demonstrate OPERABILITY. The isolation time and Frequency of this SR are in accordance with the Inservice Testing Program.

SR 3.6.3.5

Automatic containment isolation valves close on a containment isolation signal to prevent leakage of radioactive material from containment following an accident. This SR ensures that each automatic containment isolation valve will actuate to its isolation position on a containment isolation signal. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass this Surveillance. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

REFERENCES

1. UFSAR, Section 6.2.
2. UFSAR, Section 15.14.
3. 10 CFR 50.36.
4. UFSAR, Table 6-7.
5. Generic Letter 91-08

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.5.2 (continued)

The 31 day Frequency was developed considering the known reliability of the fan units and controls, the three train redundancy available, and the low probability of a significant degradation of the reactor building cooling trains occurring between surveillances and has been shown to be acceptable through operating experience.

SR 3.6.5.3

Verifying that each required Reactor Building Spray pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by Section XI of the ASME Code (Ref. 4). Since the Reactor Building Spray System pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice tests confirm component OPERABILITY, trend performance, and may detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

SR 3.6.5.4

Verifying the containment heat removal capability provides assurance that the containment heat removal systems are capable of maintaining containment temperature below design limits following an accident. This test verifies the heat removal capability of the Low Pressure Injection (LPI) Coolers and Reactor Building Cooling Units. The 24 month Frequency was developed considering the known reliability of the low pressure service water, reactor building spray and reactor building cooling systems and other testing performed at shorter intervals that is intended to identify the possible loss of heat removal capability.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.5.5 and 3.6.5.6

These SRs require verification that each automatic reactor building spray and cooling valve actuates to its correct position and that each reactor building spray pump starts upon receipt of an actual or simulated actuation signal. The test will be considered satisfactory if visual observation and control board indication verifies that all components have responded to the actuation signal properly; the appropriate pump breakers have closed, and all valves have completed their travel. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The 24 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillances. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.5.5 is modified by a note that states the SR is applicable for Reactor Building Cooling system following completion of the LPSW RB Waterhammer Modification on the respective Unit.

SR 3.6.5.7

This SR requires verification that each required reactor building cooling train actuates upon receipt of an actual or simulated actuation signal. The test will be considered satisfactory if control board indication verifies that all components have responded to the actuation signal properly, the appropriate valves have completed their travel, and fans are running at half speed. The 24 month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.5.5 and SR 3.6.5.6, above, for further discussion of the basis for the 24 month Frequency.

BASES

ACTIONS

C.1 and C.2 (continued)

Inoperable TSVs that cannot be restored to OPERABLE status within the specified Completion Time, but are closed, must be verified on a periodic basis to be closed. This is necessary to ensure that the assumptions in the safety analysis remain valid. The 7 day Completion Time is reasonable, based on engineering judgment, in view of TSV status indications available in the control room, and other administrative controls, to ensure these valves are in the closed position.

D.1 and D.2

If the TSV cannot be restored to OPERABLE status or closed in the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 18 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from MODE 2 conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1 and SR 3.7.2.2

These SRs verify that TSV closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel A and Channel B. The 1.0 second TSV closure time is assumed in the accident and containment analyses. This Surveillance is normally performed upon returning the unit to operation following a refueling outage.

The Frequency for this SR is 24 months. The 24 month Frequency to demonstrate valve closure time is based on the refueling cycle. Operating experience has shown that these components usually pass the Surveillance. Therefore, the Frequency is acceptable from a reliability standpoint.

This test is conducted in MODE 3, with the unit at operating temperature and pressure, as discussed in the Reference 5 exercising requirements. This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. This allows delaying testing until MODE 3 in order to establish conditions consistent with those under which the acceptance criterion was generated.

BASES

ACTIONS

A.1 and A.2

With one or both of the ADV flow path(s) inoperable, the Unit must be placed in a condition in which the LCO does not apply. To achieve this status, the Unit must be placed in at least MODE 3 within 12 hours, and at least MODE 4 without reliance on a steam generator for heat removal within 24 hours. The Completion Times are reasonable, based on operating experience, to reach the required Unit conditions from full power conditions in an orderly manner and without challenging Unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

To perform a controlled cool down of the RCS, the valves that comprise the ADV flow path for each steam generator must be able to perform the following functions:

a) the atmospheric dump block valve bypass and the atmospheric vent valve must be capable of being opened and closed; and

b) the atmospheric dump control valve and atmospheric vent block valve must be capable of being opened and throttled through their full range.

This SR ensures that the valves that comprise the ADV flow path for each steam generator are cycled through the full control range at least once per 18 months. Performance of inservice testing or use of an ADV flow path during a unit cool down satisfies this requirement. This surveillance does not require the valves to be tested at pressure. Operating experience has shown that these components usually pass the Surveillance. Therefore, the Frequency is acceptable from a reliability standpoint.

REFERENCES

1. 10 CFR 50.36.

2. UFSAR, Section 10.3.

3. UFSAR, Section 15.9.

4. UFSAR, Section 15.12

5. UFSAR, Section 15.14

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.5.3 (continued)

controls. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. The 24 month Frequency is also acceptable based on operating experience and design reliability of the equipment. This SR is modified by a Note which states that the SR is not required in MODES 3 and 4. In MODES 3 and 4, the heat removal requirements would be less, thereby providing more time for operator action to manually start the required EFW pump.

SR 3.7.5.4

This SR verifies that each EFW pump starts in the event of any accident or transient that generates an initiation signal. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This SR is modified by a Note which states that the SR is not required in MODES 3 and 4. In MODE 3 and 4, the heat removal requirements would be less, thereby providing more time for operator action to manually start the required EFW pump.

SR 3.7.5.5

This SR ensures that the EFW System is properly aligned by verifying the flow paths to each steam generator prior to entering MODE 2 after more than 30 days in MODE 5 or 6. OPERABILITY of EFW flow paths must be demonstrated before sufficient core heat is generated that would require the operation of the EFW System during a subsequent shutdown. The Frequency is reasonable, based on engineering judgment, in view of other administrative controls to ensure that the flow paths are OPERABLE. To further ensure EFW System alignment, flow path OPERABILITY is verified, following extended outages to determine no misalignment of valves has occurred. This SR ensures that the flow path from the UST to the steam generator is properly aligned.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.7.2 (continued)

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

This SR is modified by a Note indicating that the isolation of components or systems supported by the LPSW System does not affect the OPERABILITY of the LPSW System.

SR 3.7.7.3

The SR verifies proper automatic operation of the LPSW System valves. The LPSW System is a normally operating system that cannot be fully actuated as part of the normal testing. This SR is not required for valves that are locked, sealed, or otherwise secured in position under administrative controls. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.7.4

The SR verifies proper automatic operation of the LPSW System pumps on an actual or simulated actuation signal. The LPSW System is a normally operating system that cannot be fully actuated as part of normal testing during normal operation. The 24 month Frequency is consistent with the Inservice Testing Program. Operating experience has shown that these components usually pass the Surveillance. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.7.5

For Units with LPSW RB Waterhammer Prevention System installed, the SR verifies proper operation of the LPSW RB Waterhammer Prevention System leakage accumulator. Verifying adequate flow from the accumulator will provide assurance that in the event of boundary valve leakage during a LOOP event, there is sufficient water to keep LPSW piping filled.

The 24 month is based on engineering judgment and operating experience.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.7.6

For Units with LPSW RB Waterhammer Prevention System installed, the SR verifies that LPSW WPS boundary valve leakage is ≤ 20 gpm. Verifying boundary valve leakage is within limits will ensure that in the event of a LOOP, a waterhammer will not occur, because the LPSW leakage accumulator will be able to maintain the LPSW piping water solid.

The LPSW Leakage Accumulator is designed to allow up to 25 gpm of aggregate leakage for one minute. The boundary valve leakage is limited to 20 gpm in order to allow five (5) gpm of miscellaneous leakage.

The 24 month Frequency is based on engineering judgment and operating experience.

Justification for performing this surveillance every 24 months is the similarity of the new LPSW equipment being tested (accumulator and check valves) with installed equipment performing similar functions, the modification design and the station's corrective action program for monitoring future performance.

REFERENCES

1. UFSAR, Section 9.2.2.

2. UFSAR, Section 6.3.

3. 10 CFR 50.36.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.9

This SR verifies the ECCW system functions to supply siphon header flow to the suction of the LPSW pumps during design basis conditions by ensuring air accumulation in the ECCW siphon headers is within the removal capabilities of the ESV System. This SR establishes siphon flow with the ESV pumps off. Air accumulation in the pipe results in a corresponding reduction in water level in the CCW piping over a time period. The rate of water level reduction is recorded and compared to limits established in design basis documents. The limits on the rate of water level reduction over a time period are established to ensure ECCW siphon header air accumulation rate is within the removal capabilities of the ESV System under design basis conditions. The Frequency of 24 months is based on the need to perform this SR when the Unit is shutdown. This SR is not required to be performed with the Unit 3 LPSW System taking suction from the siphon. This is acceptable since aligning the LPSW pumps to the Unit 3 ECCW siphon headers is not necessary to demonstrate that the ECCW air accumulation is within the ESV capacity which is the basic purpose of the test. The flow path from the Unit 3 CCW piping to the suction of the Unit 3 LPSW pumps is demonstrated by normal operation of the LPSW pumps.

A Note states that for Units 1 and 2, the SR is not required to be performed with the shared LPSW System for Units 1 and 2 taking suction from the siphon. This is necessary to avoid potential effects on an operating unit and is acceptable since the capability of the LPSW pumps to take suction from the CCW crossover header is demonstrated by normal, day-to-day operation of the LPSW pumps. Although a loss of suction to the LPSW pumps is unlikely during this SR, it is prudent to minimize the potential for jeopardizing the LPSW suction supply to the LPSW pumps when they are supporting an operating Unit.

REFERENCES

1. UFSAR, Chapter 9.
2. 10 CFR 50.36.
3. UFSAR, Chapter 16.
4. ASME, Boiler and Pressure Vessel Code, Section XI.
5. ASME Standard OM-6.

BASES

ACTIONS (continued)

E.1

During movement of recently irradiated fuel assemblies, when one or more CRVS trains are inoperable, action must be taken immediately to suspend activities that could release radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes the accident risk. This does not preclude the movement of fuel to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.9.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not severe, testing each train once every 92 days adequately checks this system. The trains need only be operated for ≥ one hour and all dampers verified to be OPERABLE to demonstrate the function of the system. This test includes an external visual inspection of the CRVS Booster Fan trains. The 92 day Frequency is based on the known reliability of the equipment.

SR 3.7.9.2

This SR verifies that the required CRVS Booster Fan train testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The CRVS Booster Fan train filter test frequencies are in accordance with Regulatory Guide 1.52 (Ref. 4). The VFTP includes testing HEPA filter performance and carbon adsorber efficiency. Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.9.3

This SR verifies the integrity of the Control Room enclosure. The Control Room positive pressure, with respect to potentially contaminated adjacent areas, is periodically tested to verify that the CRVS Booster Fan trains are functioning properly. During the emergency mode of operation, the CRVS Booster Fan trains are designed to pressurize the Control Room to minimize unfiltered inleakage. The CRVS Booster Fan trains are designed to maintain this positive pressure with both trains in operation. The Frequency of 24 months is consistent with industry practice.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.13

The KHU underground ACBs have a control feature which will automatically close the KHU, that is pre-selected to the overhead path, into the underground path upon an electrical fault in the zone overlap region of the protective relaying. This circuitry prevents an electrical fault in the zone overlap region of the protective relaying from locking out both emergency power paths during dual KHU grid generation. In order to ensure this circuitry is OPERABLE, an electrical fault is simulated in the zone overlap region and the associated underground ACBs are verified to operate correctly. This surveillance is required on a 12 month Frequency. The 12 month Frequency is based on engineering judgement and provides reasonable assurance that the zone overlap protection circuitry is operating properly.

This SR is modified by a Note indicating the SR is only applicable when the overhead disconnects to the underground KHU are closed. When the overhead disconnects to the underground KHU are open, the circuitry preventing the zone overlap protective lockout of both KHUs is not needed.

SR 3.8.1.14

This surveillance verifies OPERABILITY of the trip functions of the SL and N breakers. This SR verifies each trip circuit of each breaker independently opens each breaker. Neither of these breakers have any automatic close functions; therefore, only the trip circuits require verification. The 24 month Frequency is based on engineering judgement and provides reasonable assurance that the SL and N breakers will trip when required.

The SR is modified by a Note indicating that the SR is not required for an SL breaker when its standby bus is energized by a LCT via an isolated power path. This is necessary since the standby buses are required to be energized from a LCT by several Required Actions of Specification 3.8.1 and the breakers must remain closed to energize the standby buses from a LCT.

SR 3.8.1.15

This surveillance verifies proper operation of the 230 kV switchyard circuit breakers upon an actual or simulated actuation of the Switchyard Isolation circuitry. This test causes an actual switchyard isolation (by

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.15 (continued)

actuation of degraded grid voltage protection) and alignment of KHUs to the overhead and underground emergency power paths. A 24 month Frequency minimizes the impact to the Station and the operating Units which are connected to the 230 kV switchyard. The effect of this SR is not significant because the generator red bus tie breakers and feeders from the Oconee 230 kV switchyard red bus to the system grid remain closed. Either Switchyard Isolation Channel causes full system realignment, which involves a complete switchyard realignment. To avoid excessive switchyard circuit breaker cycling, realignment and KHU emergency start functions, this SR need be performed only once each SR interval.

This SR is modified by a Note. This Note states the redundant breaker trip coils shall be verified on a STAGGERED TEST BASIS. Verifying the trip coils on a STAGGERED TEST BASIS precludes unnecessary breaker operation and minimizes the impact to the Station and the operating Units which are connected to the 230 kV switchyard.

SR 3.8.1.16

This SR verifies by administrative means that one KHU provides an alternate manual AC power source capability by manual or automatic KHU start with manual synchronize, or breaker closure, to energize its non-required emergency power path. That is, when the KHU to the overhead emergency power path is inoperable, the SR verifies by administrative means that the overhead emergency power path is OPERABLE. When the overhead emergency power path is inoperable, the SR verifies by administrative means that the KHU associated with the overhead emergency power path is OPERABLE.

This SR is modified by a Note indicating that the SR is only applicable when complying with Required Action C.2.2.4.

SR 3.8.1.17

This SR verifies the Keowee Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers on an out of tolerance trip signal. The 24 month Frequency is based on engineering judgement and provides reasonable assurance that the Voltage and Frequency out of tolerance logic trips and blocks closure of these breakers when required.

BASES

ACTIONS

B.2 (continued)

made in accordance with Required Actions A.1 and A.2, the core reactivity condition is stabilized until the source range neutron flux monitors are restored to OPERABLE status. This stabilized condition is verified by performing SR 3.9.1.1 to ensure that the required boron concentration exists.

The Completion Time of 4 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration. The Frequency of once per 12 hours ensures that unplanned changes in boron concentration would be identified. The 12 hour Frequency is reasonable, considering the low probability of a change in core reactivity during this time period.

SURVEILLANCE REQUIREMENTS

SR 3.9.2.1

SR 3.9.2.1 is the performance of a CHANNEL CHECK, which is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that the indication channel(s) should be consistent with core conditions. Changes in fuel loading and core geometry can result in significant differences between source range channels, but each channel should be consistent with its local conditions. When in MODE 6 with one channel OPERABLE, a CHANNEL CHECK is still required. However, in this condition, a redundant source range instrument may not be available for comparison. The CHANNEL CHECK provides verification that the OPERABLE source range channel is energized and indicates a value consistent with current unit status.

The Frequency of 12 hours is consistent with the CHANNEL CHECK Frequency specified similarly for the same instruments in LCO 3.3.9.

SR 3.9.2.2

SR 3.9.2.2 is the performance of a CHANNEL CALIBRATION every 24 months. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. The CHANNEL CALIBRATION for the source range nuclear instrument is a complete check and re-adjustment of the channel, from the pre-amplifier input to the indicator. The 24 month Frequency is based on the need to perform this Surveillance during the conditions that apply during a unit outage. Industry experience has shown these components usually pass the Surveillance.

BASES

ACTIONS

F.1 (continued)

year. This includes the 7 day Completion Time that leads to entry into Condition F. For example, if the SSF ASW System is inoperable for 10 days, the 45 day special inoperability period is reduced to 35 days. If the SSF ASW System is inoperable for 6 days, Condition A applies and there is no reduction in the 45 day allowance. The limit of 45 days per calendar year minimizes the number and duration of extended outages associated with exceeding the 7 day Completion Time of a Condition.

G.1 and G.2

If the Required Action and associated Completion Time of Condition F are not met or if the Required Action and associated Completion Time of Condition A, B, C, D, or E are not met for reasons other than Condition F, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 12 hours and MODE 4 within 84 hours. The allowed Completion Times are appropriate, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems, considering a three unit shutdown may be required.

SURVEILLANCE REQUIREMENTS

SR 3.10.1.1

Performance of the CHANNEL CHECK once every 7 days for each required instrumentation channel ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel with a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. This SR is modified by a Note to indicate that it is not applicable to the SSF RCS temperature instrument channels, which are common to the RPS RCS temperature instrument channels and are normally aligned through a transfer isolation device to each Unit control room. The instrument string to the SSF control room is checked and calibrated every 24 months.

Agreement criteria are determined based on a combination of the channel instrument uncertainties, including indication and readability. If a

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.10.1.12

A battery service test is a special test of the battery capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length correspond to the design duty cycle requirements. The design basis discharge time for the SSF battery is one hour.

The Surveillance Frequency for this test is 12 months. This Frequency is considered acceptable based on operating experience.

SR 3.10.1.13

CHANNEL CALIBRATION is a complete check of the instrument channel, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. CHANNEL CALIBRATION shall find that measurement errors and bistable setpoint errors are within the assumptions of the setpoint analysis. CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the setpoint analysis. This Frequency is justified by the assumption of a 24 month calibration interval to determine the magnitude of equipment drift in the setpoint analysis.

SR 3.10.1.14

Inservice Testing of the SSF valves demonstrates that the valves are mechanically OPERABLE and will operate when required. These valves are required to operate to ensure the required flow path.

The specified Frequency is in accordance with the IST Program requirements. Operating experience has shown that these components usually pass the SR when performed at the IST Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

ATTACHMENT 5

LIST OF REGULATORY COMMITMENTS

The following commitment table identifies those actions committed to by Duke Energy Carolinas, LLC (Duke Energy) in this submittal. Other actions discussed in the submittal represent intended or planned actions by Duke Energy. They are described to the Nuclear Regulatory Commission (NRC) for the NRC's information and are not regulatory commitments.

	Commitment	Completion Date
1	Any necessary revisions to setpoint calculations, calibration and functional test procedures to incorporate drift evaluation results will be prepared prior to implementation of this amendment request.	Upon implementation of the License amendment
2	The ongoing drift trending program will monitor future as-found/as-left results for three 24 month cycles to ensure the assumptions in the setpoint calculations continue to be valid.	Upon implementation of the License amendment
3	When insufficient data points are available to apply a statistical drift value, the ongoing drift trending program will validate the drift assumptions or cause re-analysis when sufficient data points are available.	Upon implementation of the License amendment

ATTACHMENT 6

DETAILED GL 91-04 EVALUATION RESULTS

1 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy) proposes Technical Specification (TS) Surveillance Requirements (SR) frequency changes to accommodate a 24-month fuel cycle for Oconee Nuclear Station (ONS). Duke Energy performed an evaluation to support the proposed changes in accordance with the guidance provided in NRC Generic Letter (GL) 91-04 (Reference 1). GL 91-04 identifies the types of information that must be addressed when proposing extensions of TS SR frequency intervals from 18 months to 24 months.

Historical surveillance test data and associated maintenance records were reviewed in evaluating the effect of these changes on safety. In addition, the licensing basis was reviewed for functions associated with each revision to ensure it was not invalidated. Based on the results of these reviews it is concluded that there is no adverse effect on plant safety due to increasing the surveillance test intervals from 18 months to 24 months with the continued application of the SR 3.0.2 grace period of 25%.

GL 91-04 also addresses steam generator inspections and interval extensions to the 24 month leak rate testing requirements of 10 CFR 50 Appendix J. Duke has already addressed the steam generator integrity issues by implementation of Oconee Amendment Nos. 355, 357, and 356 (adopted Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-449, and revision 4, "Steam Generator Tube integrity"). Since GL 91-04 was issued, NRC has revised 10 CFR 50 Appendix J to allow licensees to adopt performance based testing requirements (Option B) that allow intervals to exceed the prescriptive 24 month testing requirements (Option A). Duke is in the process of requesting a change to the adopt Option B for LLRT and expects to receive approval of that change prior to the next required performance after implementation of this change. Therefore, Duke does not anticipate needing an exemption to the 24 month testing requirements of Appendix J Option A.

2 EVALUATION

In GL 91-04, the NRC provided generic guidance for evaluating a 24-month surveillance test interval for TS SRs. Enclosure 1 of this submittal defined each step outlined by the NRC in GL 91-04 and provides a description of the methodology used by Duke Energy to complete the evaluation for each specific TS SR.

The ONS Instrument Drift Analysis Methodology is based on EPRI Technical Report TR-103335-R1 (Reference 3), which is consistent with ISA Standards (References 5 and 6) and Duke Energy Setpoint Methodology (Reference 7). The NRC Status Report providing comments on revision 0 of the referenced EPRI technical report was also used in developing the ONS methodology document. Duke Energy provided a summary of the ONS methodology during a meeting with the NRC on July 1, 2009. Duke Energy revised the methodology document to address NRC comments made during the meeting. The methodology, which is used to determine instrument drift based on historical plant calibration data, ensures that As-Found/As-Left (AFAL) drift values are determined with a high probability and a high degree of confidence.

An AFAL Drift Analysis was not appropriate or not feasible in some cases (e.g. new instrumentation with insufficient historical data, rate of change instrumentation for which drift is not applicable, instrumentation for which no uncertainty calculation/analytical limit is required, and functions with obvious margin). As a result, Duke Energy evaluated certain instrument functions (evaluation provided with each SR as applicable) to justify why an AFAL Drift Analysis is not required.

The effect of longer calibration intervals on the TS instrumentation was evaluated by performing a review of the surveillance test history for the affected instrumentation including, where appropriate, an instrument drift study. In performing the historical drift evaluation, an effort was made to retrieve recorded channel calibration data for associated instruments for at least seven[1] operating cycles (Unit 1 from June 1999 to April 2008, Unit 2 from April 1998 to May 2007, Unit 3 from November 1998 to November 2007[2]). In some instances, additional surveillances were included when available and required to perform an adequate statistical analysis of instrument drift.

In addition to evaluating the historical drift associated with current 18-month calibrations, Duke Energy also evaluated the failure history of each 18-month surveillance for at least the last five cycles (beginning with Unit 1 Spring 2002 outage, Unit 2 Spring 2001 outage, and Unit 3 Fall 2001 outage). With the extension of the testing frequency to 24 months, there will be a longer period between each surveillance performance. If a failure that results in the loss of the associated safety function should occur during the operating cycle that would only be detected by the performance of the 18-month TS SR, then the increase in the surveillance testing interval might result in a decrease in the associated function's availability. In addition to evaluating these surveillance failures, potential common features of similar components tested by different surveillances were also evaluated. This additional evaluation determined whether there is evidence of repetitive failures among similar plant components.

The surveillance failures that are detailed with each SR exclude failures that:

(1) Did not impact a TS safety function or TS operability

(2) Are detectable by required testing performed more frequently than the 18-month surveillance being extended; or

(3) Where the cause can be attributed to an associated event such as a preventative maintenance task, human error, previous modification, or previously existing design deficiency, or that were subsequently re-performed successfully with no intervening corrective maintenance (e.g., plant conditions or malfunctioning measurement and test equipment may have caused aborting the test performance).

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[1] A minimum of seven cycles were required to obtain enough calibration data to allow a valid statistical determination of instrument drift.
[2] Most common retrieval dates, specific dates for each function are in AFAL Drift Analysis calculation

These categories of failures are not related to potential unavailability due to testing interval extension and therefore are not listed or further evaluated in this submittal.

The SRs were evaluated relative to extending the testing interval from a frequency of 18 months to 24 months. These SRs ensure the availability of safety functions that respond to plant transients and design basis events. Potential time-based considerations, such as 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 below.

The following sections summarize the results of the failure history evaluation. The evaluation confirmed that the impact on system availability, if any, would be small as a result of the change to a 24-month testing frequency.

The proposed TS changes related to GL 91-04 test interval extensions have been divided into two categories. The categories are: (A) changes to surveillances other than channel calibrations, identified as "Non-Calibration Changes" and (B) changes involving the channel calibration frequency identified as "Channel Calibration Changes".

A. Non-Calibration Changes

For the non-calibration 18-month surveillances, GL 91-04 requires the following information to support conversion to a 24-month frequency:

1) Licensees should evaluate the effect on safety of the change in surveillance intervals to accommodate a 24-month fuel cycle. This evaluation should support a conclusion that the effect on safety is small.
2) Licensees should confirm that historical maintenance and surveillance data do not invalidate this conclusion.
3) Licensees should confirm that the performance of surveillances at the bounding surveillance interval limit provided to accommodate a 24-month fuel cycle would not invalidate any assumption in the plant licensing basis.

In consideration of these confirmations, GL 91-04 provides that licensees need not quantify the effect of the change in surveillance intervals on the availability of individual systems or components.

The following non-calibration TS SRs are proposed for revision to a 24-month frequency. The associated qualitative evaluation is provided for each of these changes, which concludes that the effect on plant safety is small, that the change does not invalidate any assumption in the plant licensing basis, and that the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. These conclusions have been validated by a review of the surveillance test history at ONS as summarized below for each SR.

TS 3.3.6 Engineered Safeguards Protection System (ESPS) Manual Initiation

SR 3.3.6.1 Perform CHANNEL FUNCTIONAL TEST

TS 3.3.12 Automatic Feedwater Isolation System (AFIS) Manual Initiation

SR 3.3.12.1 Perform CHANNEL FUNCTIONAL TEST

TS 3.3.13 Automatic Feedwater Isolation System (AFIS) Digital Channels

SR 3.3.13.1 Perform CHANNEL FUNCTIONAL TEST.

TS 3.3.28 Low Pressure Service Water (LPSW) Standby Pump Auto-Start Circuitry

SR 3.3.28.1 Perform CHANNEL FUNCTIONAL TEST

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. All of the actuation instrumentation and logic, controls, monitoring capabilities, and protection systems, are designed to meet applicable reliability, redundancy, single failure, and qualification standards and regulations as described in the ONS Updated Final Safety Analysis Report (UFSAR). As such, these functions are designed to be highly reliable. This is acknowledged in the August 2, 1993 NRC Safety Evaluation Report relating to extension of the Peach Bottom Atomic Power Station, Unit Numbers 2 and 3 surveillance intervals from 18 to 24 months:

> "Industry reliability studies for boiling water reactors (BWRs), prepared by the BWR Owners Group (NEDC-30936P) show that the overall safety systems' reliabilities are not dominated by the reliabilities of the logic systems, but by that of the mechanical components, (e.g., pumps and valves), which are consequently tested on a more frequent basis. Since the probability of a relay or contact failure is small relative to the probability of mechanical component failure, increasing the Logic System Functional Test interval represents no significant change in the overall safety system unavailability."

A review of the applicable ONS surveillance history demonstrated that the instrumentation for these functions had no failures of the Technical Specification (TS) functions that would have been detected solely by the periodic performance of the above SRs.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.3.14 Emergency Feedwater (EFW) Pump Initiation Circuitry

SR 3.3.14.3 Perform CHANNEL FUNCTIONAL TEST for each automatic initiation circuit.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. All of the actuation instrumentation and logic, controls, monitoring capabilities, and protection systems, are designed to meet applicable reliability, redundancy, single failure, and qualification standards and regulations as described in the ONS Updated Final Safety Analysis Report (UFSAR). As such, these functions are designed to be highly reliable. This is acknowledged in the August 2, 1993 NRC Safety Evaluation Report relating to extension of the Peach Bottom Atomic Power Station, Unit Numbers 2 and 3 surveillance intervals from 18 to 24 months:

> "Industry reliability studies for boiling water reactors (BWRs), prepared by the BWR Owners Group (NEDC-30936P) show that the overall safety systems' reliabilities are not dominated by the reliabilities of the logic systems, but by that of the mechanical components, (e.g., pumps and valves), which are consequently tested on a more frequent basis. Since the probability of a relay or contact failure is small relative to the probability of mechanical component failure, increasing the Logic System Functional Test interval represents no significant change in the overall safety system unavailability."

A review of the applicable ONS surveillance history demonstrated that the Emergency Feedwater Pump Initiation Circuitry actuation logic had only one failure of the Technical Specification functions that would have been detected solely by the periodic performance of the above SR.

a. On November 20, 2005, during the performance of Procedure IP/0/A/0275/005 Y, Time Delay Relay 2FDWTDEFWPTX (Cutler Hammer D87XLD30) setpoint was out of tolerance low. The timer would not calibrate and was replaced with a new Cutler Hammer Model D87 timer and calibrated satisfactorily.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for the failure, the impact of this change on safety, if any, is small.

<u>TS 3.3.7 Engineered Safeguards Protection System (ESPS) Automatic Actuation Output Logic Channels</u>

SR 3.3.7.2 Perform automatic actuation output logic CHANNEL FUNCTIONAL TEST.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. For Units with the ESPS digital upgrade complete, the CHANNEL FUNCTIONAL TEST essentially validates the self monitoring function and checks for a small set of failure modes that are undetectable by the self monitoring function.

The 92 day Frequency for this SR was extended to 18 months (for Unit(s) with the ESPS digital upgrade complete) by ONS Amendment Nos. 366, 368, and 367. These amendments

were effective on January 28, 2010 and are to be implemented prior to installation. The associated TS change will become applicable to Unit 1 after installation during the Spring 2011 refueling outage and to Units 3 and 2 after installation during the Spring 2012 and Fall 2013 refueling outages, respectively. The extension to 18 months was justified based on the design capabilities and reliability of the new digital ESPS. The 18-month frequency was chosen based on an 18-month refueling cycle and the need to perform the surveillance when the unit is shut down. The design capabilities and reliability of the new digital ESPS that supported the extension to 18 months also support a 24-month frequency. The digital ESPS software performs a continuous online automated cross channel check, separately for each channel, and continuous online signal error detection and validation. The protection system also performs continual online hardware monitoring. The reliability of components whose failure modes are not automatically detected or indicated also support a test frequency of up to 24 months. Amendment Nos. 366, 368, and 367 also added a 92 day SR to manually actuate the output channel interposing relays to demonstrate OPERABILITY of the relays. The proper functioning of the processor portion of the channel is continuously checked by the automatic cyclic self monitoring. Note with the addition of the new SR (SR 3.3.7.1), the CHANNEL FUNCTIONAL TEST was renumbered SR 3.3.7.2

With the absence of surveillance history, the extension of this SR frequency is based on the design capabilities and reliability of digital ESPS as described above. As such, the surveillance interval extension is justified and the impact of the change to a 24-month testing frequency on safety, if any, is small.

3.3.17 Emergency Power Switching Logic (EPSL) Automatic Transfer Function

SR 3.3.17.1 Perform CHANNEL FUNCTIONAL TEST.

The SR verifies that the ESPS inputs to the Load Shed and Transfer to Standby function and the Retransfer to Startup function operate properly during an automatic transfer of the Main Feeder Buses to the Startup Transformer, Standby Buses, and retransfer to the Startup Transformers.

3.3.18 Emergency Power Switching Logic (EPSL) Voltage Sensing Circuits

SR 3.3.18.1 Perform CHANNEL FUNCTIONAL TEST.

The SR is performed on each voltage sensing circuit channel to ensure the channel will perform its function by operating individual channel relays to cause appropriate contact responses within associated loadshed/breaker circuits, alarm activations, and proper indications for the sensing circuit control power status.

3.3.21 Emergency Power Switching Logic (EPSL) Keowee Emergency Start Function

SR 3.3.21.1 Perform CHANNEL FUNCTIONAL TEST.

The SR is performed on each Keowee Emergency Start channel to ensure the channel will perform its function during an automatic transfer of the Main Feeder Buses to the Startup Transfer, Standby Buses, and retransfer to the Startup Transformers.

3.3.23 Main Feeder Bus Monitor Panel (MFBMP)

SR 3.3.23.1 Perform a CHANNEL FUNCTIONAL TEST.

This SR is performed on each MFBMP voltage sensing channel and MFBMP actuation logic channel to ensure the MFBMP will perform its intended function.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. All of the actuation instrumentation and logic, controls, monitoring capabilities, and protection systems, are designed to meet applicable reliability, redundancy, single failure, and qualification standards and regulations as described in the ONS UFSAR. As such, these functions are designed to be highly reliable. This is acknowledged in the August 2, 1993 NRC Safety Evaluation Report relating to extension of the Peach Bottom Atomic Power Station, Unit Numbers 2 and 3 surveillance intervals from 18 to 24 months:

> "Industry reliability studies for boiling water reactors (BWRs), prepared by the BWR Owners Group (NEDC-30936P) show that the overall safety systems' reliabilities are not dominated by the reliabilities of the logic systems, but by that of the mechanical components, (e.g., pumps and valves), which are consequently tested on a more frequent basis. Since the probability of a relay or contact failure is small relative to the probability of mechanical component failure, increasing the Logic System Functional Test interval represents no significant change in the overall safety system unavailability."

A review of the applicable ONS surveillance history demonstrated that the instrumentation for these functions had only one failure of the Technical Specification functions that would have been detected solely by the periodic performance of the above SR.

a. On October 27, 2002, during the performance of a Test Procedure, 2SA14-D4 & D6 did not actuate. Investigation determined that auxiliary contact 81-82 did not close. The problem found improper alignment of the auxiliary switch. Adjustments to this alignment on the auxiliary switch fixed the problem. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failure would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal for the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for failure, the impact of this change on safety, if any, is small.

TS 3.4.1 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

SR 3.4.1.4 Verify by measurement RCS total flow rate is within limit specified by the COLR.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. Measurement of RCS total flow rate by performance of a calorimetric heat balance once after a refueling outage allows the installed RCS flow instrumentation to be calibrated and verifies that the actual RCS flow is greater than or equal to the minimum required RCS flow rate specified in the COLR.

A review of the applicable ONS surveillance history demonstrated that the instrumentation for these functions had no failures of the TS functions that would have been detected solely by the periodic performance of the above SR.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.4.9 Pressurizer

SR 3.4.9.2 Verify capacity of required pressurizer heaters and associated power supplies are ≥ 400 kW.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The SR verifies the power supplies are capable of producing the minimum power and the associated pressurizer heaters are at their design rating.

A review of the applicable ONS surveillance history demonstrated that there was only one failure of the TS required equipment that would have been detected solely by the periodic performance of the above SR.

a. On May 22, 2003, during the performance of a test procedure, several breakers were reading below the required >150K ohms resistance. Moisture was suspected in the cables. After cleaning the internal bus and outside of the breaker case, readings were still not satisfactory. The top two breakers were replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failure would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for the failures, the impact of this change on safety, if any, is small.

TS 3.4.14 Reactor Coolant System (RCS) Pressure Isolation Valve (PIV) Leakage

SR 3.4.14.1 Verify leakage from each required RCS PIV is equivalent to ≤ 0.5 gpm per nominal inch of valve size up to a maximum of 5 gpm at an RCS pressure ≥ 2150 psia and ≤ 2190 psia.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. Performance of leakage testing on each required RCS PIV or isolation valve is required to verify that leakage is below the specified limit and to identify each leaking valve.

A review of the surveillance test history determined there were no previous failures of the SR. Therefore, based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.5.2 High Pressure Injection (HPI)

SR 3.5.2.4 Verify each HPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.5.2.5 Verify each HPI pump starts automatically on an actual or simulated actuation signal.

SR 3.5.2.6 Verify, by visual inspection, each HPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.

SR 3.5.2.7 Cycle each HPI discharge crossover valve and LPI-HPI flow path discharge valve.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. SR 3.5.2.4 and SR 3.5.2.5 demonstrate that each automatic HPI valve actuates to the required position and that each HPI pump starts on an actual or simulated ESPS signal. Periodic inspections of the reactor building sump suction inlet required by SR 3.5.2.6 ensure that it is unrestricted and stays in proper operating condition. Periodic stroke testing of the

HPI discharge crossover and LPI-HPI flow path discharge valves required by SR 3.5.2.7 ensure that the valves can be manually cycled from the Control Room.

For SR 3.5.2.4 and SR 3.5.2.5, the actuation logic is tested as part of the ESPS testing, and equipment performance is monitored as part of the Inservice Testing Program. A review of the applicable ONS surveillance history demonstrated that there were no failures of the TS functions that would have been detected solely by the periodic performance of these SRs. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.5.3 Low Pressure Injection (LPI)

SR 3.5.3.4 Verify each LPI automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.5.3.5 Verify each LPI pump starts automatically on an actual or simulated actuation signal.

SR 3.5.3.6 Verify, by visual inspection, each LPI train reactor building sump suction inlet is not restricted by debris and suction inlet strainers show no evidence of structural distress or abnormal corrosion.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. SR 3.5.3.4 and SR 3.5.3.5 demonstrate that each automatic LPI valve actuates to the required position and that each LPI pump starts on an actual or simulated ESPS signal. Periodic inspections of the reactor building sump suction inlet required by SR 3.5.3.6 ensure that it is unrestricted and stays in proper operating condition.

For SR 3.5.3.4 and SR 3.5.3.5, the actuation logic is tested as part of the ESPS testing, and equipment performance is monitored as part of the Inservice Testing Program. A review of the applicable ONS surveillance history demonstrated that there were no failures of the Technical Specification functions that would have been detected solely by the periodic performance of the these SRs. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.6.2 Containment Air Locks

SR 3.6.2.2 Verify only one door in the air lock can be opened at a time.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. Periodic testing of this interlock demonstrates that the interlock will function as

designed and that simultaneous opening of the inner and outer doors will not inadvertently occur. Due to the purely mechanical nature of this interlock, and given that the interlock mechanism is not normally challenged when the containment air lock door is used for entry or exit (procedures require strict adherence to single door opening), this test is currently only required to be performed every 18 months.

A review of the surveillance history determined that there were no previous failures of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.6.3 Containment Isolation Valves

SR 3.6.3.5 Verify each automatic containment isolation valve that is not locked, sealed, or otherwise secured in position, actuates to the isolation position on an actual or simulated actuation signal.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. This SR verifies that each automatic containment isolation valve closes on a containment isolation signal to prevent leakage of radioactive material from containment following an accident.

A review of the applicable ONS surveillance history demonstrated that the there were no failures of the TS functions that would have been detected solely by the periodic performance of the above SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.6.5 Reactor Building (RB) Spray and Cooling Systems

SR 3.6.5.4 Verify that the containment heat removal capability is sufficient to maintain post accident conditions within design limits.

SR 3.6.5.5 Verify each automatic reactor building spray and cooling valve in each required flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.6.5.6 Verify each required reactor building spray pump starts automatically on an actual or simulated actuation signal.

SR 3.6.5.7 Verify each required reactor building cooling train starts automatically on an actual or simulated actuation signal.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace

period. SR 3.6.5.4 verifies that the heat removal capability of the Low Pressure Injection (LPI) Coolers and Reactor Building Cooling Units. SR 3.6.5.5, SR 3.6.5.6, and SR 3.6.5.7 demonstrate that automatic reactor building spray and cooling valve in each required flow path actuates to the required position and that each reactor building spray pump and reactor building cooling train starts on an actual or simulated actuation signal.

A review of surveillance test history determined there were no previous failures of SR 3.6.5.4. A review of the surveillance history of SRs 3.6.5.5, 3.6.5.6, and 3.6.5.7 demonstrated that there were no previous failures of the Technical Specification functions that would have been detected solely by the periodic performance of the these SRs. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.7.2 Turbine Stop Valves (TSV)

SR 3.7.2.1 Verify closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel A.

SR 3.7.2.2 Verify closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel B.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The SRs verify that TSV closure time of each TSV is ≤ 1.0 second on an actual or simulated actuation signal from Channel A or B.

A review of the applicable ONS surveillance history demonstrated that there were only two failures (one on each channel) of TS required equipment for this function that would have been detected solely by the periodic performance of the above SRs.

a. On December 16, 2007, during the performance of a Test Procedure, Valve #4, 3MS-102 closure time was not acceptable. Troubleshooting found a wire disconnected at CRD A Breaker Cubicle terminal TB2-12. The connection was not of optimal design due to both a 14 awg wire and a 12 awg wire terminated under the same compression terminal. Fast acting solenoid valve SV-4 was also replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

b. On June 1, 2006, during the performance of a Test Procedure, the test was aborted due to a problem with 3KVIC breaker #3 tripping. Troubleshooting found a conductor had broken loose from the solder pin of the electrical connector of SV2 Fast Acting Solenoid Valve. The conductor was re-soldered with no other problems encountered. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failure would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for failures, the impact of this change on safety, if any, is small.

TS 3.7.4 Atmospheric Dump Valve (ADV) Flow Paths

SR 3.7.4.1 Cycle the valves that comprise the ADV flow paths.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. This SR ensures that the valves that comprise the ADV flow path for each steam generator are cycled through the full control range at least once per 24 months. Performance of inservice testing or use of an ADV flow path during a unit cool down satisfies this requirement.

A review of the applicable ONS surveillance history demonstrated that the instrumentation for these functions had only one failure of the TS functions that would have been detected solely by the periodic performance of the above SR.

a. On May 12, 2005, during the performance of a Test Procedure, 1MS-17 was found closed. The valve opened and operated properly but would not close. Troubleshooting determined the Auxiliary Contacts required cleaning. The auxiliary contacts were cleaned to resolve the problem. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failure would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for the failure, the impact of this change on safety, if any, is small.

TS 3.7.5 Emergency Feedwater (EFW) System

SR 3.7.5.3 Verify each EFW automatic valve that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.7.5.4 Verify each EFW pump starts automatically on an actual or simulated actuation signal.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. These SRs verify that that EFW can be delivered to the appropriate steam generator by demonstrating each automatic valve actuates to its correct position and each EFW pump starts automatically on an actual or simulated actuation signal.

A review of the applicable ONS surveillance history demonstrated that there was only one failure of the TS functions that would have been detected solely by the periodic performance of the above SR.

a. On November 20, 2005, during the performance of an Instrument Procedure, Time Delay Relay 2FDWTDEFWPTX (Cutler Hammer D87XLD30) setpoint was out of tolerance low. The timer would not calibrate and was replaced with a new Cutler Hammer Model D87 timer and was calibrated satisfactorily. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failure would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for the failure, the impact of this change on safety, if any, is small.

<u>TS 3.7.7 Low Pressure Service Water (LPSW) System</u>

SR 3.7.7.3 Verify each LPSW automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.

SR 3.7.7.4 Verify each LPSW pump starts automatically on an actual or simulated actuation signal.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. These SRs verify proper automatic operation of the LPSW System valves and LPSW System pumps on an actual or simulated actuation signal.

A review of the applicable ONS surveillance history demonstrated that there were no failures of the TS functions that would have been detected solely by the periodic performance of the above SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

SR 3.7.7.5 Verify LPSW leakage accumulator is able to provide makeup flow lost due to boundary valve leakage on Units with LPSW RB Waterhammer modification installed.

SR 3.7.7.6 Verify LPSW WPS boundary valve leakage is ≤ 20 gpm for Units with LPSW RB Waterhammer modification installed.

SR 3.7.7.5 verifies proper operation of the LPSW Reactor Building (RB) Waterhammer Prevention System (WPS) leakage accumulator. Verifying adequate flow from the accumulator will provide assurance that in the event of boundary valve leakage during a loss of offsite power (LOOP) event, there is sufficient water to keep LPSW piping filled. SR 3.7.7.6 verifies the LPSW WPS boundary valve leakage is less than analyzed. These SRs were added as part of the station modification made to address generic letter (GL) 96-06 concerns associated waterhammer inside containment during a LOCA or MSLB combined with a LOOP event. Duke Energy installed WPS in all Oconee units starting with Unit 2 in fall of 2008 and Units 3 & 1 in the spring and fall of 2009 respectively. Hence, none of the units have had a full operating cycle with the WPS equipment.

The leakage accumulator function is similar in principle to the core flood tank (CFT) of the RCS (Reactor Coolant System). The components required to satisfy SR 3.7.7.5 are the leakage accumulator tank, air tank, level instrument, and discharge piping (including orifice). During normal operation, the leakage accumulator tank level floats with the system. It is a passive design that does not rely on any active components to dump leakage accumulator inventory to make up for boundary valve leakage (in the event of the loss of LPSW forced circulation). The contents of the WPS leakage accumulator is controlled and pushed into the LPSW piping by an air overpressure above a liquid inventory. The level is monitored and verified each shift. The air pressure in the tank will be the same as the LPSW system. Air will compress and expand depending on the pressure change corresponding to the level change. In an event, the initial liquid discharged would be limited by an in line orifice until the LPSW piping (to and from the reactor building) is bottled up by the boundary valves. The rest of the contents in the tank are then used to replenish the lost inventory through the boundary valve leakage. SR 3.7.7.6 insures that the boundary valve leakage (check valve and quick acting pneumatic valve are the supply and return isolations, respectively) are less than what the leakage accumulator can provide.

The LPSW System is normally operating. To test the leakage accumulator and boundary valves would cause cooling water flow interruptions to the Reactor Coolant Pump (RCP) motor coolers (RCS force circulation) and containment heat removal systems (non safety related Reactor Building Auxiliary Coolers (RBAC) and the safety related Reactor Building Cooling Units). Hence the equipment cannot be fully tested/actuated as part of normal testing during normal operation. The refueling outage frequency was the earliest possible time to perform the surveillance without affecting power operation and is also consistent with the Inservice Testing Program.

Historical surveillance testing that has been performed on similar pneumatic valves as the boundary valves (RBAC containment isolation) shows that no failures have been observed.

These 18" Fisher Posi-Seal high performance butterfly valves are actuated by a Bettis T Series actuator. These butterfly valves are designed for isolation on/off service as well as low flow control. The Operating Experience data base does not indicate any failures of these types of equipment. They are designed to meet the system requirements and will function properly with the extended surveillance tests.

Check valves by nature are simple components. The design function of the installed check valves in this application is to close. The valves are installed in the vertical orientation which is expected to aid in the closing function. The check valves are angle split body tilting disc check valves. These valves have been installed and leak checked to verify that they are meeting the leakage requirements. These valves are in the IST Condition Monitoring (CM) program. The CM program requires these valves to be disassembled during the first refueling outage following initial installation unless there is justification to extend the initial test interval. The CM Code requirements don't differentiate between 18-month and 24-month operating cycles. Therefore, it is acceptable to perform either a 24-month disassembly inspection or a Non Intrusive Test (NIT such as an acoustic type diagnostic test).

The level instrumentation consists of a Rosemount 3051 transmitter that provides a digital output signal of Accumulator Tank Level to the Plant Control System which in turns provides a digital signal to the Operator Aid Computer (OAC). The Rosemount 3051 series transmitters have been used in multiple plant applications some of which have current calibration frequencies equal to or greater than 24 months. Since the signal transmission for the Accumulator Tank Level is digital, drift over time should be minimized. In addition, a local sight glass is also provided as an independent means to verify tank level.

The leakage accumulator components are passive devices and not subject to short-term degradation mechanisms. The main function verified under SR 3.7.7.5 is to ensure that the leakage accumulator can provide water at a rate greater than the allowed rate of boundary valve leakage, adjusted for the expected range of operating conditions. Orifice fouling is the most likely reason that the flow rate would be reduced from one outage to the next. This fouling is expected to be a slow mechanism.

Although no surveillances have been performed on the newly installed equipment, the passive nature of the design leakage accumulator and operating experience with similar components used in the plant justifies that these components are expected to pass the surveillance when performed at a 24-month frequency. Therefore, the change in surveillance frequency is acceptable from a reliability standpoint and the impact on safety, if any, is small.

TS 3.7.8 Emergency Condenser Circulating Water (ECCW) System

SR 3.7.8.9 Verify upon an actual or simulated trip of the CCW pumps and ESV pumps that the rate of water level drop in the ECCW siphon header is within limits.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. This SR verifies the ECCW system functions to supply siphon header flow to the suction of the LPSW pumps during design basis conditions by ensuring air accumulation in the ECCW siphon headers is within the removal capabilities of the ESV System.

A review of the applicable ONS surveillance history demonstrated that the instrumentation for this function had only two failures of the TS functions that would have been detected solely by the periodic performance of the above SR.

a. On May 2, 2007, during the performance of a Test Procedure, level indications on 2c and 2d were identified as out of tolerance low. Troubleshooting determined that the set screws on the spline collar of Valve 2CCW-463 had loosened, allowing the collar to slide down on the valve and out of the actuator. This meant that the valve disk was not moving therefore the valve was inoperable. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

b. On May 20, 2003, during the performance of a Test Procedure, when the last CCW pump stopped, condenser outlet valves did not close as expected. Troubleshooting determined the switch was disconnected from the operating arm in breaker 3TC-5. The arm was reconnected and voltage was verified across contacts.

No similar failures are identified; therefore, the failures were not repetitive in nature. No time based mechanisms are apparent. Therefore, these failures are unique and any subsequent failures would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for failures, the impact of this change on safety, if any, is small.

<u>TS 3.7.9 Control Room Ventilation System (CRVS) Booster Fans</u>

SR 3.7.9.3 Verify two CRVS Booster Fan trains can maintain the Control Room at a positive pressure.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The SR verifies the integrity of the Control Room enclosure by verifying that two CRVS Booster Fan trains can maintain the Control Room at a positive pressure.

A review of the surveillance history demonstrated that there were no previous failures of the TS functions that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.8.1 AC Sources – Operating

SR 3.8.1.14 Verify each closed SL and closed N breaker opens on an actuation of each redundant trip coil.

SR 3.8.1.15 Verify each 230 kV switchyard circuit breaker actuates to the correct position on a switchyard isolation actuation signal.

SR 3.8.1.17 Verify each KHU's Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers. The allowable values with a time delay of 5 seconds ± 1 second shall be as follows:

a. Undervoltage ≥ 12.42 kV and ≤ 12.63 kV

b. Overvoltage ≥ 14.90 kV and ≤ 15.18 kV

c. Underfrequency ≥ 53.992 hz and ≤ 54.008 hz

d. Overfrequency ≥ 65.992 hz and ≤ 66.008 hz

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. SR 3.8.1.14 verifies operability of the trip functions of the SL and N breakers. This SR verifies each trip circuit of each breaker independently opens each breaker. The current 18-month Frequency is based on engineering judgment and provides reasonable assurance that the SL and N breakers will trip when required. SR 3.8.1.15 verifies proper operation of the 230 kV switchyard circuit breakers upon an actual or simulated actuation of the Switchyard Isolation circuitry. This test causes an actual switchyard isolation (by actuation of degraded grid voltage protection) and alignment of KHUs to the overhead and underground emergency power paths. The current 18-month Frequency minimizes the impact to the Station and the operating Units which are connected to the 230 kV switchyard. SR 3.8.1.17 verifies the Keowee Voltage and Frequency out of tolerance logic trips and blocks closure of the appropriate overhead or underground power path breakers on an out of tolerance trip signal. The current 18-month Frequency is based on engineering judgment and provides reasonable assurance that the Voltage and Frequency out of tolerance logic trips and blocks closure of these breakers when required.

A review of the applicable ONS surveillance history demonstrated that the there were no failures of the TS functions that would have been detected solely by the periodic performance of the above SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 5.5.12 Ventilation Filter Testing Program (VFTP)

While this specified frequency of testing filter ventilation systems does not explicitly state "18 months," TS Section 5.5.12 requires testing frequencies in accordance with RG 1.52 (Reference 2), which does reference explicit "18-month" test intervals for various performance characteristics. With this change, these performance tests are being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. This exception to the RG 1.52 interval is explicitly addressed in the change to TS 5.5.12. Furthermore, this revision to the ONS commitment to RG 1.52 will be reflected in a revision to the UFSAR and provided in accordance with 10CFR50.71(e). TS 5.5.12 is revised to state (inserted text shown underlined):

5.5.12 A program shall be established to implement the following required testing of filter ventilation systems at the frequencies specified in Regulatory guide 1.52, Revision 2, <u>except that the testing specified at a frequency of 18 months is required at a frequency of 24 months.</u>

In addition to the 24-month testing, ventilation filter (HEPA and charcoal) testing will continue to be performed in accordance with the other frequencies specified in RG 1.52: (1) on initial installation and (2) following painting, fire, or chemical release in any ventilation zone communicating with the system. Additionally, RG 1.52 requires a sample of the charcoal adsorber be removed and tested after each 720 hours of system operation and an in-place charcoal test be performed following removal of these samples if the integrity of the adsorber section was affected. This proposed amendment request will not change the commitment to perform these required tests.

A review of the applicable ONS surveillance history demonstrated that there were no previous failures of ESF ventilation systems that would have been detected solely by the periodic performance of SRs that reference performance of the VFTP of Specification 5.5.12.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

B. Channel Calibration Changes

NRC GL 91-04 requires that licensees address instrument drift when proposing an increase in the surveillance interval for calibrating instruments that perform safety functions including providing the capability for safe shutdown. The effect of the increased calibration interval on instrument errors must be addressed because instrument errors caused by drift were considered when determining safety system setpoints and when performing safety analyses. NRC GL 91-04 identifies seven steps for the evaluation of instrumentation calibration changes. These seven steps were discussed in Enclosure 1 to this submittal. In that discussion, a description of the methodology used by ONS for each step is summarized. The detailed methodology is provided in Attachment 7.

The following are the calibration-related TS SRs being proposed for revision from 18 months to 24 months, for a maximum interval of 30 months (considering the 25% grace period allowed by TS SR 3.02).

The methodology used to perform the drift studies of the plant instrument surveillance data is documented in the ONS Instrument Drift Analysis Methodology in Support of 24-month Surveillance Interval (Attachment 7). This methodology is based on EPRI Technical Report TR-103335-R1 (Reference 3), which is consistent with the ISA Standards (References 5 and 6) and the Duke Energy Setpoint Methodology (Reference 7). The NRC Status Report providing comments on revision 0 of the referenced EPRI technical report was also used in developing the ONS methodology document. A summary of the ONS methodology was presented to the NRC on July 1, 2009 and NRC comments were incorporated into revision 1 of the methodology document. The methodology, which is used to determine instrument drift based on historical plant calibration data, ensures that AFAL drift values are determined with a high probability and a high degree of confidence.

The projected 30-month drift values for many of the instruments analyzed from the historical AFAL evaluation shows sufficient margin between the current plant setpoint and the allowable value to compensate for the 30-month drift. For each instrument function that has a channel calibration proposed frequency change to 24 months, the associated setpoint calculation assumes (or will be revised prior to implementation to assume) a consistent or conservative drift value appropriate for a 24-month calibration interval. TS allowable values ensure that sufficient margins are maintained in the applicable safety analyses to confirm the affected instruments are capable of performing their intended design function. Also, review of the applicable safety analyses concluded that the setpoints, allowable values, and projected 30-month drift confirmed the safety limits and safety analysis assumptions remain bounding.

Below is a summary of the specific application of this methodology to the proposed ONS 24-month fuel cycle. Where optional methods are presented in Attachment 7 and where other alternate engineering justifications are allowed, the rationale for the selected method and alternate justification is summarized with the associated instrument calibration surveillance affected (e.g., for channel groupings having less than 30 calibrations, which is required to qualify for valid statistical evaluations).

TS 3.3.1 RPS Instrumentation

SR 3.3.1.7[3] Perform CHANNEL CALIBRATION.

Function 3	RCS High Pressure
Function 4	RCS Low Pressure
Function 5	RCS Variable Low Pressure
Function 6	Reactor Building High Pressure
Function 8	Nuclear Overpower Flux/Flow Imbalance

[3] SR number based on Amendment Nos. 366, 368, and 367 which was issued on January 28, 2010 and will be implemented prior to this change.

Function 9 Main Turbine Trip (Hydraulic Fluid Pressure)
Function 10 Loss of Main Feedwater Pumps (Hydraulic Oil Pressure)
Function 11 Shutdown Bypass RCS High Pressure

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The test verifies that the channel responds to the measured parameter within the necessary range and accuracy and leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests.

For these functions, no revisions to TS allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

A review of the applicable ONS surveillance history demonstrated that the instrumentation for the above functions had six failures of the TS functions that would have been detected solely by the periodic performance of the above SR.

a. On December 26, 2004, during the performance of a Unit 3 Instrument Procedure, 3PT-17P Output and Buffer Amplifier scaled output As Found data was out of tolerance low. It was adjusted in tolerance satisfactorily. TS Setpoints were outside allowed range. The out of tolerance (OOT) condition was due to instrument drift. This failure is not considered unique in that the surveillance test history does indicate that this failure is repetitive. This may invalidate the conclusion that the increase in the associated surveillance interval will have a small, if any, impact on system availability.

b. On May 25, 2005, during the performance of a Unit 1 Instrument Procedure, 1PT-20P Transmitter and RC Pressure Buffer Amplifier scaled output As Found data was OOT low. It was adjusted within procedure tolerance. The TS Setpoint for the High Pressure Bistable was outside allowed range. This failure is not considered unique in that the surveillance test history does indicate that this failure is repetitive. This may invalidate the conclusion that the increase in the associated surveillance interval will have a small, if any, impact on system availability.

c. On October 17, 2003, during the performance of a Unit 1 Instrument Procedure, 1PT-20P Output, RC Pressure Buffer meter reading and RC Pressure Buffer Amplifier scaled output As Found data was out of tolerance high. It was adjusted within procedure tolerance. Work Order Task Completion Comments state engineering decided to replace this transmitter due to past history of OOT readings. This failure is not considered unique in that the surveillance test history does indicate that this failure is repetitive. This may invalidate the conclusion that the increase in the associated surveillance interval will have a small, if any, impact on system availability.

d. On May 14, 2006, during the performance of a Unit 3 Instrument Procedure, 3PT-20P Output, RC Pressure Buffer Amplifier meter reading, and RC Pressure Buffer Amplifier scaled output As Found data was out of tolerance high. Setpoints for Shutdown Bypass, Low Pressure and High Pressure Bistables were outside TS allowed range. Transmitter electronic housing to sensor module seal was found loose. The transmitter was replaced. This failure is not considered unique in that the surveillance test history does indicate that this failure is repetitive. This may invalidate the conclusion that the increase in the associated surveillance interval will have a small, if any, impact on system availability.

e. On May 26, 2003, during the performance of a Unit 3 Instrument Procedure, 3PT-20P Output and RC Pressure Buffer Amplifier scaled output As Found data was out of tolerance high. It was adjusted within procedure tolerance. Setpoints for Shutdown Bypass, Low Pressure and High Pressure Bistables were outside TS allowed range. The transmitter was replaced due to the drift concern and vulnerability to oil loss. There was no indication of any oil loss as a result of the oil loss testing performed on the transmitter. This failure is not considered unique in that the surveillance test history does indicate that this failure is repetitive. This may invalidate the conclusion that the increase in the associated surveillance interval will have a small, if any, impact on system availability.

f. On November 17, 2004, during the performance of a Unit 3 Instrument Procedure, 3PT-20P Output, RC Pressure Buffer Amplifier meter reading, and RC Pressure Buffer Amplifier scaled output As Found data was out of tolerance high. It was adjusted within procedure tolerance. Setpoints for Shutdown Bypass, Low Pressure and High Pressure Bistables were outside TS allowed range. Transmitter was replaced due to out of tolerance data and loose seal (environmental qualification concern). This failure is not considered unique in that the surveillance test history does indicate that this failure is repetitive. This may invalidate the conclusion that the increase in the associated surveillance interval will have a small, if any, impact on system availability.

All six of the identified failures are related to Rosemount 1154GP transmitters over the review period for all three units. In four of the six failures, the transmitter was replaced. In five of the six failures, a TS Setpoint was found to exceed its allowed limit. Two of the five failures in which a TS Setpoint exceeded its allowed limit were on different channels on different units. The remaining three out of tolerance failures were on the same channel and unit on three successive performances in 2003, 2004, and 2006. In two of these three occurrences, the neck seal between the transmitter housing and the differential pressure unit or bellows was broken or loose. As a result of these repetitive failures, ONS has initiated a corrective action document to document the failures and allow for trending of future performances. There does not appear to be a time-based degradation or other condition which would affect the operation or accuracy for these devices. Considering the total number of Rosemount transmitters in the various systems in all three units, the total number of failures identified is small.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for failures, the impact of this change on safety, if any, is small.

SR 3.3.1.7[4] Perform CHANNEL CALIBRATION.
Function 1 Nuclear Overpower

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period.

There is only one Nuclear Overpower bistable per instrument loop. The bistable is recalibrated depending on plant conditions. The bistable is set to the High Setpoint in MODE 1 and in MODE 2 when not in shutdown bypass operation and, the bistable is set to the Lower Setpoint when in MODES 2, 3, 4, 5 during shutdown bypass operations with any CRD trip breakers in the closed position and the CRD System capable of rod withdrawal.

These loops are currently calibrated on an 18-month calibration interval during an outage. All the calibrated components in the RPS Nuclear Overpower High Setpoint Trip string are being replaced as part of the digital RPS/ESPS Upgrade. The digital RPS/ESPS supports 24-month fuel cycles as the drift allowance for the replacement digital RPS/ESPS bounds a 30 month calibration interval. The drift for the current RPS Nuclear Overpower High Setpoint Trip string has been Square Root Sum of the Squares (SRSS) extrapolated for a maximum 30 month calibration interval. The 24-month fuel cycle extension will precede the digital RPS/ESPS Upgrade for Unit 2. For Unit 2, the RPS Nuclear Overpower High Setpoint Trip instrument loops take credit for the Channel Functional Test for verifying proper operation of the loop every 92 days. This is possible because the uncompensated ion chambers (UCIC's) are not included in the channel calibration surveillance requirement (TS SR 3.3.1.5) per the Note to the SR or in the instrument calibration procedure. Therefore, for the portion of the loop being calibrated, the required steps for the Channel Calibration and the Channel Functional Test are the same. In addition, the Nuclear Overpower Low Setpoint is not error analyzed. Therefore, there is no limit with which to compare any analyzed drift against.

Based on the above discussion, the current and proposed RPS Nuclear Overpower High Setpoint Trip strings do not require an AFAL Drift Analysis to support a 24-month fuel cycle. A separate performance history review was performed for this function to support extension to 24-month cycles. A review of the applicable ONS surveillance history for this function demonstrated that there were no previous failures of the TS required channel calibration that would have been detected solely by the periodic performance of this SR.

[4] SR number based on Amendment Nos. 366, 368, and 367 which was issued on January 28, 2010 and will be implemented prior to this change

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

SR 3.3.1.7[5] Perform CHANNEL CALIBRATION.
Function 2 RCS High Outlet Temperature

This function is currently calibrated yearly, online. All the calibrated components in the RPS High Outlet Temperature string are being replaced with Digital RPS/ESPS Upgrade. The drift allowance for the new equipment bounds a 30 month calibration interval. The Reactor Coolant Temperature Channel is monitored by a resistance temperature detector (RTD), a linear bridge module, an 880 signal converter module and two bistable trip modules. The Digital RPS/ESPS supports 24-month fuel cycles as the drift for the current RTD and Linear Bridge have been SRSS extrapolated for a maximum 30 month calibration interval. The 24-month fuel cycle extension will precede the Digital RPS/ESPS Upgrade for Unit 2. For Unit 2, the RPS Nuclear Overpower High Setpoint Trip instrument loops take credit for the Channel Functional Test for verifying proper operation of the loop every 92 days. This is possible because the RTD's are not included in the channel calibration. Therefore, for the portion of the loop being calibrated, the required steps for the Channel Calibration and the Channel Functional Test are the same.

Based on the above discussion, the current and proposed RPS Nuclear Overpower High Setpoint Trip strings do not require an AFAL Drift Analysis to support a 24-month fuel cycle. A review of the applicable ONS surveillance history for this function demonstrated that there were no previous failures of the TS required channel calibration that would have been detected solely by the periodic performance of this SR.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

SR 3.3.1.7[5] Perform CHANNEL CALIBRATION.
Function 7 Reactor Coolant Pump to Power

The electronics for this function are currently calibrated yearly, online. The watt transducers for this function are currently calibrated on an 18-month calibration interval during an outage. All calibrated Reactor Coolant Pump Monitor components in the RPS Reactor Coolant Pump to Power Trip string are being replaced with the Digital RPS/ESPS Upgrade. The drift allowance for the new equipment bounds a 30-month calibration interval. The 24-month fuel cycle extension precedes the Digital RPS/ESPS Upgrade for Unit 2. For Unit 2, the RPS Reactor Coolant Pump Monitor instrument loops (electronic portion) take credit for the Channel Functional Test for verifying proper operation every 92 days. This is possible because the calibration procedure involves only cabinet electronics. Therefore, for the

[5] SR number based on Amendment Nos. 366, 368, and 367 which was issued on January 28, 2010 and will be implemented prior to this change

portion of the loop being calibrated, the required steps for the Channel Calibration and the Channel Functional Test are the same.

The RC Pump Monitor trip function acts in a near digital manner, tripping on a change in the pump status. The pump status can only be in one of two states, running or not running. This trip is used in accident analysis in the same manner. From Table 15-35 of Chapter 15 of the UFSAR, for the Pump Monitor Trip Function, there is no "Nominal Setpoint" listed, the "Limiting Trip Setpoint Assumed in the Analysis" is "NA" however, a "Time Delay" of 0.6 seconds is shown. The trip condition for the events analyzed is based on the loss of two or more pumps. Since an analytical limit setpoint is not credited in the safety analysis, a comparison of the safety analysis setpoint to the TS setpoint, by accounting for uncertainties, including drift, is groundless. Therefore, any drift associated with calibration of the watt transducers is not a concern for this function.

Based on the above discussion, the current and proposed RPS Reactor Coolant Pump to Power Trip strings do not require an AFAL Drift Analysis to support a 24-month fuel cycle. A review of the applicable ONS surveillance history for this function demonstrated that there were no previous failures of the TS required channel calibration that would have been detected solely by the periodic performance of this SR.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

<u>TS 3.3.5 Engineered Safeguards Protective System (ESPS) Analog Instrumentation</u>

SR 3.3.5.4[6] Perform CHANNEL CALIBRATION.
- Parameter 1 Reactor Coolant System Pressure – Low
- Parameter 2 Reactor Coolant System Pressure – Low Low
- Parameter 3 Reactor Building Pressure – High
- Parameter 4 Reactor Building Pressure – High High

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy and leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests.

No revisions to TS allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

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[6] SR number based on Amendment Nos. 366, 368, and 367 which was issued on January 28, 2010 and will be implemented prior to this change

A review of the applicable ONS surveillance history demonstrated that the instrumentation for these parameters had only two failures of the TS functions that would have been detected solely by the periodic performance of the above SR.

a. On November 25, 1999, during the performance of an Instrument Procedure, As Found data for ES HP INJECTION ES BYPASS PERMIT 1750 Alarm Setpoint was out of tolerance low. As Left value could not be adjusted within tolerance. Signal Monitor 2SA-7-37 (E1) was replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

b. On May 12, 2003, during the performance of an Instrument Procedure, Pressure Transmitter 3RCPT0022P (Rosemount 1153GD9RB) failed due to the response time being noticeably sluggish during testing. The transmitter was replaced and As Left adjusted within tolerance. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified; therefore, the failures were not repetitive in nature. No time based mechanisms are apparent. Therefore, these failures are unique and any subsequent failures would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, and the corrective action for failures, the impact of this change on safety, if any, is small.

<u>TS 3.3.8 Post Accident Monitoring (PAM) Instrumentation</u>

SR 3.3.8.3 Perform CHANNEL CALIBRATION

Function 2	RCS Hot Leg Temperature
Function 3	RCS Hot Leg Level
Function 4	RCS Pressure (Wide Range)
Function 9	Containment Area Radiation (High Range)
Function 11	Pressurizer Level
Function 12	Steam Generator Water Level
Function 13	Steam Generator Pressure
Function 14	Borated Water Storage Tank Water Level
Function 15	Upper Surge Tank Level
Function 16	Core Exit Temperature
Function 17	Subcooling Monitor
Function 18	HPI System Flow
Function 19	LPI System Flow
Function 21	Emergency Feedwater Flow

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period.

No revisions to allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

A review of the applicable ONS surveillance history demonstrated that the instrumentation for these functions had eight failures of the TS functions that would have been detected solely by the periodic performance of the above SR.

a) On May 25, 2001, during the performance of an Instrument Procedure, Series Controller (P&I) Card 2FDWPI020602 (Westinghouse 2838A30G01) failed during calibration and was replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism

b) On November 11, 2002, during the performance of an Instrument Procedure, Series Controller (P&I) Card 2FDWPI020602 (Westinghouse 2838A30G01) As Found Power Supply and High Limit was out of tolerance low. The P&I Card has no adjustment and was replaced with a new one. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism

c) On November 4, 2003, during the performance of an Instrument Procedure, Signal Comparator Card 1FDWCB011402 (Westinghouse 2837A13G01) As Found power supply voltage was out of tolerance high and As Found trip setpoint was not recorded. The signal comparator card did not have power indication. The failure was due to a power up transient after an extended power off period. The card was replaced with a new one. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

d) On November 4, 2003, during the performance of an Instrument Procedure, Signal Isolator Card 1FDWCB021101 failed during testing - found LED not illuminated on signal isolator circuit in ESGLC cabinet. The failure was due to a power up transient after an extended power off period. The card was replaced with a new one. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

e) On May 3, 2004, during the performance of an Instrument Procedure, 2FDWLT0080 Train A String Check As Found Relay Card setpoint voltage was out of tolerance low and 2FDW-315 was not closing at required voltage. The fuse had blown on the loop relay card and was replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

f) On June 4, 2001, during the performance of an Instrument Procedure, Transmitter 2FDWLT0080 (Rosemount 1154DP5RB) could not be calibrated. The transmitter was replaced and calibrated within tolerance satisfactorily. The identified failure is unique

and does not occur on a repetitive basis and is not associated with a time-based failure mechanism

g) On December 2, 2006, during the performance of an Instrument Procedure, As Found String Check for Transmitter PT0245 (Barton 753) was found out of tolerance and would not calibrate. The transmitter was replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

h) On April 28, 2005, during the performance of an Instrument Procedure, Computer Point O1E2288 was found out of tolerance. Transmitter LT0124 (Barton 752) was found out of tolerance. The transmitter was replaced due to not being linear. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

Of the eight identified failures, two were related to Series Controller (P&I) Card 2FDWPI020602 (Westinghouse 2838A30G01); two failures were related to a power up transient after an extended power off period (one for a Signal Comparator card and one for a Signal Isolator card); and the other four were related to a one of a kind occurrence. No similar failures are identified; therefore, the failures were not repetitive in nature. No time based mechanisms are apparent. Therefore, these failures are unique and any subsequent failures would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for failures, the impact of this change on safety, if any, is small.

SR 3.3.8.3 Perform CHANNEL CALIBRATION
Function 1 Wide Range Neutron Flux

The Wide Range Neutron Flux instrument loops are currently calibrated on an 18-month calibration interval during an outage. There are not any setpoint or accuracy requirements that exist for the subject indication. Although the Emergency Operating Procedures specify that on loss of subcooled margin, if the reactor core power is greater than 1% full power (FP), the RCPs should not be tripped, the 1% value was arbitrarily chosen and no instrument uncertainties applied. The only requirement for the instrumentation is to function during normal conditions and during and after a design basis event. Also, the indication is more useful to the Operator in indicating a change in power rather than indicating the exact Wide Range Power/Rate.

The PAM Wide Range Neutron Flux instrument uncertainties are not applied to any safety analysis limit and are used mainly for trending. Therefore, PAM Wide Range Neutron Flux instrument uncertainties were determined for information. As such, the PAM Wide Range Neutron Flux instrument loops do not require an AFAL Drift Analysis to support a 24-month fuel cycle.

A review of the applicable ONS surveillance history demonstrated that the instrumentation for this function had one failure of the TS function that would have been detected solely by the periodic performance of the above SR.

a) On April 5, 2008, during the performance of an Instrument Procedure, power supply ripple voltage was found out of tolerance. The power supply was replaced with new replacement model Lambda HDB12-15. During resumption of testing, Wide Range Monitor breaker CB1 tripped off. Troubleshooting found Wide Range Monitor common test jack reading 25 VDC. The new power supply was suspected as the cause. Technicians replaced the entire 1NI-3 Wide Range Monitor and the test/calibration was completed satisfactorily. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

The above failure was a one of a kind occurrence. No similar failures were identified; therefore, the failure is not repetitive in nature. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failures would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for the failure, the impact of this change on safety, if any, is small.

SR 3.3.8.3 Perform CHANNEL CALIBRATION
Function 5 Reactor Vessel Head Level

The RCS Reactor Vessel Head Level instrument loops are currently calibrated on an 18-month calibration interval during an outage. Reactor Vessel Level Indication System (RVLIS) is used for determination of Emergency Operating Procedure (EOP) setpoints. However, the RVLIS Head Level indication uncertainties are only applicable for setpoints associated with the bottom of the hot leg and the top of reactor vessel. There is insufficient data to perform an AFAL drift analysis for the RVLIS Vessel Head Level. Therefore, the same relative uncertainty as the RVLIS Hot Leg Level drift error (i.e., ± 3.92% of span) will be used for evaluation of the RVLIS Vessel Head Level Setpoints. The RVLIS Hot Leg Indication extended cycle Analyzed Drift is a reasonable estimate of the RVLIS Vessel Head Level Indication extended cycle Analyzed Drift because both loops share the same equipment, location and function. The only difference between the loops is instrument span.

Due to the significant number of out-of-tolerance (OOT) data points; the data is unlikely to be an accurate representation of the instrument performance. A number of the out-of-tolerances were due to capillary line fill leakage and; therefore, not indicative of instrument drift. An investigation into the high number of OOT's was performed. These OOT's are apparently caused by certain sections of the capillary tubing being placed under a vacuum when the RVLIS system is isolated and depressurized for calibration during an outage. Normally, the RVLIS System is pressurized at RCS operating pressure. The sections exposed to a vacuum are those connected to the decay heat drop line near the transmitter.

The mechanical fittings associated with this section of capillary tubing may "relax" and allow air in leakage. As a correction action, a RVLIS calibration procedure change was made to provide instructions to pressurize the decay heat capillary lines when calibration is not being performed. This reduces the amount of time these lines are exposed to a vacuum and thus should reduce air in leakage. Since implementation of this procedure change (on April 20, 2002), the OOT's have decreased dramatically.

During the 24-month fuel cycle extension evaluations, Duke Energy determined that RVLIS Vessel Head Level performance, although improved since the procedural changes described above, was still not representative of the expected performance of the RVLIS Vessel Head Level instrument loops. A review of AFAL Calibration Data collected to support an instrument drift analysis of Reactor Vessel Head Level for 24-month cycles and subsequent Inadequate Core Cooling Monitoring (ICCM)/RVLIS Engineering Support Program activities identified an enhancement to the calibration procedure. Further procedural enhancements were determined to be warranted that will provide further isolation of the RVLIS Vessel Head Level transmitters during RVLIS Hot Leg Level calibrations. The additional isolation will protect the vessel level transmitters from 'sensing' three times their normal differential pressure (dp) during the Hot Leg level calibrations. Although the Barton 752 transmitters are qualified for overpressure, it is not necessary to subject the RVLIS Vessel Head Level transmitters to this excessive dp. The procedural change to isolate the RVLIS Vessel Head Level transmitters during calibration of the RVLIS Hot Leg Level transmitters was implemented on Unit 1 prior to the Fall 2009 outage. The performance of the RVLIS Vessel Head Level instrument loop during the 10/15/2009 calibration is consistent with the expected loop performance. That is, the setting tolerance for the RVLIS Vessel Head Level OAC indication is ± 1.4% span and the worst case performance was – 0.51% span. Analogous changes to the calibration procedures for Units 2 and 3 will be implemented during their next scheduled outage for each unit.

An AFAL Drift Analysis of the Vessel Head Level calibration data would be meaningless in light of the above described procedural changes. The data shows continued improvement with each procedural change and the final calibration, which is the only one with both procedural changes, shows the RVLIS Head Level instrument loops performing well within expected calibration limits.

Based on the above, an AFAL Drift Analysis will provide no useful forward looking performance statistics due to the two calibration procedure changes. The current loop performance was determined acceptable. Issue 7 of Enclosure 2 to NRC GL 91-04 addresses the ongoing calibration surveillance procedure review program. Once the 24-month TS surveillance intervals have been approved and implemented, this calibration surveillance procedure review program will verify that future loop/component AFAL calibration values do not exceed those acceptable limits determined in the instrument uncertainty calculations, except on rare occasions.

A review of the applicable ONS surveillance history for this function demonstrated that there were no previous failures of the TS required channel calibration that would have been detected solely by the periodic performance of this SR.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

SR 3.3.8.3 Perform CHANNEL CALIBRATION
Function 6 Containment Sump Water Level (Wide Range)

The Containment Sump Water Level instrument loops are currently calibrated on an 18-month calibration interval during an outage. The subject indication is used for monitoring of containment water level during design basis Loss of Coolant Accident events. EOP guidance relegates the function of the wide range containment water level indication to that of trending only. As such, there are no analytical limits to compare the uncertainties against and the total loop uncertainties are for information only. Additionally, drift is not applicable to the level transmitter due to its design.

Based on the above, the PAM Containment Sump Water Level strings do not require an AFAL Drift Analysis to support a 24-month fuel cycle. A review of the applicable ONS surveillance history for this function demonstrated that there were no previous failures of the TS required channel calibration that would have been detected solely by the periodic performance of this SR.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

SR 3.3.8.3 Perform CHANNEL CALIBRATION
Function 8 Containment Isolation Valve Position

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. This SR verifies that the control switch indicating lights are functioning properly. Containment isolation valve (CIV) position is a Type B, Category 1 variable provided for verification of electrically controlled CIV position. In the case of CIV position, the important information is the isolation status of the containment penetration. The CIV position PAM instrumentation consists of limit switches that operate both Closed-Not Closed and Open-Not Open control switch indication via indicating lights in the control room.

A limit switch is an electro-mechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection. Limit switches offer high precision in terms of accuracy and repeatability, due to the fact that physical contact is made with the target. For the same reason, limit switches do not drift. Therefore, limit switches do not require calibration. The CIV position limit switches are not calibrated because once initially installed and tested, there is no variation in their performance that would not be considered an instrument failure.

Based on the above, the PAM Containment Isolation Valve Position strings do not require an AFAL Drift Analysis to support a 24 month fuel cycle. A review of the applicable ONS surveillance history for this function demonstrated that there were no previous failures of the TS required channel calibration that would have been detected solely by the periodic performance of this SR.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.3.9 Source Range Neutron Flux

SR 3.3.9.2 Perform CHANNEL CALIBRATION

TS 3.3.10 Wide Range Neutron Flux

SR 3.3.10.2 Perform CHANNEL CALIBRATION.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. These SRs verify that the channel responds to measured parameters within the necessary range and accuracy and leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests.

No revisions to TS allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

A review of the applicable ONS surveillance history demonstrated that the Source Range Neutron Flux and Wide Range Neutron Flux instrumentation had six failures of the TS functions that would have been detected solely by the periodic performance of the above SRs.

a. On February 28, 2008, during the performance of an Instrument Procedure, Unit 1 Wide Range Amplifier Assembly High Voltage (HV) power supply As Found voltage was out of tolerance high. The HV Power Supply was replaced with a new one. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

b. On December 2, 2004, during the performance of an Instrument Procedure, Unit 3 Wide Range Amplifier Assembly HV Power Supply As Found voltage was out of tolerance high. The HV Power Supply was replaced with a new one. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

c. On December 7, 2001, during the performance of an Instrument Procedure, Unit 3 Reactimeter Signal Isolator and Card (A6) TP1/TP10 As Found voltage was out of tolerance high. Wide Range Amplifier A6 Card failed and was replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

d. On November 5, 2001, during the performance of an Instrument Procedure, Unit 3 Wide Range Amplifier Assembly resistance to ground was out of tolerance low. During troubleshooting of the ground, the ground condition disappeared. When the Dixson Indicators were removed for calibration, the ground returned and caused a fuse to blow (A2-8-FB-1) for 3NI-1 SR Level/Rate Indicator (3RPSP1003). Inspection of the Indicator showed two internal jumper wires were damaged and had shorted to the case upon removal of the indicator. The damaged wires were repaired and the fuse replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

e. On December 7, 2001, during the performance of an Instrument Procedure, Unit 3 AT1 Isolator XAT1-7/8 As Found Voltage was out of tolerance low. The As Left was adjusted in tolerance satisfactorily. The A4 Preamp failed and was replaced. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

f. On April 5, 2008, during the performance of an Instrument Procedure, power supply ripple voltage was found out of tolerance. The power supply was replaced with new replacement model Lambda HDB12-15. During resumption of testing, Wide Range Monitor breaker CB1 tripped off. Troubleshooting found Wide Range Monitor common test jack reading 25 VDC and the new power supply was suspected as the cause. Technicians replaced the entire 1NI-3 Wide Range Monitor and the test/calibration was completed satisfactorily. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

Of the six identified failures, three were related to power supply issues and the other three were related to one of a kind occurrence. No similar failures are identified; therefore, the failures were not repetitive in nature. No time based mechanisms are apparent. Therefore, these failures are unique and any subsequent failures would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for failures, the impact of this change on safety, if any, is small.

TS 3.3.11 Automatic Feedwater Isolation System (AFIS) Instrumentation

SR 3.3.11.3 Perform CHANNEL CALIBRATION.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The test verifies the channel responds to a measured parameter within the necessary range and accuracy and leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests. The AFIS is designed to monitor Main Steam Pressure and prevent containment overpressurization and to limit steam generator tube-to-shell differential temperature of the faulted steam generator following a Main Steam Line Break or a Main Feedwater Line Break downstream of the containment check valves. Main Steam header pressure is used as input signals to the AFIS circuitry. There are four pressure transmitters per steam generator with each feeding a steam pressure signal to an analog isolation module. The output of the analog isolation module provides an analog signal to a processor module that actuates isolation functions at desired setpoints.

No revisions to TS allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

A review of the applicable ONS surveillance history for this function demonstrated that there were no previous failures of the TS required channel calibration that would have been detected solely by the periodic performance of this SR.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance, the impact of this change on safety, if any, is small.

TS 3.3.14 Emergency Feedwater (EFW) Pump Initiation Circuitry

SR 3.3.14.4 Perform CHANNEL CALIBRATION for LOMF pump instrumentation channel

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The test verifies the channel responds to a measured parameter within the necessary range and accuracy and leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests.

These loops are currently calibrated on an 18-month calibration interval during an outage. The pressure switches that are used to actuate the Motor Driven Emergency Feedwater Pumps and the pressure switches that are used to actuate the Turbine Driven Emergency Feedwater Pump were shown to provide acceptable performance assuming uncertainty of

± 20% of setting. The worst case accuracy/repeatability of the pressure switches was ± 1.33% of setting. The actuation delay due to a 20% error is < 0.1 second. This is due to the rapid decrease in hydraulic oil pressure after the pump trip. The actuation delay assumed in the Safety Analysis is 180 seconds. The substantial margin in the uncertainty calculation more than accounts for any 30-month Analyzed Drift term.

Based on the above, the Emergency Feedwater Pump Initiation Circuitry strings do not require an AFAL Drift Analysis to support a 24-month fuel cycle. A review of the applicable ONS surveillance history demonstrated that the instrumentation for these functions had only one failure of the TS function that would have been detected solely by the periodic performance of the above SR.

a. On November 20, 2005, during the performance of an Instrument Procedure, Time Delay Relay 2FDWTDEFWPTX (Cutler Hammer D87XLD30) setpoint was out of tolerance low. The timer would not calibrate and was replaced with a new Cutler Hammer Model D87 timer and calibrated satisfactorily. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failure would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for the failure, the impact of this change on safety, if any, is small.

<u>TS 3.3.16 Reactor Building (RB) Purge Isolation—High Radiation</u>

SR 3.3.16.3 Perform CHANNEL CALIBRATION of the instrument loop and the sensor.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The test verifies the channel responds to a measured parameter within the necessary range and accuracy and leaves the channels adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests

This instrument loop is calibrated every 12 months online. The setpoints are conservative and are more restrictive while the purge is running due to the higher flow rate (the concentration in the vent needs to be lower for a higher flow rate to get the same number of curies per second released). The math used for the setpoint is straightforward and does not have an "error" component. The current setpoints from the Offsite Dose Calculation Manual are never approached during normal operations. There are no uncertainty calculations for the Reactor Building Purge – High Radiation instrument loops. Uncertainties are not required for these instruments.

Therefore, the Reactor Building Purge – High Radiation instrument loops do not require an AFAL Drift Analysis to support a 24-month fuel cycle. A review of the applicable ONS surveillance history for this Function demonstrated that there were no previous failures of the instrument loop and the sensor that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on system design and the history of system performance, the impact of this change on safety, if any, is small.

TS 3.3.19 Emergency Power Switching Logic (ESPL) 230 kV Switchyard Degraded Grid Voltage Protection (DGVP)

SR 3.3.19.2 Perform a CHANNEL CALIBRATION of the voltage sensing channel with the setpoint allowable value as follows:

Degraded voltage ≥ 226 kV and ≤ 229 kV with a time delay of 9 seconds ± 1 second.

TS 3.3.20 Emergency Power Switching Logic (EPSL) CT-5 Degraded Grid Voltage Protection (DGVP)

SR 3.3.20.2 Perform a CHANNEL CALIBRATION of the voltage sensing channel with the setpoint allowable value as follows:

a. Degraded voltage ≥ 4143 V and ≤ 4185 V with a time delay of 9 seconds ± 1 second for the first level undervoltage inputs; and

b. Degraded voltage ≥ 3871 V and ≤ 3901 V for the second level undervoltage inputs.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period.

No drift terms were specified by the manufacturer for the undervoltage relays used for EPSL Degraded Grid Voltage Protection and the EPSL CT-5 Degraded Grid Voltage Protection functions. The manufacturer (ABB, Inc.) asserts that drift need not be considered for these relays, if the relays are calibrated on a 2 to 3 year frequency. The maximum calibration interval for a 24-month fuel cycle is 30 months (i.e., < 3 years); therefore, drift need not be considered for the undervoltage relays used for EPSL Degraded Grid Voltage Protection.

Based on the above, the EPSL 230 kV Switchyard Degraded Grid Voltage Protection and the EPSL CT-5 Degraded Grid Voltage Protection instrument loops do not require an AFAL Drift Analysis to support a 24-month fuel cycle. A review of the applicable ONS surveillance history for this Function demonstrated that there were no previous failures of TS required allowable values that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change

to a 24-month testing frequency. Based on system design and the history of system performance, the impact of this change on safety, if any, is small.

TS 3.3.27 Low Pressure Service Water (LPSW) Reactor Building (RB) Waterhammer Prevention Circuitry

SR 3.3.27.3 Perform a CHANNEL CALIBRATION.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The test verifies that each LPSW RB Waterhammer Prevention Circuitry channel responds to a measured parameter within the necessary range and accuracy and leaves the components adjusted to account for instrument drift to ensure that the circuitry remains operational between successive tests.

No AFAL Drift Analysis can be performed because this is a new function and there is insufficient data to determine a 30-month Analyzed Drift value. The LPSW RB Water-Hammer Isolation Header Pressure instrument loops were installed in April 2005, May 2004 and May 2006 for Units 1, 2, and 3, respectively. The 24-month Fuel Cycle AFAL Drift data gathering period ended approximately with the spring Unit 1 outage in 2008. Based on an 18-month interval between calibrations, there would be no more than two outages between the install dates and the end of the data gathering period for any unit. The minimum of 30 data points recommended for an AFAL Drift evaluation is not available. Thus, there was insufficient data to perform an AFAL Drift Analysis for the LPSW RB Water-Hammer Isolation Header Pressure instrument loops.

No AFAL Drift data is available for any current switch setpoint calibrations or for the Unit 1 and 2 OAC Indication calibrations. Only one cycle of AFAL Drift data is available for the Unit 3 OAC Indication. Although the TS surveillance is concerned with the current switch setpoints (which initiate the water-hammer protection), the limited results for the OAC Indication are informative. The worst case drift is 0.34% span. This is well within expectations since the reference accuracy of the Rosemount Model 1154 pressure transmitter alone is ± 0.25% span. The data should not be considered a sanction of the instrument loop for 24-month fuel cycles due to limited sample size; however, it does show that the evidence that does exist supports the design of the instrument loop.

ONS has extensive experience with the Rosemount Model 1154 pressure transmitter including loops for which there was sufficient AFAL Drift data to perform an analysis. For loops which included a Rosemount 1154, the AFAL Drift data supported the 24-month cycle extension. The drift allowance for the LPSW RB Water-Hammer Isolation Header Pressure transmitters is for a 30-month calibration interval.

The Rochester XET-1215 current switch is calibrated quarterly during the Channel Functional test. Therefore, calibration interval extension is not an issue for the Rochester Model XET-1215 current switch.

Issue 7 of Enclosure 2 to NRC GL 91-04 addresses the ongoing calibration surveillance procedure review program. Once the 24-month TS surveillance intervals have been approved and implemented, this calibration surveillance procedure review program will verify that future loop/component AFAL calibration values do not exceed those acceptable limits determined in the instrument uncertainty calculations, except on rare occasions.

Based on the above, the LPSW RB Water-Hammer Isolation Header Pressure instrument loops will rely on the instrument loop design and the on-going calibration surveillance procedure review program in lieu of an AFAL Drift Analysis to support a 24-month fuel cycle.

A review of the limited ONS surveillance history available for this Function demonstrated that there were no previous failures of TS required allowable values that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on system design and the history of system performance, the impact of this change on safety, if any, is small.

TS 3.3.28 Low Pressure Service Water (LPSW) Standby Pump Auto-Start Circuitry

SR 3.3.28.2 Perform CHANNEL CALIBRATION

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. This test verifies that the components respond to the measured parameter within the necessary range and accuracy and leaves the components adjusted to account for instrument drift to ensure that the auto-start circuitry remains operational between successive tests. The LPSW Standby Pump Auto-Start Circuitry starts the standby LPSW Pump to ensure LPSW cooling water is available if a running pump does not restart following a LOOP event and LPSW header pressure does not return to normal values within a predetermined amount of time. For LOOP events, the LPSW System is required to support operability of the SSW System, High Pressure Injection (HPI) Pump Motors, and Motor Driven Emergency Feedwater (MDEFW) motors.

No revisions to TS allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

A review of the applicable ONS surveillance history for this Function demonstrated that there were no previous failures of TS required allowable values that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on system design and the history of system performance, the impact of this change on safety, if any, is small.

TS 3.4.12 Low Temperature Overpressure Protection (LTOP)

SR 3.4.12.7 Perform CHANNEL CALIBRATION for PORV.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. The request for extending the 18 month surveillance test interval assumes the approval of Oconee LAR 2008-04 submitted on August 6, 2009.

The plant was recently modified to provide dedicated pressure transmitters for the LTOP channels in April 2008, November 2008 and December 2007, for Units 1, 2, and 3, respectively. Because of this, a minimum of 30 data points for an AFAL Drift evaluation are not available. Thus, there was insufficient data to perform an AFAL Drift Analysis for the LTOP Pressure Transmitter instrument loops.

The LTOP Pressure Transmitters are Rosemount Model 1154SH9 transmitters with a drift specification of ± 0.2% of Upper Range Limit for 30 months. The RPS RCS Pressure transmitters (which were previously re-ranged for LTOP) are Rosemount 1154GP9 with a drift specification of ± 0.2% of Upper Range Limit for 30 months. Therefore, it is expected the two transmitter models should have similar drift performances. An AFAL Drift Analysis was performed on the LTOP related RPS RCS Pressure transmitters. However, due to the fact that the LTOP transmitters were calibrated before the unit was fully down (i.e., under different environmental conditions), the AFAL Drift data for the previous LTOP transmitters is of limited value. The AFAL Drift data for the non-LTOP related RPS RCS Pressure Transmitters is more telling. The turndown ratio for the new LTOP Pressure Transmitters is 5:1. The turndown ratio of the RPS RCS Pressure Transmitters is 3.75:1. This difference is not considered significant. The RPS RCS Pressure Transmitters were shown acceptable for use with extended fuel cycles. Therefore, it can be concluded that the new LTOP dedicated Pressure Transmitters will also be acceptable for use with extended fuel cycles. ONS has extensive experience with the Rosemount Model 1154 pressure transmitters. Including the RPS RCS Pressure loops, there was sufficient AFAL Drift data to perform an analysis for the loops, which are for loops with Rosemount 1154 transmitters. In each case the AFAL Drift data supported the 24-month cycle extension.

The LTOP control room pressure indication is on a Dixson Model SH101P for which the drift was linearly extrapolated from ± 0.015% of span per month to ± 0.5% span for 30 months. Linear extrapolation of drift is used only for the strongly time dependent drift. Therefore, indicator drift has already treated with the most stringent extrapolation required for 30-month Analyzed Drift.

No drift term is specified for the Rochester XET-1215 current switch. The ONS Setpoint/Uncertainty Methodology permits that instrument drift be assumed equal to the instrument accuracy for electronic modules. The accuracy of the current switch is ± 0.1% span. Therefore, the assumed drift for extended fuel cycles would be ± 0.1% span. This is considered negligible when compared to the expected transmitter extended cycle drift.

Therefore, calibration interval extension is not an issue for the Rochester Model XET-1215 current switch.

Issue 7 of Enclosure 2 to NRC GL 91-04 addresses the ongoing calibration surveillance procedure review program. Once the 24-month TS surveillance intervals have been approved and implemented, this calibration surveillance procedure review program will verify that future loop/component AFAL calibration values do not exceed those acceptable limits determined in the instrument uncertainty calculations, except on rare occasions.

Based on the above, the LTOP System Pressure Transmitter instrument loops do not require an AFAL Drift Analysis to support a 24-month fuel cycle.

A review of the limited ONS surveillance history available for this Function demonstrated that there were no previous failures of TS required allowable values that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on system design and the history of system performance, the impact of this change on safety, if any, is small.

TS 3.4.15 Reactor Coolant System (RCS) Leakage Detection Instrumentation

Leakage detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE.

SR 3.4.15.3 Perform CHANNEL CALIBRATION for required containment sump level indication.

SR 3.4.15.4 Perform CHANNEL CALIBRATION for required containment atmosphere radioactivity monitor.

The surveillance test interval of these SRs is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. These calibration tests verify the accuracy of the instrument string, including the instruments located inside containment.

The containment normal sump level indication is used to determine the leak rate from the RCS. Some uncertainties are not expected to change during the relatively short time period for which the rate of change is determined (especially drift). Due to the very short time period of interest here (≈ 10 minutes), the containment normal sump level indication rate of change uncertainty is due only to the reference accuracy (i.e., hysteresis) and resolution of the instruments. Therefore, the 30-month Analyzed Drift term is not applicable to this function.

Based on the above, the Low RCS Leakage Detection, RB Normal Sump Level strings do not require an AFAL Drift Analysis to support a 24-month fuel cycle.

The 1 GPM Leak in RCS Analysis does not apply instrument uncertainties to the containment atmosphere radioactivity monitor. Consequently, there is no uncertainty calculation for the radioactivity monitor. Therefore, a 30-month Analyzed Drift term is not required for this application.

Based on the above, the RCS Leakage Detection Instrumentation, Containment Atmosphere Particulate Radioactivity Monitor instrument loops do not require an AFAL Drift Analysis to support a 24-month fuel cycle.

A review of the applicable ONS surveillance history for this Function demonstrated that there were no previous failures of TS SR that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on system design and the history of system performance, the impact of this change on safety, if any, is small.

TS 3.9.2 Nuclear Instrumentation

SR 3.9.2.2 Perform CHANNEL CALIBRATION.

The surveillance test interval of this SR is being increased from once every 18 months to once every 24 months, for a maximum interval of 30 months including the 25% grace period. This test is a complete check and re-adjustment of the channel, from the pre-amplifier input to the indicator. The current Frequency is based on the need to perform this Surveillance during the conditions that apply during a unit outage.

No revisions to TS allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

A review of the applicable ONS surveillance history demonstrated that the instrumentation for this function had only one failure of the TS functions that would have been detected solely by the periodic performance of the above SR.

a. On April 5, 2008, during the performance of an Instrument Procedure, power supply ripple voltage was found out of tolerance. The power supply was replaced with new replacement model Lambda HDB12-15. During resumption of testing, Wide Range Monitor breaker CB1 tripped off. Troubleshooting found Wide Range Monitor common test jack reading 25 VDC. The new power supply was suspected as the cause. Technicians replaced the entire 1NI-3 Wide Range Monitor from supply and the

test/calibration was completed satisfactorily. The identified failure is unique and does not occur on a repetitive basis and is not associated with a time-based failure mechanism.

No similar failures are identified. No time based mechanisms are apparent. Therefore, this failure is unique and any subsequent failure would not result in a significant impact on system/component availability.

As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on the history of system performance and the corrective action for the failure, the impact of this change on safety, if any, is small.

TS 3.10.1 Standby Shutdown Facility (SSF)

SR 3.10.1.13 Perform CHANNEL CALIBRATION for each required SSF instrument channel.

SSF Instrumentation is provided to monitor RCS pressure, RCS Loop A and B temperature (hot leg and cold leg), pressurizer water level, and SG A and B water level. Indication is displayed on the SSF control panel.

No revisions to TS allowable values or safety analyses result from the GL 91-04 evaluations (e.g., statistical evaluation of historical drift factored into setpoint calculations). Any necessary revisions to setpoint calculations and calibration procedures to incorporate results of the statistical analysis of the historical AFAL data will be completed prior to implementation.

A review of the applicable ONS surveillance history for this Function demonstrated that there were no previous failures of TS required allowable values that would have been detected solely by the periodic performance of this SR. As such, the impact, if any, on system availability is minimal from the proposed change to a 24-month testing frequency. Based on system design and the history of system performance, the impact of this change on safety, if any, is small.

ATTACHMENT 7

DETAILED EVALUATION METHODS

Form 101.3 (R08-04)

CERTIFICATION OF ENGINEERING CALCULATION – REVISION LOG

Station and Unit Number: Oconee Nuclear Station, Units 1, 2 and 3

Title of Calculation: Instrument Drift Analysis Methodology in Support of 24-month Surveillance Interval

Calculation Number: OSC-9719

Active Calculation/Analysis: Yes ☑ No ☐

	Calculation Pages (Vol)			Supporting Documentation (Vol)			Volumes		Orig	Chkd	Verif. Meth.	Appr[1]	Issue Date
Rev. No.	Revised	Deleted	Added	Revised	Deleted	Added	Deleted	Added	Date	Date	1, 2, 3, "Other"	Date	Rec'd Date
1	1, 2, 17, 26, 28	29-55	ii and 29-56,	Attch.1 Pages 5, 6, 9, 11, 12 & 16					John N Kurtz 8/18/09	EM Welch 8/19/09	1	8/28/09	sjc 9/1/09 / pah 9/2/09
2	1, 2, 9 11, 14, 16 17, 18, 39		iii			Att. 2			John N Kurtz via telecon 2/2/10	EM Wall 2/15/10	1	2/22/10	DLB 2/25/10 / pah 2/25/10
	40, 41 45, 46 50, 52								2/2/10				
	56, 22, 24, 26, 43, 49								2/2/10				

FIGURE 101 1CERTIFICATION OF ENGINEERING CALCULATION

CERTIFICATION OF ENGINEERING CALCULATION

Station And Unit Number: Oconee Nuclear Station, Units 1, 2 and 3

Title Of Calculation: Instrument Drift Analysis Methodology in Support of 24-month Surveillance Interval

Calculation Number: OSC-9719

Total Original Pages: i, 1 Through 55

Total Supporting Documentation Attachments: 1 Total Microfiche Attachments: 0

Total Volumes: 1 Active Calculation/Analysis ☑ YES ☐ NO

Microfiche Attachment List ☐ YES ☑ NO (SEE FORM 101.4) If Active, is this a Type I Calculation/Analysis ☐ YES ☑ NO

These engineering Calculations cover QA Condition 1 Items. In accordance with established procedures, the quality has been assured and I certify that the above Calculation has been Originated, Checked, or Approved as noted below:

Originated By: John N. Kurtz Date: 02-Jun-09

Checked By: Date: 6/3/09

Verification Method: Method 1 ☑ Method 2 ☐ Method 3 ☐ Other ☐

Approved By: William B. Eddy Date: 6/25/09

Issued To Document Management: Date: 7/6/09

Received By Document Management: Sheila Henderson Date: 7/8/09

Complete The Spaces Below For Documentation Of Multiple Originators Or Checkers

Pages _____ Through _____

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Checked By _____ Date _____

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Originated By _____ Date _____

Checked By _____ Date _____

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Pages _____ Through _____

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Verification Method: Method 1 ☐ Method 2 ☐ Method 3 ☐ Other ☐

(06 Aug 2004)

OSC-9719
DUKE ENERGY - OCONEE NUCLEAR STATION
INSTRUMENT DRIFT ANALYSIS METHODOLOGY
IN SUPPORT OF 24 MONTH SURVEILLANCE INTERVAL

TABLE OF CONTENTS

1.0 BACKGROUND

NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle", dated April 2, 1991, provides the NRC guidance which Oconee Nuclear Station (ONS) must use to evaluate the issue of instrumentation errors caused by drift, in order to justify an increase in surveillance intervals to accommodate a 24-month fuel cycle.

The NRC indicates that "operating experience and available vendor data can provide insights on the increase in instrument errors that could occur with an increased calibration interval". The NRC continues "these insights, with a program to monitor and assess the long-term effects of instrument drift, can provide the basis for increasing the refueling outage related calibration intervals for instruments that perform safety functions".

Enclosure 2 to NRC Generic Letter 91-04 provides a summary of the seven issues that should be addressed:

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

1.2 "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.

The licensee should have a body of as-found and as-left calibration data that permits the determination of the rate of instrument drift with time over the calibration interval. This data should allow the determination of instrument drift for those instruments that perform safety functions."

1.3 "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.

The magnitude of the instrument drift error that occurs over a longer interval is an important consideration to justify an extension of the calibration interval for instruments that perform safety functions. Licensees need to identify the applications where the calibration interval for these instruments depends upon the length of the fuel cycle and could be as long as 30 months (the extension limit for this calibration interval). Licensees should determine the projected value of the instrument drift error that could occur over a 30-month interval for each of these applications."

1.4 "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 a 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.

Licensees should ensure that the projected value of instrument drift for an increased calibration interval is consistent with the values of drift errors used in determining safety system setpoints. These setpoints ensure that the consequences of accidents and anticipated transients are bounded within the assumptions of the safety analysis. If the allowance for instrument drift that was used to establish trip setpoints for safety systems would be exceeded, licensees should establish new trip setpoints for safety systems. Instrument Society of America (ISA) Standard, ISA-A67.04-1982, "Setpoints for Nuclear Safety-Related Instrumentation Used in Nuclear Power Plants," provides a methodology for evaluating instrument drift. The NRC endorsed this standard in Regulatory Guide 1.105, "Instrument Setpoints for Safety-Related Systems." If a new setpoint must be used to ensure that safety actions will be initiated consistent with the assumptions of the safety analysis, this will require a TS revision to reflect a new trip setpoint value. If the combination of instrument drift errors and current trip setpoints is not consistent with existing safety analysis assumptions, licensees should perform a new safety analysis to confirm that safety limits will not be exceeded with the increased drift associated with longer calibration intervals." [NOTE: Reg Guide 1.105, Rev. 3 (December, 1999) endorsed Part 1 of ISA S67.04-1994. Also, part II "Methodologies for the Determination of Setpoints for the Nuclear Safety-Related Instrumentation," of ISA-S67.04-1994 was <u>not</u> addressed by this regulatory guide].

1.5 "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.

Licensees should determine the effect of instrument errors on control systems used to effect a safe shutdown. Licensees must confirm that the instrument errors caused by drift will not affect the capability to achieve a safe plant shutdown."

1.6 "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.

Licensees should take care to avoid errors or oversights when establishing acceptance criteria for plant surveillance procedures that are derived from the assumptions of the safety analysis and the results of the methodology for determining setpoints. The NRC staff experience is that licensees have encountered problems when asked to confirm that instrument drift and other errors and assumptions of the safety and setpoint analyses are consistent with the acceptance criteria included in plant surveillance procedures. This review should include channel checks, channel functional tests, and the calibration of channels for which surveillance intervals are being increased."

1.7 "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.

Finally, licensees should have a program to monitor calibration results and the effect on instrument drift that will accompany the increase in calibration intervals. The program should ensure that existing procedures provide data for evaluating the effects of increased calibration intervals. The data should confirm that the estimated errors for instrument drift with increased calibration intervals are within the limits projected."

"In summary, licensees can provide a justification for increased surveillance intervals for instrument channel calibration by addressing each of the items noted herein."

2.0 OBJECTIVE / PURPOSE

The purpose of this document is to establish the Duke Energy methodology, guidance and detail required to perform a drift analysis using the historical As-Found / As-Left instrument calibration data in order to address and confirm the applicable requirements of GL 91-04 are met.

The calibration data is collected from ONS surveillance and maintenance procedure records obtained from Oconee Records Management. This methodology will be used as a means of characterizing the performance of an instrument loop, component, or group of components as follows:

2.1 Quantifying loop and/or component drift characteristics within defined probability limits to gain an understanding of the expected behavior for the loop and/or component by evaluating past performance.

2.2 Estimating loop and/or component drift to review for integration into existing instrument uncertainty calculations if necessary.

2.3 Establishing a technical basis for extending calibration and surveillance intervals (18 to 24 months) using historical calibration data. The required time interval for which the drift study data must be computed is the required calibration interval plus 25%, or 24 months + (0.25 x 24 = 6) months for a total interval of 30 months.

2.4 Evaluating extended surveillance intervals (18 to 24 months) in support of longer fuel cycles.

2.5 As an analysis aid for reliability centered maintenance practices (e.g., optimizing calibration frequency, 18 to 24 months)

3.0 DRIFT ANALYSIS SCOPE

3.1 Limited 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.

Duke Energy's Engineering Directives Manual, EDM-102 (Reference 8.2.2), "Instrument Setpoint/Uncertainty Calculations", provides guidance to determine instrument or loop drift in Appendix C, "Drift Determination Based on As-Found/As-Left Values". In addition, Appendix F, "Basic Statistical Methods/Techniques" provides the basic statistical tools to implement the As-Found/As-Left drift determination described in Appendix C, Approach 2. This Drift Analysis Methodology expands on the approach in EDM-102 Appendix C and the statistical methods in Appendix F. The conclusions and Analyzed Drift value outputs from the Drift Analysis/Calculations performed using this Analysis Methodology will be utilized as required, to update the associated instrument Uncertainty calculations.

The analysis techniques described below are based on determining a statistically derived value of drift by analyzing the instrument loop and/or component as-found and as-left calibration measurement values recorded in calibration or surveillance testing of the instrument loop and/or component. This analysis methodology is termed as-found as-left analysis (AFAL analysis).

The scope of the instrument applications analyzed is limited to those instrument loops and/or components that perform Safety Functions, including those which provide the capability for Safe Shutdown and which are currently subject to the Oconee Tech. Spec. required 18-month calibration interval. The results obtained from the completed data analysis will be incorporated into a Drift Analysis/Calculation in accordance with the Duke Power Engineering Directives Manual, EDM-101 (Reference 8.2.1).

The existing Oconee Instrument Setpoint/Uncertainty calculations will be reviewed to ensure the drift values determined in the AFAL analysis are bounding with respect to the uncertainty terms developed in the Oconee Instrument Setpoint/Uncertainty calculations.

3.2 Included Devices

A drift analysis may be performed on all regularly calibrated devices where as-found and as-left data is recorded. The scope of this methodology includes, but is not limited to, the following list of devices:

3.2.1. Transmitters (Differential Pressure, Flow, Level, Pressure, Temperature, etc.)

3.2.2. Bistables (Trip Units, Alarm Units, etc.)

3.2.3. Indicators (Analog, Digital)

3.2.4. Switches (Differential Pressure, Flow, Level, Pressure, Temperature, etc.)

3.2.5. Signal Conditioners/Converters (Summers, E/P Converters, Square Root Converters, etc.)

3.2.6. Recorders (Differential Pressure, Flow, Level, Pressure, Temperature, etc.)

3.2.7. Monitors & Modules (Radiation, Neutron, Pre-Amplifiers, Buffer Amplifiers, etc.)

3.2.8. Relays (Time Delay, Undervoltage, Overvoltage, etc.)

3.3 Relation to QA Condition/Nuclear Safety

This calculation is designated a QA Condition 1 calculation since it provides the guidance for performing a Drift Analysis for QA Condition 1 instrumentation.

4.0 DRIFT STUDY METHODOLOGY and DISCUSSION

4.1 Assumptions

Each Drift Analysis calculation makes the following three assumptions which are then proven or disproven in the statistical analysis. The analysis results are applied to the final Analyzed Drift term.

4.1.1. The AFAL drift sample data is assumed to be "Normal" and is analyzed for Normality through a series of steps. The data is checked through standard statistical means for determination of normality. This topic is discussed in detail in section 4.8.

4.1.2. The AFAL drift sample data is also assumed to be zero centered (the mean is zero based). See section 4.10 for a detailed discussion of how the mean is analyzed (drift bias determination).

4.1.3. Moderate time dependency in the AFAL drift sample data is assumed as a standard approach. Various techniques described in section 4.9 are then used to support or refute this assumption.

4.2 Methodology

This guide will provide the methodology necessary for the analysis of As-Found and As-Left calibration data as a means of characterizing the performance of an instrument loop and/or component. The data will be used to determine the rate of instrument drift with time based on historical plant calibration data as required by NRC Generic Letter 91-04 (Reference 8.1.1 and Section 1.0).

The methodology defined herein will follow the methodology presented in the Electric Power Research Institute (EPRI) TR-103335 (Reference 8.1.2). By letter dated December 1, 1997, from T.H. Essig, NRC, to R.W. James, EPRI (Reference 8.1.3), the NRC staff issued a status report documenting its concerns with TR-103335. Attachment 1 contains the Duke Energy - Oconee positions which apply to the NRC issues described in this letter.

The EPRI report was reissued as TR-103335-R1 in October, 1998. The NRC has not issued a formal review of TR-103335-R1. Refer to the EPRI document for a more detailed description of the AFAL method than presented here. The Duke Energy Drift Methodology was developed using EPRI TR-1033351-R1, considering the NRC Status Report and associated Duke comments (as shown in Attachment 1).

Fuel cycle extension efforts require an analysis of plant-specific instrument performance to demonstrate that the longer calibration interval will not result in larger than expected drift. The analysis techniques described herein are based on determining a statistically derived value of drift by analyzing the as-found and as-left measurements recorded during calibration or surveillance of the instruments. The details of this statistical analysis are given in this section.

4.3 As-Found As-Left (AFAL) Calibration "Drift" Analysis

4.3.1. Although TR-103335 discusses alternate variations by which to analyze drift, the AFAL Calibration Analysis has been selected for use in this review. The following information can be obtained by evaluating the AFAL data for an instrument or group of instruments:

4.3.1.1 The typical loop and/or component drift between calibrations (random in nature).

4.3.1.2 Any tendency for the loop and/or component to drift in a particular direction (bias).

4.3.1.3 Any tendency for the loop and/or component drift to increase in magnitude over time.

4.3.1.4 Confirmation that the setting or calibration tolerance is appropriate for the loop and/or component.

4.3.2. General Features of AFAL "Drift" Analysis

4.3.2.1 Methodology evaluates historical calibration data only: Data is obtained from instrument loop and/or component calibration and maintenance records.

4.3.2.2 Present and future performance is based on statistical analysis of past performance.

4.3.2.3 Data can be analyzed starting from instrument installation up to the present or only the more recent data can be evaluated.

4.3.2.4 Since only historical data is evaluated, the method is not intended as a tool to identify individual faulty instruments. It can be used to demonstrate that a particular instrument, model, or application is performing well or poorly.

4.3.2.5 A similar class of instruments, i.e., same make, model, application, is to be evaluated.

4.3.2.6 The methodology is less suitable for evaluating the drift of a single instrument loop and/or component due to statistical analysis penalties that occur with smaller sample sizes.

4.3.2.7 The methodology is based on Oconee surveillance procedure calibration data and is thus traceable to calibration standards.

4.3.2.8 The methodology determines plant-specific drift for a particular instrument loop and/or component that can be compared to the Oconee Instrument Setpoint/Uncertainty calculations. The value of drift represents the plant specific performance of this loop and/or component.

4.3.2.9 The methodology is designed to support the analysis of longer calibration intervals for 18 to 24-month (30 months with 25% extension as allowed by Tech Spec 3.0.2) fuel cycle extensions and is consistent with the NRC expectations described in Reference 8.1.1.

4.3.3. Random Behavior

4.3.3.1 If the AFAL calibration data indicates that the instrument loop and/or component randomly drifts around its setting without a tendency to drift in a particular direction, the drift is referred to as random drift.

4.3.3.2 Per EPRI TR-103335 (Reference 8.1.2), in terms of AFAL analysis, the standard deviation of the AFAL drift data is usually taken as the random portion of the instrument loop and/or component drift.

4.3.4. Bias Behavior

4.3.4.1 If the instrument loop and/or component consistently drifts in one direction, the drift is said to have a bias.

4.3.4.2 Per EPRI TR-103335 (Reference 8.1.2), in terms of AFAL analysis, the mean, or average value of the AFAL drift data, is usually taken as the bias portion of the instrument loop and/or component performance. In an ideal case with no bias, the mean would have a value of zero, indicating that there was no tendency for the instrument to drift preferentially in one direction. However, if the instrument does drift preferentially in one direction, the mean of the AFAL analysis will be non-zero. This deviation from a zero mean value should be treated as a bias if statistically significant. See section 4.10, "Drift Bias Determination" for further guidance and discussion.

4.3.5. Analyzed Drift (AD)

4.3.5.1 Once the statistical tests are applied and the AFAL sample population passes specified testing, the Analyzed Drift term ($AD_{18month}$) for the existing Technical Specification interval is calculated as: the ± random term (sample population standard deviation) combined arithmetically with the bias term (sample population mean), but only if the bias term is determined to be significant. (See examples in section 4.10.)

4.3.5.2 The extended or 30-month Analyzed Drift term ($AD_{30month}$) will then be extrapolated from the $AD_{18month}$ term as discussed in section 4.11.

4.3.6. Error and Uncertainty Content in AFAL Data

4.3.6.1 The As-Found versus the As-Left data includes several sources of uncertainty over and above loop and/or component drift. Each of the following sources of error can contribute to the magnitude of the AFAL value:

1. True drift representing a change, time-dependent or otherwise, in loop and/or component output over the time period between any two consecutive calibrations.
2. Accuracy errors present between any two consecutive calibrations.
3. Measurement and test equipment error between any two consecutive calibrations.
4. Personnel-induced or human-related variation or error between any two consecutive calibrations.
5. Normal temperature effects due to a difference in ambient temperature between any two consecutive calibrations.
6. Environmental effects on component performance, e.g., radiation, humidity, vibration, etc., between any two consecutive calibrations that cause a shift in component output.
7. Misapplication, improper installation, or other operating effects that affect component calibration between any two consecutive calibrations.
8. Instrument shifts associated with system operational changes (Shutdown, cooldown, depressurization).

4.3.7. Potential Effects of AFAL Data Analysis

4.3.7.1 Many of the items listed in Step 4.3.6 are not expected to have a significant effect on the measured As-Found and As-Left settings. Because of the many independent parameters contributing to the possible variance in calibration data, they will all be considered together and termed the instrument loop or component's Analyzed Drift (AD) uncertainty. This approach has the following potential effects on an analysis of the loop and/or component's calibration data:

1. The calculated variation may exceed any assumptions or manufacturer predictions regarding drift. Attempts to validate manufacturer's performance claims should consider the possible contributors to the calculated drift.
2. 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 AFAL data might not reveal 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. The AFAL drift value could possibly be used in place of more than just the drift term in the channel uncertainty calculation.

4.4 Data Collection

4.4.1. Sources of Data

4.4.1.1 Instrument Surveillance procedures and Calibration procedures (PM's).

4.4.1.2 Corrective Maintenance and Nuclear Station Modifications.

4.4.2. How Much Data To Collect

4.4.2.1 The goal is to collect sufficient data for the instrument loop and/or component to make a statistically valid pool. The ONS Drift Studies should have a minimum of 7 calibration intervals x 3 units x 1 each component/loop calibration procedure or 21 calibration procedures. As has been done at other utilities, a minimum of 30 drift values should be attained before the drift analysis can be performed without additional justification. Drift analyses should not be performed for sample sizes of less than 20 drift values.

4.4.2.2 Table 4.2 provides the Tolerance Interval Factor (TIF) for various sample pool sizes. It should be noted that the smaller the pool the larger the TIF. A tolerance interval factor 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. Generally, sample sizes of greater than 30 are acceptable. AFAL analysis performed with a smaller sample size must have justification provided within the analysis documentation.

4.4.2.3 The total population of instrument loop and/or components - all makes, models, and applications - that will be analyzed must be known.

4.4.2.4 For each selected loop and/or component in the sample, enough historic calibration data should be provided to ensure that the loop and/or component's performance over time is understood.

4.4.2.5 Specific justification in the drift study is required to document the sampling plan.

4.4.3. Documentation associated with Oconee PM Work Orders is available through Oconee Document Control and Records Management. The completed instrument calibration procedures that contain the data recorded during the instrument calibrations can be located by WO number by accessing the Duke Application Environment (DAE).

4.4.3.1 On the DAE, select the "REPORTS – MS Reporting Services (PASSPORT) program.

4.4.3.2 Select "Maintenance Reports". Then under Report Builder, select "ST762 WO Task Lookup by PN and date", which allows a Work Order Task lookup by procedure number and date range.
This report includes scheduled Surveillance Calibrations (PM's) and any corrective instrument calibrations, for the interval selected.

1. At "FACILITY" select Oconee Nuclear Station.
2. At "START DATE", select a date far enough in the past to allow at least seven cycles worth of calibration data to be collected, (e.g., for 18-month surveillances, select 7 x 1.5 years = 10.5 years or [2008 – 10.5 years = 1997], choose 1/1/1997 as a starting date).
3. At "END DATE", select an appropriate recent date, (e.g., 9/15/2008).
4. At "PROCEDURE", select the appropriate calibration procedure, (e.g., for Post Accident monitoring Instrumentation for RCS Hot Leg Temperature, select via check boxes "IP/0/A/0200/041A" and "IP/0/A/0200/041B".
5. At "TASK STATUS", select "CLOSED".
6. Select "VIEW REPORT", the selected report will be generated.
7. To save and print the report, under "select a format", choose the desired format, select a file name, save and print file as desired.
8. To view the Work Order, find the WO location (reel and frame, or the electronic version) by accessing the Duke Application Environment (DAE), then looking in NEDL (Nuclear Electronic Document Libraries) under Oconee, then find in "Misc Documents and Manuals", under "Work Orders" by the listed WO number.

4.4.4 The ST762 report described in section 4.4.3 identifies all performances of a specific procedure including those due to corrective work or modifications. Therefore, this report is used as the primary means to identify significant repairs and/or replacements of instrument loop components that affect calibration during the time span of interest. The history panel in NAS/EDB for a component ID can also be used as additional input as deemed necessary. For EQ components the installed date in NAS/EDB can also be used to augment the report results as needed.

4.5 Data Grouping

4.5.1. Grouping Calibration Data

4.5.1.1 The analysis goal for Oconee is to combine the Technical Specification functionally equivalent loops and/or components which are normally calibrated using the same or similar procedure(s) into a single statistical group for the drift analysis.
For example, procedure IP/0/A/0370/002 B is used for calibration of the SSF RC System Temperatures for all three Oconee units, and the calibration data from this one procedure would include all three units and would be grouped.
Similarly, procedure IP/1/A/0305/001 I is used to calibrate the unit 1 Reactor Protective System Channel A RC Flow Instruments and data from this procedure would be grouped with IP/2/A/0305/001 I (Unit 2) and IP/3/A/0305/001 I (Unit 3).

4.5.1.2 Example of Groupings

1. All devices of same manufacturer, model and range, covered by the same Surveillance Test
2. All transmitters used to monitor a specific parameter e.g. pressurizer level (assuming that all transmitters are the same manufacturer, model and range)
3. All transmitters of a specific manufacturer, model that have similar spans and performance requirements
4. All control room indicators of a specific manufacturer and model

4.5.2. Rationale for Grouping Loop and/or Components into a Larger Sample

4.5.2.1 A single Oconee unit loop and/or component analysis may result in too few data points to make statistically meaningful performance predictions.

4.5.2.2 Smaller sample sizes associated with a single loop and/or component may unduly penalize performance predictions by applying a larger Tolerance Interval Factor to account for the smaller data set. Larger sample sizes results in greater confidence and assurance of representative data that in turn reduces the uncertainty factor.

4.5.2.3 Larger groupings of loop and/or components into a sample set for a single population ultimately allows the user to state the ONS-specific performance for a particular make, model and Tech. Spec. function of component.

4.5.2.4 An analysis of smaller sample sizes is more likely to be influenced by non-representative variations of a single loop and/or component (outliers).

4.5.2.5 Grouping similar components together, rather than analyzing them separately, is more efficient and minimizes the number of separate calculations that must be maintained.

4.5.3. Combining Loops and/or Components into a Single Group

4.5.3.1 From EPRI TR-103335 (Reference 8.1.2), section 5.3, when grouping instruments together into a sample set for a single population, the following questions should be addressed:

1. Are the grouped instruments of the same make and model?
2. Do the grouped instruments receive the same type of signal?
3. Do the grouped instruments have similar operating characteristics?
4. Do the grouped instruments have similar operating spans?
5. Do the grouped instruments have the same calibration check points?
6. Are the grouped instruments exposed to similar operating environments?
7. Are the grouped instruments calibrated in the same manner?
8. Is there a reasonable analysis goal that warrants grouping the instruments together?

4.5.3.2 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 instruments have essentially equal variances and means at the desired statistical level, the data for the groups can be pooled to form a single group. EPRI TR-103335 states that instruments of a single make and model such as signal isolators or control room indicators could be pooled into a single group for analysis. However, sensors of the same make and model but with different spans could not always be combined into a single group. Based on studies performed by EPRI, most AFAL analyses will have near-zero means. Consequently, two groups of instruments really only need to have near-equal variances to pass a data pooling test. For example, it might be possible to find a group of pressure transmitters that have the same variance as the control room indicators. But, that does not mean that the transmitters and indicators should be combined into a single group. See Section 5.3 of EPRI TR-103335 (Reference 8.1.2), for considerations when combining instruments into a single group.

4.5.3.3 A t-Test (two samples assuming unequal variances) may 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.

4.6 Populating the Spreadsheet and Initial AFAL (RAW) Data Review

Once the Raw data is combined (as required) and in the correct format (see Section 5.2, Populating The Spreadsheet and Section 5.3, Calculating Initial Statistics), initial data review using Outlier testing can be useful in the initial processing of the raw data to help to identify failures, deficiencies and data errors that require correction or removal. For any values that show up as outliers, the raw data should be analyzed to determine if the data is erroneous. If data failures, deficiencies or errors exist, the data should be filtered into the final data set and the analysis reperformed. The careful data examination should be repeated until all erroneous data has been removed. Justification for removal of the erroneous data must be documented in the Calculation/Analysis.

The number of data points, the average and the sample standard deviation should be determined for each calibration point, see Section 6 of EPRI TR-103335 (Reference 8.1.2).

4.7 Outlier Analysis

4.7.1. 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 loop and/or 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.

Initial data review using Outlier analyses of the raw data can help to identify failures, deficiencies and data errors that require correction or removal. As discussed in EPRI TR-103335 (Reference 8.1.2), examples include:

4.7.1.1 Data Transcription Errors - Calibration data can be recorded incorrectly on the original calibration data sheet. Note that since all Oconee drift study spreadsheets are being checked, data from the calibration procedures being incorrectly entered into the EXCEL spreadsheet is unlikely.

4.7.1.2 Calibration Errors - Improper setting of a device at the time of calibration would indicate larger than normal drift during the subsequent calibration.

4.7.1.3 Measuring & Test Equipment (M&TE) Errors - Improperly selected or miscalibrated test equipment could indicate drift, when little or no drift was actually present.

4.7.1.4 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.

4.7.1.5 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.

4.7.1.6 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.

4.7.2. Detection of Outliers

4.7.2.1 ASTM Standard E178-02 (Reference 8.1.7) provides several methods for determining the presence of outliers. This methodology utilizes the Critical Values for t-Test. The t-Test utilizes the values listed in Table 4.1 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.

4.7.2.2 t-Test Outlier Detection Equation

This test compares an individual measurement to the sample statistics and calculates a parameter, t, known as the extreme studentized deviate. This parameter is calculated as follows:

$$t = \frac{|D_n - \mu|}{\sigma}$$

Where:

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

D_n = nth value of AFAL drift analysis,

μ = AFAL drift sample mean and

σ = AFAL drift sample standard deviation.

4.7.2.3 The calculated t-value is then compared to the critical t-value. If the calculated t-value exceeds the critical t-value, then that AFAL drift data point is a candidate for removal from the sample as an outlier. The critical t-value is based on the significance level and sample size from ASTM E178 (Reference 8.1.7). Examples of the Critical t-values are shown below (Table 4.1) for the 95% and 99% significance levels.

4.7.2.4 This methodology will use critical t-values based on an upper 1% significance level. Identifying outliers at a 1% significance level will ensure that the resultant tolerance interval is determined at greater than a 95/95 confidence level.

4.7.2.5 The AFAL drift data points whose calculated t-values exceed the critical t value are candidates for removal from the sample as outliers. Peer Review indicates that some utilities remove up to 3% of the initial data set. The Duke Energy methodology will remove no more than one AFAL drift data point (per calibration point) from the sample based solely on the t-Test.

Outlier candidates should be reviewed on a case by case basis and every effort made to determine the cause of the outlier status. Refer to section 4.7.1 for examples of failures, deficiencies and data errors that may require correction or removal. For example, a transcription error could be the cause for failing the t-Test. In this case the data point should be retained, the transcription error should be corrected and the sample statistics should be recalculated. The first step in the Drift Analysis is to confirm that the instruments meet "acceptable limits". Therefore, most potential "outliers" will have been identified early in the study and; thus, identifying them at this point in the study should be rare. It is imperative that no data point be removed unless it has been clearly demonstrated as an outlier. The responsibility for removing outliers from an AFAL drift sample lies with the analyst but an attitude of "valid until demonstrated invalid" should be maintained at all times. After the outliers have been identified and reviewed, the most egregious outlier candidate(s) should be reviewed for removal; however, only one outlier should be excluded for purely statistical reasons. Once this outlier(s) has been removed, the remaining data set is the Final Data Set.

4.7.3. Removal of Erroneous Data and Outliers

The removal of erroneous data as listed in Section 4.7.1 is not considered removal of outliers. Outlier testing is used in this case to identify calibration procedure errors, measurement and test equipment errors or design deficiencies, instrument failures or other errors.

After removal of the erroneous data, certain other 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. If there are many identified outliers, the data should be reviewed in more detail to determine if a single instrument or unusual situation is influencing the results. Outliers should be removed from the analysis only after confirming that they are truly not representative of the instrument's normal performance. The basis for removal should be documented with the analysis.

Table 4.1
Critical t values
(from Table 1 of Reference 8.1.7)

Sample Size	Upper 5% Significance Level	Upper 1% Significance Level
15	2.409	2.705
16	2.443	2.747
17	2.475	2.785
18	2.504	2.821
19	2.532	2.854
20	2.557	2.884
21	2.580	2.912
22	2.603	2.939
23	2.624	2.963
⋮	⋮	⋮
30	2.748	3.103
⋮	⋮	⋮
40	2.866	3.240
⋮	⋮	⋮
50	2.956	3.336
⋮	⋮	⋮
60	3.025	3.411
⋮	⋮	⋮
75	3.107	3.496
⋮	⋮	⋮
100	3.207	3.600
⋮	⋮	⋮
125	3.281	3.675
⋮	⋮	⋮
147	3.334	3.727

4.8 Normality Testing

4.8.1. Up to this point in the Drift Analysis we have been assuming that the AFAL drift sample data represents a normal distribution. This was necessary to evaluate outliers, which have the capacity to obscure the characteristics of a normal distribution. Assuming normality initially is done purely for convenience. It is easier to assume normality, remove outliers and then prove normality than it is to verify normality with outliers present, remove outliers and then re-verify normality and test again for outliers. The outlier removed from the AFAL drift sample data and the tolerance interval determined from the remaining sample is predicated on the normality of the data distribution. If the sample data distribution is not normal, then neither the outliers identified (unless corroborated independently) nor the calculated tolerance interval is valid at the stated confidence level.

4.8.2. The AFAL drift sample data is analyzed for Normality through a series of steps. The data is checked through standard statistical means for determination of the normality of the data set. The W or D-Prime test is the preferred tests for Normality depending on sample size, as discussed below. If these tests do not confirm that the data is normally distributed, then visual examinations are used with a coverage analysis to determine if a normal distribution is conservative with respect to the data. The coverage analysis consists of a histogram and a bin-by-bin comparison of actual data to expectations for a normal distribution. In all cases, the Oconee data will be determined to be normally distributed using the W or D-Prime test or treated conservatively using Coverage Analysis.

4.8.3. There are many statistical methods for determining if a given sample population represents a normal distribution. The most common are described in TR-103335 (Reference 8.1.2). The methods to be used in this analysis to determine if a sample population is consistent with a normal distribution are the D-Prime Test for sample sizes greater than 50 and the W Test for sample sizes of 50 or less. Note that the W Test is also described in Reference 8.2.2. Coverage Analysis will be used on those sample populations that cannot be shown to be consistent with a normal distribution. Both methods are discussed below.

Table 4.2
Tolerance Interval Factors for Normal Distributions

Sample Size	95/95 Percent Tolerance Factor	99/95 Percent Tolerance Factor
10	3.38	4.27
11	3.26	4.05
12	3.16	3.87
13	3.08	3.73
14	3.01	3.61
15	2.95	3.51
16	2.90	3.42
17	2.86	3.35
18	2.82	3.28
19	2.78	3.22
20	2.75	3.17
30	2.55	2.84
40	2.45	2.68
50	2.38	2.58
75	2.29	2.43
100	2.23	2.36
150	2.18	2.27
200	2.14	2.22
300	2.11	2.17
400	2.08	2.14

4.8.3.1 W Test for Normality (Sample < 50)

The general procedure for conducting the W test is as follows:
Order the sample data (x_n) in ascending order from smallest to largest value. Where x_1 = the smallest value and x_n = the largest value.
Compute the total sum of squares about the mean, S^2, for the sample data.

$$S^2 = (n-1) \times \sigma^2$$

Where n = sample size and σ = sample standard deviation.
Calculate the quantity, b, for the sample data. The VAR function in Microsoft EXCEL (Reference 8.3.2) may be used to calculate the variance of a sample population or VAR(sample population) = s^2 *or* σ^2.

$$b = a_1(x_n - x_1) + a_2(x_{n-1} - x_2) + a_3(x_{n-2} - x_3) \ldots + a_i\,(x_{n-k+1} - x_k),$$

or

$$b = \sum_{i=1}^{k}\left[a_i \times \left(x_{(n-i)+1} - x_i\right)\right]$$

Where k = n/2 if n is even or k = (n – 1)/2 if n is odd. The values for coefficient a_i are tabulated in ANSI N15.15-1974 (Reference 8.1.6), for sample sizes up to 50.

Calculate the test statistic, W, for the sample data.

$$W = \frac{b^2}{S^2}$$

The test statistic (W) is compared to the corresponding critical value in the table below at the desired level of confidence, which in this case is 5%. 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. See Table 4.3 for values of One -Tailed Percentage Points of W Test for Normality.

Table 4.3
One -Tailed Percentage Points of W Test for Normality

	P			P	
n	1%	5%	n	1%	5%
3	0.753	0.767	27	0.894	0.923
4	0.687	0.748	28	0.896	0.924
5	0.686	0.762	29	0.898	0.926
6	0.713	0.788	30	0.900	0.927
7	0.730	0.803	31	0.902	0.929
8	0.749	0.818	32	0.904	0.930
9	0.764	0.829	33	0.906	0.931
10	0.781	0.842	34	0.908	0.933
11	0.792	0.850	35	0.910	0.934
12	0.805	0.859	36	0.912	0.935
13	0.814	0.866	37	0.914	0.936
14	0.825	0.874	38	0.916	0.938
15	0.835	0.881	39	0.917	0.939
16	0.844	0.887	40	0.919	0.940
17	0.851	0.892	41	0.920	0.941
18	0.858	0.897	42	0.922	0.942
19	0.863	0.901	43	0.923	0.943
20	0.868	0.905	44	0.924	0.944
21	0.881	0.908	45	0.926	0.945
22	0.878	0.911	46	0.927	0.945
23	0.881	0.914	47	0.928	0.946
24	0.884	0.916	48	0.929	0.947
25	0.888	0.918	49	0.929	0.947
26	0.891	0.920	50	0.930	0.947

4.8.3.2 The D-Prime Test (Sample ≥ 50)

The D-Prime test is endorsed by ANSI N15.15-1974, Assessment of the Assumption of Normality (Employing Individual Observed Values) to evaluate the assumption of a normal distribution for sample sizes equal to or greater than 50. The general procedure for conducting the D-Prime test is as follows:

1. Order the sample data in ascending order from smallest to largest value.

2. Compute the total sum of squares about the mean, S_2, for the sample data as follows:

$$S^2 = \sum x_i^{\,2} - \frac{1}{n} \times \left(\sum x_i\right)^2$$

Note that S^2 equals (n-1) times the variance (s^2) of the sample data, or

$$S^2 = (n-1) \times s^2$$

As stated in 4.8.3.1, the VAR function in Microsoft EXCEL (Reference 8.3.2) may be used to calculate the variance of a sample population or VAR(sample population) = s^2.

Thus, it is usually straightforward to calculate the variance by the multiple of (n-1). The term can be calculated from either the ordered or unordered sample data.

3. Calculate the quantity T as follows: where i = 1 to n.

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

where i = 1 to n.

4. The test statistic is calculated by:

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

5. Compare the calculated value of D' with the D' percentage points of the distribution of this test. The D' test is two-sided, which effectively means that the calculated D' must be bounded by the two-sided percentage points at the stated level of significance. ANSI N15.15 provides percentage points for several levels of significance. Table 4.4 (from TR103335, Table 19-10), provides the percentage points for the 5% significance level. For the given sample size, the calculated value of D' must lie within the two values provided in Table 4.4 in order to accept the hypothesis of normality.

Table 4.4
D-Prime Percentage Points for the 5% Significance Level

n	0.025	0.975
50	95.6	101.3
60	126.3	133.1
70	159.6	167.7
80	195.6	204.8
90	233.9	244.3
100	274.4	286
200	783.6	806.9
300	1445	1480
400	2230	2276
500	3120	3179
600	4106	4181
800	6331	6425

4.8.3.3 Coverage Analysis

If the D-Prime or W normality tests show that the sample data is inconsistent with a normal distribution (to a 5% significance level), TR-103335 (Reference 8.1.2), recommends Coverage Analysis. Coverage Analysis entails, at a minimum, 95% of the AFAL drift data to be bounded by an assumed normal distribution (i.e., tolerance limits = $\mu \pm 1.96\sigma$). A plot of the data and the assumed normal curve should be evaluated to determine whether the assumed normal distribution effectively bounds the actual data. As can be seen the example Coverage Analysis Plot shown below (Figure 4-1), the AFAL data is more center-peaked than is a normal distribution.

1. 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 data set, overlaid with the equivalent probability distribution curve for the normal distribution, based on the data sample's mean and standard deviation. Visual examination of the plot is used, and the kurtosis is analyzed to determine if the distribution of the data is near normal. If the data is near normal, then a normal distribution model which adequately covers the set of drift data as observed is derived. This normal distribution will be used as the model for the drift of the component or loop.

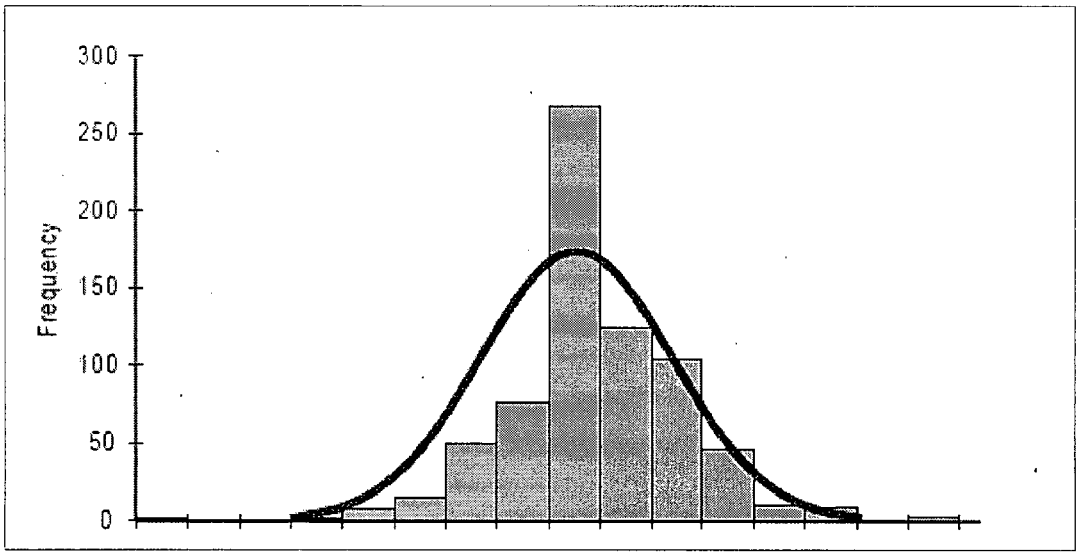
2. Sample counting is used to determine an acceptable normal distribution. The standard deviation of the group is computed. The number of samples within two standard deviations of the mean is computed. The count is divided by the total number of samples in the group to determine a percentage.

3. If the mean can be neglected as described in the Drift Bias Determination in section 4.10, it will not be considered when performing the coverage analysis.

4. If the percentage of data within the two standard deviations tolerance is at least 97.5%, the existing standard deviation is acceptable to be used for the encompassing normal distribution model. However, if the percentage is less than 97.5%, the standard deviation of the model will be enlarged, such that the required percentage within two standard deviations is greater than or equal to 97.5%. The required multiplier for the standard deviation in order to provide this coverage is termed the Normality Adjustment Factor (NAF). Note that for small data set populations (e.g., less than 40 sample points), the NAF may be chosen such that a minimum of $[(n - 1) \div n]$ or 97.5%, whichever is less, of all sample data (n) is covered by the tolerance interval. If no adjustment is required, the NAF is equal to one (1).

5. The coverage analysis and histogram should be established with a 9 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 (NAF) is determined iteratively in the coverage analysis. This multiplier produces a normal distribution model for the drift, which shows adequate data population from the Final Data Set within the $\pm 2\sigma$ bands of the model. See discussion in 4.9.3.3 for more discussion of the Binning Analysis.

Figure 4-1
Coverage Analysis Plot



4.9 Time-Dependency Analysis

The loop and/or component 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 with component age. This section discusses the importance of understanding the time-related performance and the impact of any time-dependency on an analysis.

4.9.1 A clear time-dependency of drift data would greatly simplify the confirmation of the 24-month cycle drift values. It would be a simple matter of increasing the 18-month cycle drift values by a factor appropriate for a 24-month cycle. However, as TR-103335 (Reference 8.1.2) states time-dependent behavior is not usually detectable by an AFAL analysis for the following reasons:

4.9.1.1 Drift tends to fluctuate randomly with many calibrations remaining within the specified as-left tolerance.

4.9.1.2 Instruments do not exhibit strong time-dependent behavior such that an increasing standard deviation with time might be observed.

4.9.1.3 Calibrations are usually performed at specified intervals with only a few months spread between calibration frequencies. In these cases, it will be difficult to identify a clear time-dependent behavior. Note that the Oconee loop and/or component calibrations of interest are currently on an 18-month interval.

Section 9 of EPRI TR-103335 (Reference 8.1.2), discusses the importance of a time dependency analysis whenever the AFAL analysis results are intended to support an extension of calibration intervals. Section 9.5 does not recommend extrapolation of the AFAL results for longer calibration intervals by either linear terms or square root terms. As stated in TR-103335, section 9.5 *"From the data evaluated by this and other EPRI projects, including the actual observation of instrument channels in service by on-line monitoring programs, such a model of drift is inappropriate because it is inconsistent with the available data".*

As another example, EPRI TR-1009603 (issued 2005), Reference 8.1.8, concludes the following, speaking of other sources of instrument uncertainty, (similar to the uncertainty sources discussed in section 4.3.6.1): *"The magnitude of the calculated variation that includes all of the above sources of uncertainty might mask any true time-dependent drift. In other words, the analysis of AFAL data might not reveal any time dependency (a tendency for the variation in output to increase in magnitude with time). This does not mean that time-dependent drift does not exist, only that it might be small enough that it is not readily apparent in the cumulative effects of instrument uncertainty for the evaluated period, when all of the above sources of uncertainty are combined."*

Additionally, EPRI TR-1003695 (issued 2004), Reference 8.1.9 states: *"The EPRI OLM* (On-Line Monitoring) *implementation project has developed dozens of models for hundreds of sensors at various nuclear plants, and significant instrument drift or failure has rarely been observed in the models developed to date".*

As discussed in the NRC Status report, "the time dependency of drift for a sample or population is understood to be time dependency of the uncertainty statistic describing the sample or population; e.g.: the standard deviation of drift." If the time dependency tests are NOT definitive they can be used to support an engineering judgment about the degree of time dependency e.g. "moderately time dependent", etc. (see discussion and methodology in section 4.11, Time Dependent Analyzed Drift).

4.9.2 Limitations of Time Dependency Analyses

EPRI TR-103335, Reference 8.1.2 performed drift analyses 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 (reference section 5.11).

4.9.3 Based on the discussion in 4.9.1 and 4.9.2 above, this methodology assumes moderate time dependency in the AFAL data as a standard approach. Various techniques as described in the remainder of this section are then used to support or refute this assumption.

4.9.3.1 The primary Duke Energy method of validating moderate time dependency will be to compare one-cycle AFAL data to multi-cycle AFAL data. The loop and/or component AFAL data from (typically) two 18-month calibration intervals will be combined. This multiple interval data is sometimes referred to as "Three Cycle Data".

Using multiple interval raw data (1) eliminates the potential for data grooming by only selecting intervals where the instrumentation was NOT reset, and (2) increases the number of data sets which enhances the statistical results. This method is similar to that described in section 4.3 of the NRC Status Report (Reference 8.1.3): "acceptable ways to obtain this longer-interval data include"...,"combining intervals between which the instrument was not reset or adjusted".

In addition, when using the data from multiple intervals, the drift data will be obtained as follows:

Drift1 = [(AF2-AL1) + (AF3-AL2)]
Drift2 = [(AF4-AL3) + (AF5-AL4)]
Drift3 = [(AF6-AL5) + (AF7-AL6)], etc.

Where AF(1,2,3,....) is the set of As Found values and AL(1,2,3,....) are the associated As Left values. The multi-cycle calibration data sets will be evaluated even if the component or loop was recalibrated in the middle interval, e.g.: AFAL2, AFAL4 or AFAL6 as described above.

The multi-cycle data evaluation will include: number of data points, data average and data standard deviation. Note that for this time dependency evaluation, all of the AFAL data will be included and combined. When comparing the one-cycle data to the multi-cycle data, if the value of the ratio of the standard deviations indicate a significant increase, then the associated Analyzed Drift should be judged to be strongly time dependent. Otherwise, the one-cycle data will always be considered to be moderately time dependent per the assumption in Section 4.9.3 above.

For the Analyzed Drift random term, a "significant increase" in the value of the ratio of the standard deviations of the multi-cycle data and the one-cycle data is considered to be equal to or greater than the value of the square root of the ratio of the average multi-cycle data calibration interval and the average one-cycle data calibration interval.

For example, if the multi-cycle data average interval is 35.9 months and the one-cycle data average interval is 17.4 months, the square root of the interval ratio would be $1.44 = (35.9 \div 17.4)^{1/2}$.

To validate a moderate time dependency, the ratio of the standard deviation of the multi-cycle data and the standard deviation of the one-cycle data would be required to be ≤ 1.44. For this example, if the multi-cycle data standard deviation is 0.20% and the one-cycle standard deviation is 0.15%, the ratio would be 1.33 = (0.20% ÷ 0.15%). Since 1.33 is less than 1.44, the assumption of moderate time dependency for this example is validated.

Note that EPRI TR-103335 (Reference 8.1.2), section 9.5 does not recommend extrapolation of the AFAL results for longer calibration intervals by either linear terms or square root terms. As stated in TR-103335, section 9.5 "From the data evaluated by this and other EPRI projects, including the actual observation of instrument channels in service by on-line monitoring programs, such a model of drift is inappropriate because it is inconsistent with the available data". However, this is a conservative approach.

Refer to section 4.11 for the development of the extended interval Analyzed Drift terms (random and bias).

4.9.3.2 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.

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

If not enough AFAL data from multiple intervals is available to support analysis, a second method to establish time dependency, is to perform a drift interval plot (XY scatter plot) that shows the adjusted or final drift data plotted against the time interval between tests for the data points (reference section 4.9.3.2 above).

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 1.25 months (covers most weekly and monthly calibrations)
   b. >1.25 to 3.75 months (covers most quarterly calibrations)
   c. >3.75 to 7.50 months (covers most semi-annual calibrations)
   d. >7.50 to 15.0 months (covers most annual calibrations)
   e. >15.0 to 22.5 months (covers most old refuel cycle calibrations)
   f. >22.5 to 30.0 months (covers most extended refuel cycle calibrations)
   g. >30.0 months covers missed and forced outage refueling cycle calibrations.
2. Since the Oconee units normally have a refueling every 18 months, the Binning Analysis will typically NOT be utilized since normally scheduled surveillance calibration procedures and hence AFAL data will usually be performed on a nominal 18 month interval.
3. Different bin splits may be used, but must be evaluated for data coverage and acceptable data groupings.

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

   b. 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.

   c. 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, 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.

4.9.3.4 For evaluation of the binning method, the critical value of the F-distribution is compared to the ratio of the smallest and largest variances for the evaluated bins. If the ratio of variances exceeds the critical value, the drift uncertainty should be considered as strongly time dependent. If the ratio of variances does not exceed the critical value, the drift uncertainty may be considered as moderately time dependent.

4.9.3.5 Regression Analyses and Plots

As discussed in the NRC Status Report (Reference 8.1.3), Evaluation item 4.4.4, all the regression analysis methods presented in EPRI TR-103335, (Reference 8.1.2) are deemed unacceptable for estimating instrument drift, but the methods will be described and the plots may be included in the drift analysis as a tool to support an engineering judgment about the degree of time dependency. A standard regression analysis within an EXCEL spreadsheet can plot the drift data versus time, with a prediction line showing the trend. It can 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.

4.9.3.6 Regression Plots

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

1. 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.

2. 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.

4.9.3.7 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 are 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.

1. 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 0.09 (thereby indicating the R value greater than 0.3), then it appears that the data does closely conform to a linear function, and therefore, should be considered time dependent.

2. 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.

3. Significance of F Test - An ANOVA table F value greater than the critical F-table value 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 0.05 or 5.0%) as the probability argument to FINV, 1 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.

4. 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.

5. 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.

4.9.3.8 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.

4.10 Drift Bias Determination

From EPRI TR-103335 (Reference 8.1.2), in terms of AFAL analysis, the mean, or average value, of the drift result is usually taken as the bias portion of the instrument performance. In an ideal case with no bias, the mean would have a value of zero, indicating that there was no tendency for the instrument to drift preferentially in one direction. This is based on an assumption that instrument drift is zero centered and a normal distribution. However, if the instrument does drift preferentially in one direction, the mean of the AFAL analysis will be non-zero.

If significant, this deviation from a zero mean value should be treated as a bias. The maximum value of the non-biased mean can be determined for a particular sample based on the standard deviation and the normal deviate, t (at 95% confidence, see Table 4.5, below) for a particular sample size. When the absolute value of the calculated mean for the given sample exceeds the maximum values in Table 4.5 for the sample size and the calculated standard deviation, the mean is conservatively treated as a bias to the drift term, otherwise it is considered negligible in determining the Analyzed Drift for the 18 month calibration interval.

The mean (bias term) must be combined properly with the standard deviation (random term) to determine $AD_{18months}$. The standard deviation (random term) is given as a plus and minus value, so the mean (bias term) must be added arithmetically to the random term in the appropriate direction, but should not be subtracted from the random term in the opposite direction. Refer to the example 4.10.1 on next page.

Table 4.5
Maximum Value 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%	s ≥ 1.50%	s ≥ 2%	s ≥ 2.50%	s ≥ 3%
≤ 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 (x_{crit}) for a given standard deviation (σ) and sample size (n) is calculated using the following formula (reference 8.3.3):

$$x_{crit} = t \times \frac{s}{\sqrt{n}}$$

Where;

x_{crit}	=	Maximum value of non-biased mean for a given s and n, expressed in %
t	=	Normal Deviate for a t-distribution at 0.025 for 95% confidence interval
s	=	Standard Deviation of the sample pool
n	=	Sample pool size

Normal Deviate (t) values above from reference 8.3.3, Table V, "t-Distribution".

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

4.10.1 Transmitter Group With a Biased Mean

A group of flow transmitters are calculated to have a standard deviation of 1.150%, mean of -0.355% with a count of 47. From Table 4.5, 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 (AD) term for a 95%/95% tolerance interval for the existing 18 month calibration interval is calculated as $AD_{18months}$ = -0.355% ± 1.150% x 2.401 (Tolerance Interval Factor interpolated from Table 4.2 at the 95/95 percent Tolerance Factor for 47 samples) or $AD_{18months}$ = -0.355% ± 2.761%. For conservatism, the $AD_{18months}$ term for the positive direction is not reduced by the bias value where as the negative direction is summed with the bias value, so $AD_{18months}$ = +2.761%, -3.116%.

4.10.2 Transmitter Group With a Non-Biased Mean

A group of transmitters is calculated to have a standard deviation of 1.150%, mean of 0.100% with a count of 47. From Table 4.5, 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 $AD_{18months}$ = ±1.150% x 2.401 (Tolerance Interval Factor from Table 4.2 interpolated for 47 samples) or $AD_{18months}$ = ±2.761%.

4.11 Time Dependent Analyzed Drift (AD)

Instrument uncertainty calculations at ONS follow the guidance of EDM-102 (Reference 8.2.2). If a manufacturer does not specify a drift term for their instrument, EDM-102 provides guidance and discussions of drift terms in Sections 102.7.3, "Typical Uncertainty Terms" and 102 B.2, "Standard Assumptions". In addition, if required, in lieu of utilizing published vendor specifications or in the absence of published specifications, determination of drift can be established based on historical calibration data as described in Appendix C. 102, "Drift Determination Based on As-Found/As-Left Values".

Thus, verification that the AD values determined in the drift analysis are consistent with the drift values used in the existing instrument uncertainty calculations is also verification that EDM-102 guidance for extending or establishing instrument drift can be used to conservatively account for the time-dependency of AFAL Drift Analysis results. In actuality many ONS Uncertainty / Setpoint Calculations have already used EDM-102 guidance to account for drift intervals up to 30 months.

Extrapolation of the random term of the drift will be performed as discussed below.

4.11.1 Time Dependent Random Term

The random portion of the Analyzed Drift is calculated by multiplying the standard deviation of the Final Data Set by the Tolerance Interval Factor (TIF) for the sample size and by the Normality Adjustment Factor (NAF), if required from the Coverage Analysis, and then extrapolating the final result for any time dependency.

Obtain the appropriate Tolerance Interval Factor for the size of the sample set from Table 4.2 using the 95/95 Percent column.

The following equation will be used to determine the random value:

$$AD_{RANDOM} = s \times TIF_{95/95\%} \times NAF$$

Where:

s – standard deviation or drift term calculated from the observed data

TIF95/95 – 95%/95% Tolerance Interval factor from Table 4.2

NAF – Normality Adjustment Factor from Coverage Analysis (to ensure coverage is ≥ 97.5%), or as discussed in section 4.8.3.3, for small data set populations (e.g., less than 40 sample points), the NAF may be chosen such that a minimum of [(n – 1) ÷ n] or 97.5%, whichever is less, of all sample data (n) is covered by the above tolerance interval.

As discussed in EPRI TR-103335, section 9.5 (Reference 8.1.2), if the sample random portion of the Analyzed Drift (standard Deviation) is verified as moderately time-dependent using one of the methods in section 4.9, the drift uncertainty for the extended calibration interval is extrapolated by using the square root of the ratio of the average multi-cycle data calibration interval and the average one-cycle data calibration interval:

$$AD_{ERANDOM} = AD_{RANDOM} \times \sqrt{\frac{CI_E}{CI_O}}$$

Where:

$AD_{ERANDOM}$ – random drift term for the extended calibration interval (30 months)

AD_{RANDOM} – random drift term calculated from the observed data

CI_E – extended calibration interval (surveillance interval + 25%) or 30 months

CI_O – averaged calibration time interval from the sample data

Again, EPRI TR-103335, section 9.5 (Reference 8.1.2), does not recommend extrapolation by either linear or square root relationship. However, if the sample random portion of the Analyzed Drift is determined to be strongly time-dependent per section 4.9, the following conservative equation is used.

$$AD_{ERANDOM} = AD_{RANDOM} \times \frac{CI_E}{CI_O}$$

Where:

CI_E – extended calibration interval (surveillance interval + 25%) or 30 months

CI_O – averaged calibration time interval from the sample data

If the drift bias (bias of the mean) of the Final Data Set is determined to be significant per the criteria in Section 4.10, a bias term will be determined. Extrapolation of the bias term will be performed as discussed below.

4.11.2 Time Dependent Bias Term

The bias portion of the Analyzed Drift is equal to the mean (m) of the Final Data Set.

The bias portion of the Analyzed Drift (AD_{BIAS}) if determined to be significant, (per section 4.10) will always be treated as being strongly time-dependent, so the bias portion (AD_{EBIAS}) will be extrapolated in a linear fashion:

$$AD_{EBIAS} = AD_{BIAS} \times \frac{CI_E}{CI_O}$$

Where:

AD_{EBIAS} – bias drift term for the extended calibration interval

AD_{BIAS} – bias drift term determined from Section 4.10

CI_E – extended calibration interval (surveillance interval + 25%) or 30 months

CI_O – averaged calibration time interval from the sample data

If the bias portion of the Analyzed Drift (AD_{BIAS}) is determined to be insignificant per section 4.10, then AD_{EBIAS} is zero.

4.11.3 Total extended interval Analyzed Drift Term (ADE)

$$AD_E = \pm AD_{ERANDOM} \pm AD_{EBIAS}$$

Note that AD_{EBIAS} shall added algebraically to the positive or negative (not both) portion of $AD_{ERANDOM}$, depending on the sign of AD_{EBIAS}.

4.12 Shelf Life Of Analysis Results

4.12.1. As discussed in EPRI TR-103335 (Reference 8.1.2), any analysis result based on the performance of existing loops and/or 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 performance are based upon our knowledge of past calibration performance. This approach assumes that changes in performance will occur slowly or not at all over time. For example, if evaluation of the last ten years of data shows the loop and/or component drift is stable with no observable trend, it is highly unlikely 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 performance ten years from now. For this reason, the analysis results should be re-verified periodically.

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

4.12.2.1 Changes to M&TE accuracy

4.12.2.2 Changes to the loop and/or component (e.g. span, environment, manufacturer, model, etc.)

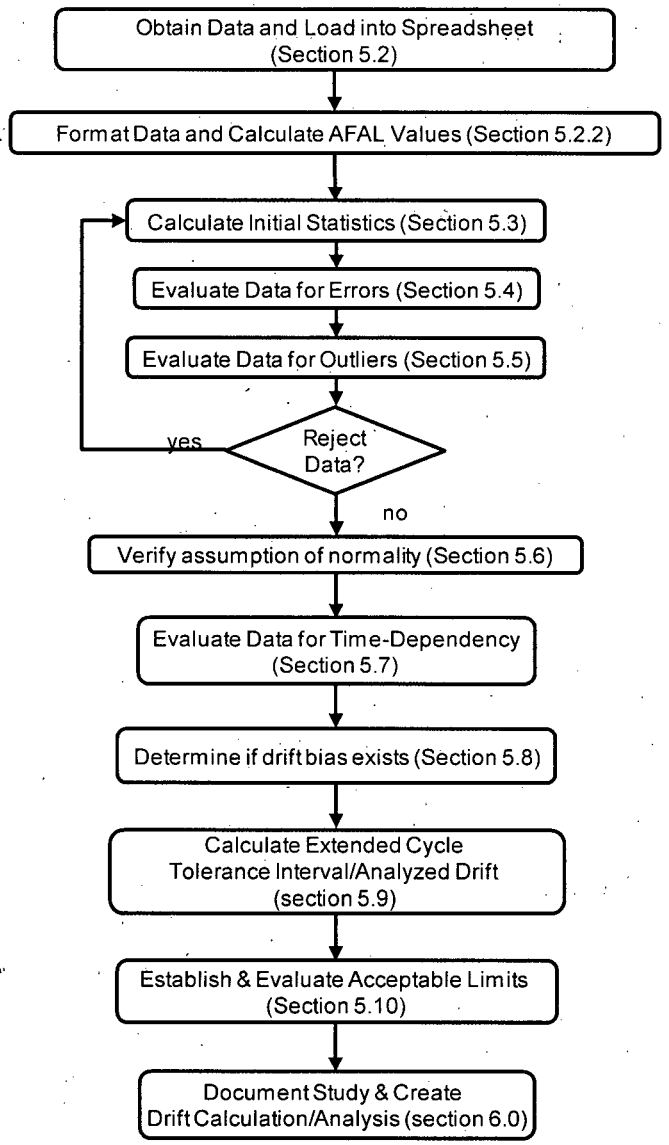
4.12.2.3 Calibration procedure changes that alter the calibration methodology

5.0 INSTRUCTIONS FOR PREPARING THE DRIFT CALCULATION/ANALYSIS

5.1 Performing a Drift Calculation/Analysis

The Drift Calculation/Analysis should be performed in accordance with the methodology described above and the requirements of EDM-101 (Reference 8.2.1). The Drift Calculation/Analysis will be performed using Microsoft© Office EXCEL (Reference 8.3.2) spreadsheets for display and calculation.

Figure 5.1
Flow Chart of Drift Statistical Analysis



5.2 Populating The Spreadsheet

The initial step in any As-Found/As-Left (AFAL) Drift Analysis is the gathering of the as-found/as-left data from completed plant calibration procedures. As-found and as-left values are defined as follows:

As-found is the condition in which a channel, or portion of a channel, is found after a period of operation and prior to any calibration.

As-left is the condition in which a channel, or portion of a channel, is left after a calibration or surveillance check.

5.2.1. Example of Data Formatting

TR-103335 (Reference 8.1.2), focuses on device calibrations. However, ONS normally performs loop, rather than device calibrations. Device calibrations are only performed if loop calibrations fail to meet the specified as-found/as-left calibration tolerances or it is desired to improve the loop as-left calibration. At best, device AFAL data would be sporadic at ONS. Therefore, the ONS AFAL Drift Analysis will primarily utilize loop calibration data. Every effort will be made to lump like instrument loops together; however, the likely effect of using loop rather than device AFAL data is smaller sample sizes. All data from the Technical Specification Surveillance procedures performed during the intervals of interest will be entered into the spreadsheets if available. As-Found or As-Left data which was unable to be located will be noted.

5.2.2. Initial AFAL (Raw) Data Confirmation

Prior to any statistical analysis of the data, the raw data is subject to the following constraint; that it has not, except on rare occasions, exceed acceptable limits. Instruments that do not pass this simple constraint are not candidates for AFAL Drift Analysis and should be considered for replacement if refueling cycle extension is planned. In other words, an instrument that has difficulty remaining within acceptable limits through an 18 month refueling cycle cannot be expected to remain within acceptable limits through an extended refueling cycle with any level of confidence. This constraint also helps verify that data collected represents normal instrument drift that has not been degraded by including instrument failures, which have the potential of skewing the results significantly.

The raw drift (D_{RAW}) will be calculated from the AFAL data as follows:

$$D_{RAWn} = \{AF_n - AL_{n-1}\}/\text{span}$$

Where: D_{RAWn} = Instrument Drift between "n" and "n–1" calibrations

AF_n = As-found data for calibration "n"

$AL_{(n-1)}$ = As-left data for calibrations "n–1"

Span = Instrument calibrated span

5.2.3. AFAL Drift Analysis

Prior to calculating the initial statistics, an effort should be made to group as many instrument loops together as possible. These loops should include the same make and model instruments, should be exposed to the same environmental conditions and should be calibrated on the same frequency.

The pattern of statistical analysis in this methodology will follow the pattern laid out in TR-103335 (Reference 8.1.2), as shown in Figure 5.1, the Flow Chart of Drift Statistical Analysis Process.

5.3 Calculating Initial Statistics

The initial statistics involve the mean, median and standard deviation of the drift sample population. The drift data determined for comparison with the loop acceptable limit (Section 5.10) will be the same data to be used in the calculation of the initial statistics. This data should be formatted in a consistent manner for all loops using an EXCEL spreadsheet. Consistent formatting will make reviewing the statistical analysis across loops/functions easier and more reliable. The format used in the TR-103335 (Reference 8.1.2), shown below, meets these requirements with the following additions. This format should include the date, status (As-Found/As-Left), Instrument Procedure number and all ONS tag numbers for the loop in question.

Figure 5.2
Examples of Raw AF / AL Historical Data

	WO Number	Calibration Date (1)		Calibration Points (2) 0/2%	25%	50%	75%	98/100%
			Vdc:	-0.038/0.169	2.469	4.969	7.469	9.962/9.769
IP/0/A/0310/003 B Enclosure 11.2.1 & 11.4.1 (latest rev) 1RC PT0021P 2nd Floor RB	1768569	5/4/2008	AL:	0.151	2.463	4.966	7.468	9.761
			AF:	0.151	2.463	4.966	7.468	9.761
	1670441	11/28/2006	AL:	0.147	2.462	4.964	7.465	9.762
			AF:	0.147	2.462	4.964	7.465	9.762
	1643667	4/16/2005	AL:	0.149	2.464	4.966	7.465	9.765
			AF:	0.149	2.464	4.966	7.465	9.765
	1610280	12/1/2003	AL:	0.142	2.462	4.945	7.453	9.736
			AF:	0.142	2.462	4.945	7.453	9.736
	1578814	4/2/2002	AL:	-0.046	2.462	4.968	7.466	9.961
			AF:	-0.048	2.459	4.951	7.442	9.920
	1547273	12/5/2000	AL:	-0.044	2.480	4.954	7.446	9.943
			AF:	-0.035	2.507	4.959	7.464	10.030
	1518392	6/10/1999	AL:	-0.034	2.472	4.968	7.457	9.955
			AF:	-0.006	2.482	4.960	7.451	9.910

Raw AFAL values shown above are in engineering units (volts).

Table notes for Figure 5.2 & 5.3:

1) Date the calibration was performed.
2) The calibration points are shown in Volts and percent of span and are equivalent to 0 or 60 psig, 625 psig, 1250 psig, 1875 psig and 2450 or 2500 psig, or 0/2%, 25%, 50 % 75% and 98/100% respectively. In 2002, the upper and lower calibration points were changed from 0% to 2% and 100% to 98%.
3) Calibration interval = (As-Found Date - As-Left Date)/30.44.
4) The calibration points and AFAL drift values are in "% of Span". AFAL drift values = (AFn – ALn-1)/span x 100%.
5) In 2002, the upper calibration point was changed from 100% Span to 98% Span for M&TE reasons. This change is well within the grouping requirements of Reference 8.1.2 therefore, they may be considered a single calibration point.
6) The AFAL drift value at the transition calibration point from 100% to 98% was normalized by -2.0% span and transition calibration point from 0% to 2% was normalized by +2.0% span to account for the change.

Figure 5.3
Example of Calculated Drift Data from Raw Data Above

Calibration Interval (3)	0/2%	25%	50%	75%	98/100%
17.2	0.04%	0.01%	0.02%	0.03%	-0.01%
19.4	-0.02%	-0.02%	-0.02%	0.00%	-0.03%
16.5	0.07%	0.02%	0.21%	0.12%	0.29%
20.0	-0.12%	0.00%	-0.23%	-0.13%	-0.25%
15.9	-0.04%	-0.21%	-0.03%	-0.04%	-0.23%
17.9	-0.01%	0.35%	-0.09%	0.07%	0.75%

Refer to Figure 5.2 for applicable notes.

Figure 5.4
Example Formatting of Initial Statistics

Calibration Point =	0/2%	0.25	0.5	0.75	98/100%	
n =	54	54	54	54	54	(1)
Mean =	-0.02%	-0.02%	-0.01%	-0.02%	-0.02%	(2)
Median =	-0.01%	-0.01%	0.01%	0.00%	-0.01%	(2)
Standard Deviation =	0.13%	0.12%	0.14%	0.15%	0.19%	(2)
Maximum Value =	0.35%	0.35%	0.26%	0.27%	0.75%	(3)
Minimum Value =	-0.51%	-0.31%	-0.36%	-0.47%	-0.39%	(4)
calculated T value =	3.68	3.14	2.43	3.09	3.94	(5)
Critical T value =	3.37	3.37	3.37	3.37	3.37	(6)
	outlier	no outliers	no outliers	no outliers	outlier	

Outliers deemed acceptable data.

Notes for the calibration points in Table 5.4:

1) n = number of AFAL data points per calibration point.
2) Sample Mean, Median and Standard Deviation
3) Maximum AFAL value in % of span
4) Minimum AFAL value in % of span
5) Calculated T value
6) Critical T value from Table 4.1 at 99% significance level.

From the raw drift data, the mean, median and standard deviation of the sample should be determined. The example data above assumes a standard five point calibration. This is applicable to most of the instrument loops at ONS and; therefore, will continue to be used as the example data. However, it should be recognized that many loops will consist of only a single data point per calibration (e.g., pressure switches, bistables, etc.). These will require a different format but they are evaluated in the same manner as the standard 5 point calibration.

The sample mean value (μ) for any group of like instrument loops is calculated as the sum of all calculated drift values for all intervals (i.e., all D_n's) divided by the number of calculated drift values. The sample mean is determined using the following formula.

$$\mu = \frac{\sum_n D_n}{n}$$

Where: n = number of drift terms.

EXCEL (Reference 8.3.2) spreadsheet's AVERAGE function may be used to calculate the mean value (μ) of a sample population.

The median is the middle number in an ordered set of numbers. If there are an odd number of observations, it is the middle number. If there is an even number of observations, the median is the average of the two middle observations. A simple comparison of the sample mean to the sample median can often identify the presence of outliers or non-symmetry in the data. EXCEL (Reference 8.3.2) spreadsheet's MEDIAN function may be used to calculate the median value of a sample population.

The sample standard deviation value (σ) for any group of like instrument loops is calculated using the following formula.

$$\sigma = \sqrt{\frac{\sum_n (D_n - \mu)^2}{(n-1)}}$$

Where: n = number of drift terms.

EXCEL (Reference 8.3.2) spreadsheet's STDEV function may be used to calculate the standard deviation value (σ) of a sample population.

Initially, a mean, median and standard deviation of the drift sample population should be calculated at each calibration point, Oconee typically utilizes a 5-point check at 0%, 25%, 50%, 75% and 100% of span.

From EPRI TR-103335 (Reference 8.1.2), the basis for the recommendation that each calibration check point be evaluated separately in an AFAL analysis is that drift trends will be observed across the instrument span, if the calibration check points are retained separately in the analysis. If the calibration data for the various check points is instead pooled into a single data set, these drift trends across the span will be missed.

If the instrument being evaluated is used to control the plant in an operating range, the instrument should be evaluated using the calibration data point(s) nearest its operating point, the closest calibration data point or the worst case calibration data point. If the instrument being evaluated is employed to trip the reactor or initiate a safety function, the instrument should be evaluated using the calibration data points nearest or on either side of the trip point.

5.4 Review Raw Data for Failures, Deficiencies and Errors

Review raw data for failures, deficiencies and data errors that may require correction or removal, as discussed in section 4.7.1. Preliminary Outlier testing may be useful in identifying possible failures, deficiencies or data errors.

5.5 Testing For and Removal of Outliers

Perform Outlier testing on final data set as described in section 4.7.2. After the outliers have been identified and reviewed, the most egregious outlier candidate should be removed and sample statistics recalculated. As discussed, only one outlier should be excluded for purely statistical reasons. Removal of erroneous data as described in section 4.7.3 will be justified in the Drift Analysis/Calculation.

5.6 Normality Testing

Perform Normality Testing as described in Section 4.8. The Normality tests which may be utilized are:

5.6.1. The W-Test for Normality if less than 50 data points are available.

5.6.2. The D-Prime Test if 50 or more data points are available.

5.6.3. Coverage Analysis
If the D-Prime or W-Tests show that the sample data is inconsistent with a normal distribution (to a 5% significance level), TR-103335 (Reference 8.1.2), recommends a Coverage Analysis. Perform the coverage analysis as described in Section 4.8.3.3. This is an EPRI TR-103335 specific concept. Coverage Analysis entails, at a minimum, that 95% of the AFAL drift data will be bounded by an assumed normal distribution (i.e., tolerance limits = $\mu \pm 1.96\sigma$).

As discussed in section 4.8.3.3, the Tolerance Interval Factor will be increased by the Normality Adjustment Factor to ensure that at least 97.5% of all of the sample data will be enveloped, or for small data set populations (e.g., less than 40 sample points), the NAF may be chosen such that a minimum of $[(n - 1) \div n]$ or 97.5%, whichever is less, of all sample data (n) is covered by the tolerance interval.

A plot of the data and the assumed normal curve should be evaluated to determine whether the assumed normal distribution effectively bounds the actual data.

As can be seen in the example plot of Figure 4-1, the AFAL data is more center-peaked than is a normal distribution.

5.7 Time-Dependency Evaluation

Perform a Time Dependency analysis as described in Section 4.9.3. Compare the value of the ratio of the standard deviations of the multi-cycle data and the one-cycle data to the value of the square root of the ratio of the average multi-cycle data calibration interval and the average one-cycle data calibration interval.

5.8 Drift Bias Determination

Perform a Drift Bias determination as described in Section 4.10 using the maximum value of non-biased mean as described in Section 4.10.

5.9 Calculate the Tolerance Interval/Analyzed Drift (AD)

Using the methods discussed in Section 4.11, calculate the analyzed drift term using the random and bias terms following sections 5.9.1 and 5.9.2 as discussed below. Discuss the evaluation and conclusions and results.

5.9.1 Bias Term
Calculate and extrapolate the Bias Term of the Final Data Set (AD_{EBIAS}) as required, for the extended calibration interval as described in Section 4.11.2.

5.9.2 Random Term
Calculate and extrapolate the Random Term of the Final Data Set ($AD_{ERANDOM}$) as required, for the extended calibration interval as described in Section 4.11.1.

5.9.3 Final Analyzed Drift (AD_E)
Combine the Bias and Random terms as required, for the extended calibration interval (30 months) as described in Section 4.11.3.

5.9.4 Compare the Final Analyzed Drift term (AD_E) with the loop/component uncertainty calculation.

5.10 Acceptable Limits

An ideal "acceptable limit" would be one that would include all the errors present at the time of calibration. However, certain errors may or may not be present and this complicates the definition of an acceptable limit. Temperature effects (TE's), for example, may or may not be present at the time of calibration.

There are no temperature constraints on the instrument calibrations at ONS other than the general area temperature limits. A Main Feedwater pressure transmitter may be calibrated at the maximum temperature of the Turbine Building during one refueling and at the minimum temperature the next. However, there is no way of determining this from the calibration data available. In some cases, certain loop components, especially transmitters located in the Reactor Building, may also have a normal Temperature Effect based on the change of ambient temperature which may be experienced from spring to fall outages.

Reference the applicable instrument loop setpoint/uncertainty calculation for the uncertainty terms described below for the loop Acceptable Limit (AL_{LOOP}) or determine the acceptable limit from the applicable uncertainty terms as discussed in EDM-102 (Reference 8.2.2). The component or loop uncertainties to be included in the Acceptable Limit determination are reference accuracy (A), drift (D) and measurement and test equipment uncertainties (MTE). Please note that in certain situations an indicator or OAC display might act as an in situ measurement and test equipment (M&TE); therefore, the resolution/readability of the indicator or OAC display may apply. For example, one technician, in calibrating a pressure indication loop, might be applying a known pressure to the input of the transmitter in the Aux Building while another technician reads the display of the indicator in the Control Complex.

In this case, the resolution/readability of the indicator should be included as part of the MTE. In addition, certain loop components, especially transmitters located in the Reactor Building may have a Temperature Effect (TE) term which is significant enough to warrant inclusion in the determination of the Acceptable Limit. As described in EDM-102, section 102.7.3, the TE is based on the field ambient temperature fluctuations relative to the instrument calibration temperature (e.g., ambient temperature changes from spring to fall outages at Oconee). For the purposes of the Duke Energy Drift Analysis, one-half of the normal temperature range TE may be used in the AL for those devices which have a normal TE term in the associated Uncertainty Calculation.

Note that other "normal conditions" process effects may also need to be considered in the Acceptable Limit. Justification for any additional terms must be included in the Drift Analysis/Calculation. These effects could be either random or bias effects.

The acceptable limit for each instrument loop will be the Square Root Sum of the Squares (SRSS) of the uncertainty terms described above for each device in the loop and the loop MTE. For example, say a loop consists of a transmitter (TR), located in the Reactor Building, a signal converter (SC) and an indicator (IN). The acceptable limit (AL) for this loop would be:

$$AL_{LOOP} = \pm [A_{TR}^2 + A_{SC}^2 + A_{IN}^2 + D_{TR}^2 + D_{SC}^2 + D_{IN}^2 + TE_{TR}^2 + MTE^2 + RES^2]^{1/2}$$

Note that this calculation assumes the indicator display (RES) will be used during the calibration. AL_{LOOP} should be calculated in units of calibrated instrument span.

Acceptable Limit Failure Rates

An instrument loop AFAL data point will be deemed to have failed the initial constraint (see section 1.1) when the AFAL data point for that instrument loop is greater than its loop Acceptable Limit (AL_{LOOP}). As required, failures of the Acceptable Limit as defined in Section 5.10.3 should be investigated on a case by case basis in consultation with the appropriate System Engineers. Failed or erroneous instrument data will not be used in the AFAL data analysis. See examples of erroneous data in section 4.7.1.

The initial constraint requirement is that the instrument has not, except on rare occasions, exceeded acceptable limits. TR-103335 (Reference 8.1.2) gives no definition of "rare". Duke Energy will allow a maximum of 5% AFAL data point Acceptable Limit failures to be considered as "rare", that is 95% of the AFAL data will NOT fail the Acceptable Limit test. This implies that no more than 2 out of 40 data points will fail the Acceptable Limit test. This level of confidence is consistent with industry standards in regard to instrumentation performance.

5.11 Ongoing Instrument Loop/Component Calibration As-Found/As-Left Evaluation Program

Oconee has in place a continuing calibration surveillance procedure review program which verifies that loop/component As-Found calibration values do not exceed acceptable limits as defined in applicable Instrument Uncertainty Calculations, except on rare occasions.

For additional information, refer to Attachment 1, Item 4.8, Section 8, "Guidelines for Fuel Cycle Extensions", Duke Energy's Interpretation for question number 7 (page 17 of 18).

Once the 24-month Tech Spec Surveillance Requirement intervals have been approved and implemented, this calibration surveillance procedure review program will continue to verify that future loop/component As-Found calibration values do not exceed the Acceptable Limits determined in the Drift Evaluations and associated Instrument Uncertainty Calculations as revised to reflect a 30 month calibration frequency, except on rare occasions.

6.0 CALCULATION/ANALYSIS

The Drift Calculation/Analysis should be performed in accordance with the methodology described above and the requirements of Duke EDM-101, (Reference 8.2.1). The following items are to be addressed in the calculation.

6.1 Calculation/Analysis Content

(Reference EDM-101 for discussion of 6.1.1 – 6.1.6 topics)

6.1.1. Statement of Problem/Purpose

- 6.1.1.1 Purpose
- 6.1.1.2 Analyzed Instrument Loop Function
- 6.1.1.3 24 Month Cycle Extension Requirements
- 6.1.1.4 Instrument Locations and Installation Dates

6.1.2. Relation To QA Condition/Nuclear Safety

6.1.3. Design Calculation Method

6.1.4. FSAR/Technical Specification Applicability

6.1.5. References

6.1.6. Assumptions/Design Input

- 6.1.6.1 Assumptions
- 6.1.6.2 Design Input/Bases

6.1.7. Drift Analysis

- 6.1.7.1 Instrument Block Diagram
- 6.1.7.2 As-Found/As-Left Data Evaluation/Outlier Evaluation
- 6.1.7.3 Normality Tests/Bias Evaluation/Tolerance Intervals
- 6.1.7.4 Drift Data Time Dependency / Find Analyzed Drift Value
- 6.1.7.5 Acceptable Limit (AL)
- 6.1.7.6 Comparison Of Final Analyzed Drift Value with Uncertainty Calculation Limits and Procedure Acceptance Criteria

6.1.8. Conclusions/Results

- 6.1.8.1 Justification of NRC GL 91-04 Issues.
- 6.1.8.2 Final Disposition

6.2 Drift Analysis Details

6.2.1 Describe, at a minimum, that the objective of the calculation is to document the drift analysis results for the loop and/or component group.

6.2.2 Provide a list for the group of all pertinent instrument information (e.g. Tag Numbers, Manufacturer, Model Numbers, ranges and calibration spans).

6.2.3 Describe any limitations on the application of the results. For example, if the analysis only applies to a certain transmitter range code.

6.2.4 The method of solution will describe, at a minimum, a summary of the methodology used to perform the drift analysis outlined by this Drift Methodology. Exceptions taken to this methodology will be identified, including basis and references for exceptions.

6.2.5 The actual calculation/analysis will provide:

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

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

6.2.5.3 Input data with Initial Statistics and Tests:

A. Input data with notes on removal and validity,

B. Computation of drift data and calibration time intervals,

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

D. W Test or D-Prime Test Results (as applicable),

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

F. Scatter Plot with prediction line and equation (if applicable),

G. Binning Analysis Summaries for Bins and Plots (if applicable),

H. Derivation of the projected 30-month drift values.

6.2.5.4 Results and conclusions, including:

A. Manufacturer and model number analyzed,

B. Bias and random Analyzed Drift values, as applicable,

C. The applicable Tolerance Interval Factors (provide detailed discussion and justification if other than 95%/95%),

D. Applicable drift time interval for application,

E. Normality conclusion,

F. Statement of time dependency observed, as applicable,

G. Limitations on the use of this value in application to uncertainty calculations, as applicable,

H. Limitations on the application of the results to similar instruments, as applicable.

6.3 Comparison of Analyzed Drift (AD) with Uncertainty Calculation Limits and Procedure Acceptance Criteria

6.3.1. To apply the results of the drift analyses to a specific loop or device, the associated setpoint/uncertainty calculation will need to be evaluated and revised as necessary in accordance with EDM-102, (Reference 8.2.2). All required changes will be tracked in the ONS Corrective Action Program (Problem Investigation Process (PIP), Reference 8.2.4).

6.3.2. The results of the drift analysis and associated impacts to the setpoint/uncertainty calculations should be compared to Calibration Test and Channel Functional Test As-Found tolerance limits and Channel Check limits to determine if any changes are required. All required changes will be tracked in the ONS Corrective Action Program (Problem Investigation Process (PIP), Reference 8.2.4).

7.0 DEFINITIONS

Acceptable Limit – An ideal component or loop acceptable limit would be one that includes all the errors present at the time of calibration. See section 5.10 discussion.

AFAL – As-found minus as-left value. The change between the as-found measurement recorded during a calibration and the as-left measurement recorded from the previous calibration. AFAL values in the Duke Energy drift studies are expressed as a percentage of the instrument span.

As-Found – The condition in which a channel, or portion of a channel, is found after a period of operation and before any calibration (if necessary). (From Reference 8.1.4).

As-Left – the condition in which a channel, or portion of a channel, is left after calibration or final setpoint device setpoint verification. (From Reference 8.1.4).

Bias – A systematic or predictable uncertainty component that consistently has the same algebraic sign or for which the direction (sign) is unknown, and is expressed as an estimated limit of error. (From Reference 8.2.2)

Calibration Span – The actual input/output signal range for which the instrumentation is calibrated, typically specified by the calibration procedure. In many cases the process sensor has an input calibration span, which differs from the actual instrument loop process output range. (From Reference 8.2.2).

Confidence Interval – The range of values which encompasses the area under the normal distribution curve for which the probability or confidence limit applies. For a normal distribution and a 95% probability, the confidence interval would be ± 1.96 standard deviations (σ) of the mean and would represent the interval for which 95% of all observation would be expected to fall within. (From Reference 8.2.2).

Drift – an undesired change in output over a period of time where change is unrelated to the input, environment, or load (from Reference 8.1.4). In addition, the uncertainty term "Drift" is normally expressed as a fixed magnitude per unit time that bounds the expected change in performance and is considered to be a random-independent term (unless specified otherwise). Although the magnitude of drift would not be expected to be time dependent, drift uncertainty should be based on the typical or maximum calibration interval, channel check, and/or functional check, with respect to the published drift magnitude per unit time. For surveillance frequencies dictated by the Technical Specifications, the drift determinations should be based on the maximum interval inclusive of the "25% grace period" (i.e. 24 months + 25%, or 30 months), as applicable.

EDM – Engineering Directives Manual, a compilation of engineering directives that cover procedures, programs and processes that apply to the functional area of engineering. This manual provides guidance on the various procedures and processes used within engineering for individuals to perform assigned responsibilities and accountabilities. (From Reference 8.2.3).

EPRI – Electric Power Research Institute

Error – The algebraic difference between the indication and the ideal value of the measured temperature, pressure, humidity, or radiation. Error = Indication – Ideal Value. (From Reference 8.2.2).

Kurtosis – A characterization of the relative peakedness 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. (From Reference 8.1.2).

M&TE – measuring and test equipment or the uncertainty associated with the measuring and test equipment used for calibrating a component or loop. From Reference 8.1.2, typically, there will be some M&TE associated with the devices used to measure an input to the loop and some M&TE associated with device used to monitor the output of the loop.

ONS – Oconee Nuclear Station

PIP – "Problem Investigation Process", as discussed the Duke Energy Nuclear Policy Manual, Nuclear Systems Directive (NSD) 208 (Reference 8.2.4), to provide a structured approach for "the formal reporting of problems, concerns, issues and events by nuclear site and support personnel"

- A formal corrective action program which facilitates the prioritization, evaluation, and correction of conditions adverse to quality, as defined by 10CFR Part 50, Appendix B.
- The evaluation of potential issues involving safety system operability, NRC reportability and Maintenance Rule functional failure.
- Managing selected internal and external commitments.
- The identification of areas for improvement and optimization

Resolution/Readability (RES) – The least interval between two adjacent discrete details which can be distinguished one from the other. (From Reference 8.2.2).

Shelf Life – As discussed in section 4.11.3, the term shelf life is used to describe a period of time extending from the present into the future during which the drift analysis results are considered valid. (From Reference 8.1.2).

Skewness – A measure of the degree of symmetry around the mean. Positive skewness indicates a distribution with an asymmetric tail extending toward more positive values. Negative skewness indicates a distribution with an asymmetric tail extending toward more negative values. (From Reference 8.1.2 and 8.3.2).

Temperature Effect – In this case refers to the effect of the ambient temperature fluctuations in the field at the instrument location. Since the existing Oconee refueling outages occur in the spring and the fall, Temperature Effects should be must be considered with respect to the instrument Acceptable Limit. Vendors typically specify a temperature effect (± %span /°F), and a range of temperatures over which it is applicable. (From Reference 8.2.2).

8.0 REFERENCES

8.1 Industry Standards Documents

8.1.1. NRC Generic Letter 91-04, "Changes in Technical Specification Surveillance Intervals to Accommodate a 24-Month Fuel Cycle", dated April 2, 1991.

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

8.1.3. NRC Status Report dated December 1, 1997, on the Staff review of EPRI Technical Report (TR)-103335, "Guidelines for the Instrument Calibration Extension / Reduction Programs."

8.1.4. ANSI/ISA–S67.04, Part 1 - 1994, "Setpoints for Nuclear Safety - Related Instrumentation".

8.1.5. ISA–RP67.04, Part 2 - 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation".

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

8.1.7. ANSI/ASTM E178-80, "Standard Practice for Dealing with Outlying Observations".

8.1.8. EPRI TR-1009603, Final Report, July 2005, "Instrument Drift Study - Sizewell B Nuclear Generating Station".

8.1.9. EPRI TR-1003695, Final Report, December 2004, "Equipment Condition Assessment Volume 1: Application of On-Line Monitoring Technology".

8.2 Duke Energy Documents

Documents include: Nuclear Systems Directives (NSD), Engineering Directives Manual (EDM) & Oconee Site Directives Manual (SD)

8.2.1. EDM–101, "Engineering Calculations/ Analyses", Revision 14.

8.2.2. EDM–102, "Instrument Setpoint/Uncertainty Calculations", Revision 3.

8.2.3. EDM–100, "Manual Organization and Administration" Revision 8.

8.2.4. NSD–208, "Problem Investigation Process (PIP)", Revision 31.

8.2.5. NSD-219, "Instrument and Electrical Device Calibration Out of Tolerance (OOT)", Revision 3.

8.2.6. SD-2.4.2, Instrumentation Out Of Tolerance Program, Revision 2.

8.3 Miscellaneous Documents

8.3.1. NIST/SEMATECH e-Handbook of Statistical Methods, found at http://www.itl.nist.gov/div898/handbook/

8.3.2. Microsoft Office® Excel 2007 (12.0.6331.5000) SP1 MSO (12.0.6213.1000), part of Microsoft Office Professional Plus 2007 Spreadsheet Program.

8.3.3. Statistics For Nuclear Engineers And Scientists, Part I: Basic Statistical Inference, William J. Beggs, February, 1981

9.0 ATTACHMENTS

Attachment 1 - The Duke Energy, Oconee Nuclear Station positions which apply to the NRC issues described in the NRC Status Report dated December 1, 1997. (18 pages)

Attachment 2 - List of Instruments, Manufacturer, Model and Range by Technical Specification Surveillance Requirement.

OSC-9719, Attachment 1
Duke Energy - Oconee Nuclear Station
Positions which apply to the NRC issues described in the
NRC Status Report dated December 1, 1997.

*The following (*NRC COMMENTS ON EPRI TR*) are excerpts or paraphrases from the NRC Status Report dated December 1, 1997, on the Staff review of EPRI Technical Report (TR)-103335, "Guidelines for the Instrument Calibration Extension/Reduction Programs." (REVISION 0)*

NRC COMMENTS ON EPRI TR

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

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

Duke Energy Interpretation:

Extensions for longer than 24 months (maximum 30 months) are not requested for any surveillance requirements in this submittal.

NRC COMMENTS ON EPRI TR

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

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

Duke Energy Interpretation:

The Duke Instrument Drift Analysis Methodology document recognizes this difference. Section 4.9 of the methodology document discusses "Time-Dependency Analysis" and section 4.10 discusses "Drift Bias Determination". Section 4.11 describes the Duke methodology for determining the bias and the random terms of the 18-month Analyzed Drift (AD) and the method to extrapolate the 18-month AD to the final extended interval drift term.

NRC COMMENTS ON EPRI TR

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

Drift is defined as as-found $_{(i)}$ – as-left $_{(i-1)}$, where i denotes the ith calibration. As mentioned in the TR this quantity unavoidably contains uncertainty contributions from sources other than drift. These uncertainties account for variability in calibration equipment and personnel,

instrument accuracy, and environmental effects. It may be difficult to separate these influences from drift uncertainty when attempting to estimate drift uncertainty, but this is not sufficient reason to group these allowances with a drift allowance. Their purpose is to provide sufficient margin to account for differences between the instrument calibration environment and its operating environment, see Section 4.7 of this report for a discussion of combining other uncertainties into a "drift" term.

Duke Energy Interpretation:

As discussed in the Duke Instrument Drift Analysis Methodology document and Duke Engineering Directive EDM-102 (Reference 8.2.2), the drift term determined by the drift analysis does include other uncertainties, such as Measurement and Test Equipment (M&TE) error, Temperature effects due to ambient temperature differences between two calibrations, instrument hysteresis, linearity error, and/or instrument repeatability error present during the current and previous calibrations, etc. As discussed in the Duke Instrument Drift Analysis Methodology document, the Analyzed Drift term is compared to the Acceptable Limit which is calculated using the various applicable uncertainty terms from the associated instrument Uncertainty Calculation.

This is considered to increase the calculated drift value, and is therefore conservative. The M&TE, Temperature effects, etc., uncertainties were included separately in the instrument uncertainty calculation in addition to the calculated drift value, if required. This is considered to increase the total uncertainty in the conservative direction.

NRC COMMENTS ON EPRI TR

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

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

Duke Energy Interpretation:

Time dependency evaluations were performed on the basic As-Found/As-Left data. Obviously other error contributors are contained in this data, but it is impossible to separate the contribution due to drift from the contribution due to Measurement and Test Equipment, human-related variations, ambient environmental effects, device accuracies, etc. All of these terms contributed to the observed errors. The Duke Instrument Drift Analysis Methodology document examines the raw data values for time dependency (after failures, deficiencies and data errors are corrected or removed) as described in section 4.9.

NRC COMMENTS ON EPRI TR

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

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

Duke Energy Interpretation:

The Oconee instruments were grouped based upon the Tech Spec functions which are the same for all three Oconee units. The instruments were reviewed to ensure all three Oconee units utilized the same device manufacturer, model number, and range. If unit differences existed, then the instruments were grouped based on manufacturer, model and range differences. Instrument groups were not divided into subgroups based upon age.

NRC COMMENTS ON EPRI TR

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

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

Duke Energy Interpretation:

A separate surveillance test failure evaluation was performed for the procedures implementing the surveillance requirements. This evaluation identified calibration-related and non-calibration-related failures for the Tech Spec instrument loops and associated components. After all relevant device failures are identified, a cross-check of failures across manufacturer, make and model number will be performed to determine if common mode failures could present a problem for the cycle extension. It is expected that this evaluation will confirm that almost all instruments in a group (associated with extended Tech Spec instrument loops) performed reliably and most failures were detected by the associated Tech Spec Channel Check or Functional Tests. Completion of this evaluation will be documented in a later revision of this calculation.

NRC COMMENTS ON EPRI TR

Item 4.3, Section 3, "Calibration Data Collection," Third Paragraph:
Instruments within a group should be investigated for factors that may cause correlations between calibrations. Common factors may cause data to be correlated, including common calibration equipment, same personnel performing calibrations, and calibrations occurring in the same conditions. The group, not individual instruments within the group, should be tested for trends.

Duke Energy Interpretation:

Because Measurement and Test Equipment (M&TE) is calibrated in the Duke central M&TE calibration facility on a regular basis and different calibration devices are frequently used for the refueling or 18-month surveillance testing, the effect of test equipment between calibration intervals is considered to be negligible and random. A review of a sample of calibrations for several of the instrument types revealed instances of a specific M&TE device being used for two (or more) refueling calibrations in a row. At other times a specific piece of M&TE may have been used for multiple calibrations, but not in a row. The calibration data was reviewed and there is no indication that repeated use of a single M&TE device had an impact on calibration of the installed instruments. Based on the frequent calibration of M&TE and the frequent use of different M&TE to accomplish the testing, effects due to M&TE is not considered a correlation factor in the result of the drift analysis. (IP's reviewed: IP/0/A/0310/004B & 5B, IP/0/A/0200/041A & B, IP/0/A/370/001A, IP/0/A/370/002C)

A review of a sample of data was performed to determine if there could be effects caused by technicians. There were many instances where the same technicians were involved in the instrument calibrations for consecutive calibration intervals. In all but a few cases, there were either two or three technicians involved in the testing. A review of the data when different technicians were performing the test resulted in no indication that there was any effect by any one technician. Due to the testing being accomplished by procedures, and additional trained and qualified technicians being involved in the testing, the effect due to technicians is not considered a correlation factor in the result of the drift analysis.

All equipment in each Tech Spec loop group experienced similar environments in each of the Oconee units for the spring and fall outages. The equipment would experience environmental variations that would impact the calibration data. Based on this, the variations in data could include ambient temperature, humidity and pressure effects and would result in larger standard deviations when analyzing the data. This is considered conservative and would not have a negative impact on the drift analysis.

NRC COMMENTS ON EPRI TR

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

TR-103335, Section 3.3, advises that older data may be excluded from analysis. It should be emphasized that when selecting data for drift uncertainty time dependency analysis, it is unacceptable to exclude data simply because it is old data. When selecting data for drift uncertainty time dependency analysis, the objective should be to include data for time spans at least as long as the proposed extended calibration interval, and preferably several times as long, including calibration intervals as long as the proposed interval. For limited extensions (e.g., a GL 91-04 extension), acceptable ways to obtain this longer interval data include obtaining data from other nuclear plants or from other industries for identical or close-to-identical instruments, or combining intervals between which the instrument was not reset or adjusted. If data from other sources is used, the source should be analyzed for similarity to the target plant in procedures, process, environment methodology, test equipment, maintenance schedules and personnel training. An appropriate conclusion of the data collection process may be that there is insufficient data of appropriate time span for a sufficient number of instruments to support statistical analysis of drift uncertainty time dependency.

Duke Energy Interpretation:

Data has been collected which includes at least the seven (refueling interval) calibration cycle data up to and including at least the Fall 2008 unit 2 outage (an average of approximately 106 months for the refueling calibration cycles or approximately 9 years). 106 months of data may not always be available due to replacement of instruments or changes in calibration procedures or methods. Data from outside the Oconee three unit data set was not used to provide longer interval data. In most cases the time dependency determination was based on three cycle calibrations all of which were performed at or near 18 months.

If any of the Oconee 18-month calibration interval instrument loops are identified as having insufficient data to support statistical analysis of drift time dependency, a moderate correlation between drift magnitude and time will be assumed and the calculation will reflect time dependent drift as described in section 4.11.

NRC COMMENTS ON EPRI TR

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

TR-103335, Section 3.3 provides guidance on the amount of data to collect. As a general rule, it is unacceptable to reject applicable data, because biases in the data selection process may introduce biases in the calculated statistics. There are only two acceptable reasons for reducing the amount of data selected: enormity, and statistical dependence. When the number of data points is so enormous that the data acquisition task would be prohibitively expensive, a randomized selection process, not dependent upon engineering judgment, should be used. This selection process should have three steps. In the first step, all data is screened for applicability,

meaning that all data for the chosen instrument grouping is selected, regardless of age of the data. In the second step, a proportion of the applicable data is chosen by automated random selection, ensuring that the data records for single instruments are complete, and enough individual instruments are included to constitute a statistically diverse sample. In the third step, the first two steps are documented. Data points should be combined when there is indication that they are statistically dependent on each other, although alternate approaches may be acceptable. See Section 4.5, below, on "combined point" data selection and Section 4.4.1 on '0%, 25%, 50%, 75%, and 100% calibration span points.'

Duke Energy Interpretation:

During the data collection process, typically, seven sets of 18-month, refueling interval calibration procedures (Oconee IP's) were selected as representative based on the Oconee operating history. No data points (except as discussed in section 4.7.1 and on page 8 below) were rejected from the selected time interval, and no sampling techniques were used.

In certain cases either due to upgrade of equipment, revision of calibration procedures or methods, extended plant shutdowns or other plant changes, seven cycles of data were not available. In these cases the analysis was performed using the available data set, considering the requirement of minimum sample size specified in Section 4.4.

As described in the Instrument Drift Analysis Methodology document, section 4.4, "Data Collection" any additional instrument maintenance performed in the selected time frame as evidenced by other Work Orders listed in the maintenance report "ST762 WO Task Lookup by PN and date" were reviewed for applicability and included in the drift analysis as required.

NRC COMMENTS ON EPRI TR

Item 4.4, Section 4, "Analysis of Calibration Data"
Sub-item 4.4.1, Sections 4.3 and 4.4, Data Setup and Spreadsheet Statistics, First Paragraph:

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

Duke Energy Interpretation:

The Duke Drift analysis project used Microsoft® Excel (Excel 2007 (12.0.6331.5000) SP1 MSO (12.0.6213.1000), from Microsoft Office Professional Plus 2007 Spreadsheet Program) to perform the statistical analysis. Each drift analysis/calculation was independently verified as required by Duke Energy's Engineering Directives Manual, EDM-101, "Engineering Calculations/Analyses" (Reference 8.2.1).

NRC COMMENTS ON EPRI TR

Item 4.4, Section 4, "Analysis of Calibration Data"
Sub-item 4.4.1, Sections 4.3 and 4.4, Data Setup and Spreadsheet Statistics, Second Paragraph:

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

Duke Energy Interpretation:

The calibration data point(s) chosen for drift analysis were based on:

(1) the loop function, e.g. for ES Wide Range Pressure, the calibration data points that were the closest to the trip values were chosen, or
(2) the calibration data points were evaluated and the "worst case" was used, as explained in the drift analysis

The Duke methodology uses % of span quantities for analysis in most cases. One exception is component/loops with a logarithmic scale.

NRC COMMENTS ON EPRI TR

Item 4.4, Section 4, "Analysis of Calibration Data"
Sub-Item 4.4.2, Section 4.5, "Outlier Analysis:"

Rejection of outliers is acceptable only if a specific, direct reason can be documented for each outlier rejected. For example, a documented tester failure would be cause for rejecting a calibration point taken with the tester when it had failed. It is not acceptable to reject outliers on the basis of statistical tests alone. Multiple passes of outlier statistical criterion are not

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

Duke Energy Interpretation:

From section 4.7 of the Duke Instrument Drift Analysis Methodology document, initial raw data review using Outlier analyses can help to identify failures, deficiencies and data errors that require correction or removal. Once any identified failures, deficiencies or data errors have been removed or corrected, detection of actual statistical outliers is performed. Section 4.7.1 identifies the following examples:

A. Data Transcription Errors - Calibration data can be recorded incorrectly on the original calibration data sheet. Note that since all Oconee drift study spreadsheets are being checked, data from the calibration procedures should NOT be incorrectly entered into the EXCEL spreadsheet.

B. Calibration Errors - Improper setting of a device at the time of calibration would indicate larger than normal drift during the subsequent calibration.

C. Measuring & Test Equipment (M&TE) Errors - Improperly selected or miscalibrated test equipment could indicate drift, when little or no drift was actually present.

D. 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.

E. 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.

F. 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.

All eliminated or adjusted data points were individually evaluated and independently verified to meet these categories. The criteria above are consistent with the five reasons defined in EPRI TR-103335 and in the NRCs status report. The additional criteria for scaling or setpoint change are included to prevent past poor practices from generating excessively large acceptance criteria for the future.

From section 4.7.2 of the Duke Instrument Drift Analysis Methodology document, after the statistical outliers have been identified the most egregious outlier candidates are reviewed for removal. Only one calibration data set (0% through 100% calibration points) can be excluded for purely statistical reasons. Once this data set outlier has been removed, the remaining data is the Final Data Set for analysis, discussion of outlier removal is included in the Drift Analysis.

NRC COMMENTS ON EPRI TR

Item 4.4, Section 4, "Analysis of Calibration Data"
Sub-item 4.4.3, Section 4.6, "Verifying the Assumption of Normality:"

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

Duke Energy Interpretation:

As described above, a maximum of one calibration as-found/as-left data set is allowed to be removed as an outlier from the drift data for purely statistical reasons, therefore, the normality tests are still valid. Coverage analysis (Tolerance Interval Factor times the Normality Adjustment Factor covers a minimum of 97.5% of the data population, or for small data set populations (e.g., less than 40 sample points), the NAF may be chosen such that a minimum of $[(n - 1) \div n]$ or 97.5%, whichever is less, of all sample data (n) is covered by the tolerance interval) was used where the normality tests did not confirm the assumption of normality. This produces a conservative model of the drift data by expanding the standard deviation to provide adequate coverage. Section 4.8 of the Duke Instrument Drift Analysis Methodology document, discusses Normality Testing.

NRC COMMENTS ON EPRI TR

Item 4.4, Section 4, "Analysis of Calibration Data"
Sub-item 4.4.4, Section 4.7, "Time-Dependent Drift Considerations," First through Ninth Paragraphs:

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

Duke Energy Interpretation:

The Oconee instrument loop calibrations are nearly always performed on a refueling (18-month) interval. The exceptions are for instrument failures or out-of-tolerance instruments as determined by Channel Checks or Functional Tests. Therefore, as discussed in Section 4.9 of the Duke Instrument Drift Analysis Methodology document, the primary drift interval time dependency analysis methodology will be to statistically evaluate the loop and/or component AFAL data from enough calibration intervals as are necessary to span at least a 30-month total interval (typically two 18-month intervals).

Section 4.11 describes how the 18-month Analyzed Drift value is determined and the extrapolation of that value to the 30-month Analyzed Drift value. The random portion of the Analyzed Drift value is always assumed to be at least moderately time dependent even though many of the test results showed that the random portion was not time independent.

NRC COMMENTS ON EPRI TR

Item 4.4, Section 4, "Analysis of Calibration Data"
Sub-item 4.4.4, Section 4.7, "Time-Dependent Drift Considerations," Thirteenth and Fourteenth Paragraphs:

A model can be used either to bound or project future values for the quantity in question (drift uncertainty) for the extended intervals. An acceptable method would use standard statistical methods to show that a hypothesis (that the instruments under study have drift uncertainties bounded by the drift uncertainty predicted by a chosen model) is true with high probability. Ideally, the method should use data that include instruments that were un-reset for at least as long as the intended extended interval, or similar data from other sources for instruments of like construction and environmental usage. The use of data of appropriate time span is preferable; however, if this data is unavailable, model projection may be used provided the total projected

interval is no greater than 30 months and the use of the model is justified. A follow-up program of drift monitoring should confirm that model projections of uncertainty bounded the actual estimated uncertainty. If it is necessary to use generic instrument data or constructed intervals, the chosen data should be grouped with similar grouping criteria as are applied to instruments of the plant in question, the Student's "t" test should be used to verify that the generic or constructed data mean appears to come from the same population. The "F" test should be used on the estimate of sample variance. For a target surveillance interval constructed of shorter intervals where instrument reset did not occur, the longer intervals are statistically dependent upon the shorter intervals; hence, either the constructed longer-interval data or the shorter-interval data should be used, but not both. In a constructed interval, drift = as-left(0) - as-found(Last), the intermediate values are not used.

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

Duke Energy Interpretation:

For the purposes of the Duke Oconee Drift Analyses, no generic instrument data was utilized.

Note that EPRI TR-103335 (Reference 8.1.2), section 9.5 does not recommend extrapolation of the AFAL results for longer calibration intervals by either linear terms or square root terms. As stated in TR-103335, section 9.5 "From the data evaluated by this and other EPRI projects, including the actual observation of instrument channels in service by on-line monitoring programs, such a model of drift is inappropriate because it is inconsistent with the available data". However, this is a conservative approach.

As discussed in Section 4.11 of the Duke Instrument Drift Analysis Methodology document, the random portion of the Analyzed Drift (AD_{RANDOM}) is calculated by multiplying the standard deviation of the Final Data Set by the 95/95 percent Tolerance Interval Factor (TIF) for the sample size and by the Normality Adjustment Factor (NAF), if required from the Coverage Analysis:

$$AD_{RANDOM} = S \times TIF_{95/95} \times NAF$$

As stated above, the random portion of the Analyzed Drift value is always assumed to be at least moderately time dependent. Therefore, the drift uncertainty for the extended calibration interval ($AD_{ERANDOM}$) is extrapolated by using the square root of the ratio of the extended calibration interval (30 months) and the averaged calibration interval from the sample data:

$$AD_{ERANDOM} = AD_{RANDOM} \times \sqrt{\frac{CI_E}{CI_O}}$$

If the sample random portion of Analyzed Drift is determined to be strongly time dependent, the following conservative equation is used.

$$AD_{ERANDOM} = AD_{RANDOM} \times \frac{CI_E}{CI_O}$$

where CI_E is the average multi-cycle data calibration interval and CI_O is the average one-cycle data calibration interval from the sample data.

The bias portion of the Analyzed Drift is equal to the mean (*m*) of the Final Data Set. The mean of the final data set is compared to a maximum value of non-biased mean based on sample size, standard deviation and the normal deviate as described in Section 4.10 of the methodology document. If the absolute value of the mean of the final data set exceeds the maximum value, the mean is conservatively treated as a bias in the drift term.

If inclusion of a bias term drift term is determined to be required per section 4.10, the bias portion of the Analyzed Drift (AD_{BIAS}) will always be treated as being strongly time-dependent, so the bias portion (AD_{EBIAS}) will be extrapolated in a linear fashion as shown in Section 4.11.2:

$$AD_{EBIAS} = AD_{BIAS} \times \frac{CI_E}{CI_O}$$

NRC COMMENTS ON EPRI TR

Item 4.4, Section 4, "Analysis of Calibration Data"
Sub-item 4.4.5, Section 4.8, "Shelf Life of Analysis Results:"

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

Duke Energy Interpretation:

Per Section 6.3 of the Guidance Document the value of the Analyzed Drift will be compared with uncertainty values in the associated setpoint/uncertainty calculation. In addition, the value of the Analyzed Drift will also be compared to the acceptance criteria in the Calibration Test, Channel Functional Test and Channel Check tests to determine if any changes are required. All required changes will be tracked in the ONS Corrective Action Program (Problem Investigation Process (PIP), Reference 8.2.4). See discussion for *Question 7* on page 18.

NRC COMMENTS ON EPRI TR

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

Section 5 discusses two alternatives to as-found/as-left (AFAL) analysis, combining the 0%, 25%, 50%, 75% and 100% span calibration points, and the EPRI Instrument Calibration Reduction Program (ICRP).
Two alternatives of AFAL are mentioned: as-found/setpoint (AFSP) analysis, and worst case as-found/as-left (WCAFAL). Both AFSP and WCAFAL are more conservative than the AFAL method because they produce higher estimates of drift. Therefore, they are acceptable alternatives to AFAL drift estimation.

The combined-point method is acceptable, and in some cases preferable, if the combined value of interest is taken at the point important to the purpose of the analysis. That is, if the instrument being evaluated is used to control the plant in an operating range, the instrument should be evaluated near its operating point. If the instrument being evaluated is employed to trip the reactor, the instrument should be evaluated near the trip point. The combined-point method should be used if the statistic of interests shows a correlation between calibration span points, thus inflating the apparent number of data points and causing an overstatement of confidence in the results. The method by which the points are combined (e.g., nearest point, interpolation, averaging) should be justified and documented.

Duke Energy Interpretation:

Neither the AFSP nor the WCAFAL method has been used by Duke in the Oconee instrument Drift Studies.

NRC COMMENTS ON EPRI TR

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

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

set of bistable data. There are other methods that would be acceptable, in particular, the X^2 test for significance.

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

Duke Energy Interpretation:

Duke did not propose extending any surveillances from monthly to quarterly. The Duke submittal uses the same methodology for the analysis of the AFAL bistable calibration data as is used for AFAL calibration data for transmitters or switches. The bistable drift analysis was analyzed in the same manner as for process instrumentation (input to output relationship changes). No bistable AFAL drift values were found to exceed the Acceptable Limit as determined in the associated Drift Analysis. See section 5.10 of the Instrument Drift Analysis Methodology document for a discussion of Acceptable Limit determination.

Note that the Reactor Protective System (RPS) and Engineered Safeguards Protective System (ESPS) rack mounted loop components, including the trip bistables (trip setpoints) are verified more frequently by the on-line Channel Functional tests. The rack Functional Tests are performed on a staggered 45 day basis for each channel of the RPS and on a 92 day basis for each channel of the ESPS.

NRC COMMENTS ON EPRI TR

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

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

analysis of the differences between operational and calibration environments, including accident environments in which the instrument is expected to perform.

Duke Energy Interpretation:

If required, application of the new drift values to plant uncertainty calculations will be performed in accordance with the Duke Energy EDM-102 (Reference 8.2.2), "Instrument Setpoint /Uncertainty Calculations". The guidance in EDM-102 on the computation of allowable values is based on ANSI/ISA-S67.04-1994, Part I. Therefore, if required, any changes to allowable values will be made consistent with the guidance in ANSI/ISA-S67.04-1994, Part I. Based on expected analyzed drift values for 30-month calibration intervals, no changes to Technical Specification allowable values are anticipated.

NRC COMMENTS ON EPRI TR

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

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

Duke Energy Interpretation:

Each Drift Analysis Calculation for the instrument loops shown in Attachment 2 provides summary answers to the seven issues of Enclosure 2 of NRC Generic Letter 91-04.

The following are excerpts from Enclosure 2, "Guidance for Addressing the Effect of Increased Surveillance Intervals on Instrument Drift and Safety Analysis Assumptions," of GL 91-04. These excerpts are followed by the Duke staffs' evaluation of each issue identified.

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."

A review of each of the instrument loops with 18-month Tech Spec calibration surveillance requirement was performed to evaluate the requirement for a Drift Analysis to be performed. A Drift Analysis Calculation was then performed using the ONS Instrument Drift Analysis Methodology as required. As part of the instrument loop Drift Analysis, a loop Acceptable Limit (AL) value was determined as described in section 5.10.

Each instrument loop AFAL data point was evaluated against the associated loop AL and the total number of times that the AFAL data point exceeded the AL were added up, divided by the total number of AFAL data points and then "rare" was defined as a maximum failure of not more than 5% of the AFAL data points. That is 95% of the AFAL data did NOT fail the Acceptable Limit test.

The loops which have exceeded the Acceptable Limits more than on "rare" occasion are as follows:

(1) IP/1,2,3/A/0200/042, Reactor Vessel Hot Leg and Head Level Indication
(2) IP/0/A/0275/019 A & B, Steam Generator Level Indication
(3) IP/0/A/0370/001 A, Standby Shutdown Facility RC Makeup Pump Suction and Discharge Pressure Indication (Note: This instrument supports SLC rather than TS SRs.)
(4) IP/0/A/0370/001 C, Standby Shutdown Facility RC Makeup Pump Discharge Flow (Note: This instrument supports SLC rather than TS SRs.)

Refer to the specific Drift Analysis Calculation for these functions for details on the disposition of the AL review.

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.

Drift Analyses were performed for each Tech Spec instrument loop, based on the data retrieved from the associated 18-month Surveillance Test. Additional maintenance performed on these instrument loops between the scheduled 18-month Surveillance testing was retrieved by utilizing the Nuclear Generation Reporting Services (PASSPORT) Maintenance Report ST762 WO Task Lookup by Procedure Number and date. The Work Orders were retrieved from the Oconee Document History files and the AFAL data from the instrument calibration data sheets were incorporated into the Drift Analysis spread sheet.

Initial statistics were then typically calculated for each column (i.e., 0%, 25%, 50%, 75% and 100% values) drift value. Each column of data was tested for Outliers then Normality tested (using a 95% tolerance factor). If the data failed the normality test, then a coverage analysis was performed to ensure that a minimum of 97.5% of the AFAL data points were covered by the tolerance limits. Note that for small data set populations (e.g., less than 40 sample points), the NAF may be chosen such that a minimum of $[(n - 1) \div n]$ or 97.5%, whichever is less, of all sample data (n) is covered by the tolerance interval. Time dependency (multi-cycle data) testing was performed and finally as described in the ONS Instrument Drift Analysis Methodology, the 18-month Analyzed drift was determined and then extrapolated to 30-month Analyzed Drift term(s), reference the Oconee Instrument Drift Analysis Methodology document.

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 channels by TS section that identifies these instrument applications."

The methodology described in the previous section was used to determine the magnitude of instrument drift with a high degree of confidence and a high degree of probability for a bounding calibration interval of 30 months for each instrument make and model number and range. Attachment 2 to the Oconee Instrument Drift Analysis Methodology document lists the associated instruments, including manufacturer and model number for each affected Tech Spec Surveillance Requirement.

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 a revised safety analysis to support existing setpoints, provide a summary of the Updated analysis conclusions to confirm that the safety limits and safety analysis assumptions are not exceeded."

As discussed in Section 6.3 of the Drift Guidance Document, a comparison of Analyzed Drift with Uncertainty Calculation Limits and Procedure Acceptance Criteria is performed. Any required changes to the Uncertainty Calculation will be performed in accordance with EDM-102, "Instrument Setpoint/Uncertainty Calculations" (Reference 8.2.2). In addition, required changes will be tracked in the ONS Corrective Action Program (Problem Investigation Process (PIP), Reference 8.2.4).

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."

As discussed in the response to question 4, any required changes to the Uncertainty Calculation will be performed in accordance with EDM-102, "Instrument Setpoint/Uncertainty Calculations" (Reference 8.2.2). In addition, required changes will be tracked in the ONS Corrective Action Program (Problem Investigation Process (PIP), Reference 8.2.4).

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."

As required by Section 6.3.2 of the Drift Guidance Document, the results of the drift analysis will be compared to Calibration Test and Channel Functional Test As-Found tolerance limits and Channel Check limits to determine if any changes are required. Note that any changes required to the procedure acceptance criteria will be implemented prior to extension to 24-month cycles.

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."

Oconee has in place a continuing calibration surveillance procedure review program which verifies that loop/component As-Found calibration values do not exceed acceptable limits as defined in applicable Instrument Uncertainty Calculations, except on rare occasions.

Once the 24-month Tech Spec Surveillance Requirement intervals have been approved and implemented, this calibration surveillance procedure review program will continue to verify that future loop/component As-Found calibration values do not exceed the Acceptable Limits determined in the Drift Evaluations and associated Instrument Uncertainty Calculations as revised to reflect a 30 month calibration frequency, except on rare occasions. The calibration surveillance review program consists of the following programs and procedures.

Duke Energy's Nuclear System Directive, NSD-219, "Instrument and Electrical Device Calibration Out of Tolerance (OOT)" (Reference 8.2.5). Section 219.8.1.5 requires that Instrument and Electrical device OOT notification to Engineering shall be made by the Problem Investigation Process (PIP) **or** by a site approved process.

The Oconee site approved process is implemented via the Site Directives Manual, SD 2.4.2 (Reference 8.2.6) which can be utilized for such notifications.

The Duke Energy formal corrective action (PIP) program which facilitates the prioritization, evaluation, and correction of conditions adverse to quality, as defined by 10CFR Part 50, Appendix B), uses Nuclear System Directive, NSD-208 (Reference 8.2.4).

Typically, the instrument calibration procedure will require that SD 2.4.2, Enclosure 7.1, "String/Component Malfunction/Maximum OOT Limit Exceeded Sheet" be completed if:

(1) The As Found loop calibration error is greater than or equal to two times the specified calibration tolerance.
(2) The As Found calibration error for a stand-alone component (NOT part of the loop check) is greater than or equal to two times the specified calibration tolerance.
(3) The loop/component CANNOT be calibrated to the specified tolerance.
(4) A component malfunction is found.

As-Found calibration tolerances are established such that the two times limit or other limit as specified in the instrument calibration procedure, is conservative in regard to the acceptable limit as determined by the instrument uncertainty calculation. Enclosure 7.1 is required to be sent to Engineering for review.

OSC-9719, Attachment 2
List of Instruments, Manufacturer, and Model by Technical Specification Surveillance Requirement

DRIFT STUDY	TECH SPEC APPLICATION	FUNCTION	NOTES	EQUIPMENT TAG NUMBER	EQUIPMENT MANUFACTURER	EQUIPMENT DESCRIPTION	EQUIPMENT APPROVED MODEL
OSC-9741	SR 3.3.8.3	15 (UST Level)		1,2,3C LT0015A	Rosemount	dp Transmitter	1153DB4/1154DP4
OSC-9741	SR 3.3.8.3	15 (UST Level)		1,2,3C LT0036	Rosemount	dp Transmitter	1153DB4/1154DP4
OSC-9741	SR 3.3.8.3	15 (UST Level)		1,2,3C P0081	Westinghouse	indicator	VX-252
OSC-9741	SR 3.3.8.3	15 (UST Level)		1,2,3C P0343	Westinghouse	indicator	VX-252
OSC-9741	SR 3.3.8.3	15 (UST Level)		ICCM System	Westinghouse		
OSC-9741	SR 3.3.8.3	15 (UST Level)	3	OAC	SAIC		
OSC-9771	SR 3.3.1.5	3,4,5,11 (RPS RC Pressure)		1,2,3RC PT0017P,18P,19P,20P	Rosemount	pressure transmitter	1154GP9RB
OSC-9771	SR 3.3.1.5	3,4,5,11 (RPS RC Pressure)		1,2,3RPS AFA20307	Bailey	buffer amplifier	6621670A
OSC-9771	SR 3.3.1.5	3,4,5,11 (RPS RC Pressure)		1,2,3RPS AFB,C,D20310	Bailey	buffer amplifier	6621670A
OSC-9771	SR 3.3.1.5	3,4,5,11 (RPS RC Pressure)	3	OAC	SAIC		
OSC-9752	SR 3.3.5.3	1, 2 (ES RC Pressure)		1,3RC PT0021P	Rosemount	pressure transmitter	1154GP9RB
OSC-9752	SR 3.3.5.3	1, 2 (ES RC Pressure)		1,3RC PT0023P	Rosemount	pressure transmitter	1153GD9RB
OSC-9752	SR 3.3.5.3	1, 2 (ES RC Pressure)		1,3RC PT0022P	Rosemount	pressure transmitter	1154GP9RB
OSC-9752	SR 3.3.5.3	1, 2 (ES RC Pressure)		2RC PT0021P,22P,23P	Rosemount	pressure transmitter	1153GD9RB
OSC-9752	SR 3.3.5.3	1, 2 (ES RC Pressure)		1,2,3ES AF010306	Bailey	buffer amplifier	6621670A
OSC-9752	SR 3.3.5.3	1, 2 (ES RC Pressure)		1,2,3ES AF020306	Bailey	buffer amplifier	6621670A
OSC-9752	SR 3.3.5.3	1, 2 (ES RC Pressure)		1,2,3ES AF030306	Bailey	buffer amplifier	6621670A
OSC-9754	SR 3.3.8.3	14 (BWST Level)		1,2,3LPI LT0002A	Rosemount	level Transmitter	1153DB5
OSC-9754	SR 3.3.8.3	14 (BWST Level)		1,2,3LPI LT0006	Rosemount	level Transmitter	1153DB5
OSC-9754	SR 3.3.8.3	14 (BWST Level)		1,2,3LPI LT0132	Rosemount	level Transmitter	1153DB5
OSC-9754	SR 3.3.8.3	14 (BWST Level)		1,2,3LPI P0346,0345	Westinghouse	indicator	VX-252
OSC-9754	SR 3.3.8.3	14 (BWST Level)		1,2,3LPI OI0132	TEC	Analog Signal Isolator	156D
OSC-9754	SR 3.3.8.3	14 (BWST Level)		1,2,3MSC CR0004	Chessell	Graphics Recorder	6180A
OSC-9754	SR 3.3.8.3	14 (BWST Level)		1,2,3LPI OI1MTC4BA	Electromax	Optical Isolator	175D127-8
OSC-9754	SR 3.3.8.3	14 (BWST Level)		ICCM System	Westinghouse		
OSC-9754	SR 3.3.8.3	14 (BWST Level)	3	OAC	SAIC		
OSC-9793	SR 3.3.1.5	8 (RPS RC Flow)		1,2,3RC FT0014B,C,D,E	Rosemount	dp Transmitter	1154HP6RB
OSC-9793	SR 3.3.1.5	8 (RPS RC Flow)		1,2,3RC FT0015B,C,D,E	Rosemount	dp Transmitter	1154HP6RB
OSC-9791	SR 3.3.8.3	2 (ICCM Thot)	2	1,2,3RC RD0084B,85B	Weed	RTD	N9031-1A
OSC-9791	SR 3.3.8.3	2 (ICCM Thot)		1,2,3ICC CB106A,B	Westinghouse	RTD input board	2343D99 G01
OSC-9791	SR 3.3.8.3	2 (ICCM Thot)		1,2,3ICC CBOC07A,B	Data Translation	Analog to Digital converter board	DT1742
OSC-9791	SR 3.3.8.3	2 (ICCM Thot)		ICCM System	Westinghouse		
OSC-9825	SR 3.3.8.3	3 (RVLIS)		1,2,3RC LT0123,0124	Barton	pressure transmitter	752
OSC-9825	SR 3.3.8.3	3 (RVLIS)	1	1,2,3ICC CB103A,B	Westinghouse	4 to 20 mAdc analog input board	2343D97G07
OSC-9825	SR 3.3.8.3	3 (RVLIS)	1	1,2,3ICC CBOC06A,B	Data Translation	Analog to Digital converter board	DT1742
OSC-9825	SR 3.3.8.3	3 (RVLIS)		ICCM System	Westinghouse		
OSC-9825	SR 3.3.8.3	3 (RVLIS)	3	OAC	SAIC		
OSC-9746	SR 3.3.8.3	16 (Core Exit		1,2,3 ICC CB 107A, 107B,	Westinghouse	T/C Input boards	2343D98G01

OSC-9719, Attachment 2
List of Instruments, Manufacturer, and Model by Technical Specification Surveillance Requirement

DRIFT STUDY	TECH SPEC APPLICATION	FUNCTION	NOTES	EQUIPMENT TAG NUMBER	EQUIPMENT MANUFACTURER	EQUIPMENT DESCRIPTION	EQUIPMENT APPROVED MODEL
		Thermocouples)		108A, 108B			
OSC-9746	SR 3.3.8.3	16 (Core Exit Thermocouples)		1,2,3 ICC CB OC06A, 6B, 7A, 7B	Data Translation	Analog to Digital converter board	DT1742
OSC-9746	SR 3.3.8.3	16 (Core Exit Thermocouples)		ICCM System	Westinghouse		
OSC-9746	SR 3.3.8.3	16 (Core Exit Thermocouples)	3	OAC	SAIC		
OSC-9776	SR 3.3.8.3	11 (Pressurizer Level)		1,2,3RC LT0004P1,P2,P3	Rosemount	Level Transmitter	1154HP5RB
OSC-9776	SR 3.3.8.3	11 (Pressurizer Level)		1,2,3RC P0365,0366	Dixson	indicator	SA-101AXTX4
OSC-9776	SR 3.3.8.3	11 (Pressurizer Level)		2,3RC P0368	Dixson	indicator	SA-101AXTX4
OSC-9776	SR 3.3.8.3	11 (Pressurizer Level)		1RC P0368	Dixson	indicator	SA-101P
OSC-9776	SR 3.3.8.3	11 (Pressurizer Level)		ICCM System	Westinghouse		
OSC-9776	SR 3.3.8.3	11 (Pressurizer Level)	3	OAC	SAIC		
OSC-9777	SR 3.3.8.3	13 (Steam Generator Pressure)		1,2,3MS PT0277,0278,0279,0280	Rosemount	pressure transmitter	1154GP9RB
OSC-9777	SR 3.3.8.3	13 (Steam Generator Pressure)		1,2,3MS P0354,0355,0357	Dixson	indicator	SA101AXTX4
OSC-9777	SR 3.3.8.3	13 (Steam Generator Pressure)		2,3MS P0356	Dixson	indicator	SA101AXTX4
OSC-9777	SR 3.3.8.3	13 (Steam Generator Pressure)		1MS P0356	Dixson	indicator	SA-101P
OSC-9777	SR 3.3.8.3	13 (Steam Generator Pressure)		1,2,3MS SI0011&21	Framatome	Analog Voltage Isolation Module	5008181
OSC-9777	SR 3.3.8.3	13 (Steam Generator Pressure)		ICCM System	Westinghouse		
OSC-9777	SR 3.3.8.3	13 (Steam Generator Pressure)	3	OAC	SAIC		
OSC-9781	SR 3.3.8.3	12 (Steam Generator ER Level)		1,2,3FDWLT0080, 1,2,3FDWLT0081,	Rosemount	level transmitter	1154DP5RB
OSC-9781	SR 3.3.8.3	12 (Steam Generator ER Level)		1,2,3FDWLT0082, 1,2,3FDWLT0083	Rosemount	level transmitter	1154DP5RB
OSC-9781	SR 3.3.8.3	12 (Steam Generator ER Level)		1,2,3 FDW PY010201, 1,2,3 FDW PY020201,	Westinghouse	Isolator/Power Supply	2837A12G02
OSC-9781	SR 3.3.8.3	12 (Steam Generator ER Level)		1,2,3FDW PY010202, 1,2,3FDW PY020202	Westinghouse	Isolator/Power Supply	2837A12G02
OSC-9781	SR 3.3.8.3	12 (Steam Generator ER Level)		1,2,3FDW P0270, 1,2,3FDW P0271,	Dixson	indicator	SA101P
OSC-9781	SR 3.3.8.3	12 (Steam Generator ER Level)		1,2,3FDW P0272, 1,2,3FDW P0273	Dixson	indicator	SA101P
OSC-9781	SR 3.3.8.3	12 (Steam Generator ER Level)	3	OAC	SAIC		
OSC-9720	SR 3.3.5.3	3 (ES RB Narrow Range Pressure)		1,2,3BS PT0004P,6P	ITT Barton	pressure transmitter	764
OSC-9720	SR 3.3.5.3	3 (ES RB Narrow Range Pressure)		2,3BS PT0005P	ITT Barton	pressure transmitter	764
OSC-9720	SR 3.3.5.3	3 (ES RB Narrow		1BS PT0005P	Rosemount	pressure transmitter	1154DP5RB

OSC-9719, Attachment 2
List of Instruments, Manufacturer, and Model by Technical Specification Surveillance Requirement

DRIFT STUDY	TECH SPEC APPLICATION	FUNCTION	NOTES	EQUIPMENT TAG NUMBER	EQUIPMENT MANUFACTURER	EQUIPMENT DESCRIPTION	EQUIPMENT APPROVED MODEL
		Range Pressure)					
OSC-9720	SR 3.3.5.3	3 (ES RB Narrow Range Pressure)		1, 2, 3ES AF010506/1, 2, 3ES AF020506/1, 2, 3ES AF030506	Bailey	buffer amplifier	6621670A
OSC-9720	SR 3.3.5.3	3 (ES RB Narrow Range Pressure)	3	OAC	SAIC		
OSC-9732	SR 3.3.8.3	18 (HPI Flow)		1,2,3HPI FT0007A,8A	Rosemount	flow transmitter	1154HH5RB
OSC-9732	SR 3.3.8.3	18 (HPI Flow)		1,2,3HPI P0363,0364	Dixson	indicator	SA101A
OSC-9732	SR 3.3.8.3	18 (HPI Flow)		ICCM System	Westinghouse		
OSC-9733	SR 3.3.8.3	HPI Crossover Flow		1, 2, 3HPI FT0159, 0160	Rosemount	differential pressure transmitter	1154HH5RB
OSC-9733	SR 3.3.8.3	HPI Crossover Flow		1, 3HPI SR0159, 0160	Rochester	square root extractor	SC1330
OSC-9733	SR 3.3.8.3	HPI Crossover Flow		2HPI SR0159, 0160	Rochester	square root extractor	XSC-1330-20012
OSC-9733	SR 3.3.8.3	HPI Crossover Flow		1, 2, 3HPI P319	Dixson	indicator	SH202AXTX4
OSC-9802	SR 3.10.1.13	SSF Pressurizer Level	4	1,2,3RC LT0072	Rosemount	differential pressure transmitter	1154HP5RB
OSC-9822	SR 3.10.1.13	SSF RC Pressure	4	1,2,3RC PT0225,0226	Rosemount	pressure transmitter	1154SH9RB
OSC-9803	SR 3.10.1.13	SSF Steam Generator Level	4	1,2,3FDW LT0066,0067	Rosemount	differential pressure transmitter	1154DP5RB
OSC-9804	SR 3.3.8.3	9 (High Range Area Radiation Monitor)		1,2,3RIA RT0057,0058	Sorrento	Radiation Monitor System	Model RD-23A Detector
OSC-9804	SR 3.3.8.3	9 (High Range Area Radiation Monitor)		1,2,3RIA RT0057,0058	Sorrento	Radiation Monitor System	Model RM-80 microprocessor unit
OSC-9804	SR 3.3.8.3	9 (High Range Area Radiation Monitor)		1,2,3RIA RT0057,0058	Sorrento	Radiation Monitor System	RM-23A control/display assembly
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		1,2FDW FT0153,0154	Rosemount	pressure transmitter	1152DP5A92PB
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		3FDW FT0153,0154	Rosemount	pressure transmitter	1152DP5E92PB
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		1FDW FT0129,0130	Rosemount	pressure transmitter	1152DP5A92PB
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		2FDW FT0129,0130	Rosemount	pressure transmitter	1152DP5E92PB
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		3FDW FT0140	Rosemount	pressure transmitter	1152DP5N92PB
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		3FDW FT0141	Rosemount	pressure transmitter	1152DP5E92PB
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		1,2,3FDW SR0153,0154	Rochester	square root extractor	XSC-1330-20012
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		1,2FDW SR0129,0130	Rochester	square root extractor	XSC-1330-20012
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		3FDW SR0140,0141	Rochester	square root extractor	XSC-1330-20012
OSC-9786	SR 3.3.8.3	21 (Emergency Feedwater Flow)		1,2,3FDW P0275,0276,0277,0278	Westinghouse	indicator	VX-252
OSC-9786	SR 3.3.8.3	21 (Emergency		3FDW P0276	Weschler	indicator	VX-252

OSC-9719, Attachment 2
List of Instruments, Manufacturer, and Model by Technical Specification Surveillance Requirement

DRIFT STUDY	TECH SPEC APPLICATION	FUNCTION	NOTES	EQUIPMENT TAG NUMBER	EQUIPMENT MANUFACTURER	EQUIPMENT DESCRIPTION	EQUIPMENT APPROVED MODEL
		Feedwater Flow)					
OSC-9792	SR 3.3.1.5	10 (RPS FDW Pump)		1,2,3RPS PS0400,0401,0402,0403,0404, 0405,0406,0407	Custom Control	pressure switch	646 GEM3
OSC-9792	SR 3.3.1.5	9 (RPS Main Turbine Trip)		1,2RPS PS0408	Custom Control	pressure switch	646 GEM5
OSC-9792	SR 3.3.1.5	9 (RPS Main Turbine Trip)		3RPS PS0408, 1RPS PS0409,0411	Static-O-Ring	pressure switch	9N6-W5-U4-C1A-JJTTNQX
OSC-9792	SR 3.3.1.5	9 (RPS Main Turbine Trip)		2,3RPS PS0409/1,2,3RPS PS0410/2,3RPS PS0411	Custom Control	pressure switch	646 GEAM5
OSC-9809	SR 3.3.5.3	4 (ES RB Pressure)		1,2,3BS PS0018,0019,0020,0021,0022, 0023	ASCO	pressure switch	SA21AR/TD20A32 R
OSC-9819	SR 3.3.1.5	6 (RPS RB Pressure)		1,2,3BS PS0065,0066,0067,0068	ASCO	pressure switch	SA31AR/TD30A32 R
OSC-9841	SR 3.3.8.3	19 (LPI Flow)		1,2,3LPI FT0004P,0005P	Rosemount	flow transmitter	1154DB5RB
OSC-9841	SR 3.3.8.3	19 (LPI Flow)		1,2,3LPI P0030,0037	Dixson	indicator	SB101
OSC-9823	SR 3.3.28.2	LPSW Pump Header Pressure		0LPS PS0097,0098, 3LPS PS0097,0098	ASCO	pressure switch	SB11AR/TF10A46 R
OSC-9824	SR 3.10.1.13	SSF RC Temperature	4	1,2,3RC TT0083,0084,0085,0086,0087,0 088	Rochester	temperature transmitters	SC-1372
OSC-9840	SR 3.10.1.13	SSF Dixson Indicators		1,2,3RC P0237, 1,2,3RC P0238, 1,2,3RC P0312,0313,0314	Dixson	indicator	SA101P
OSC-9840	SR 3.10.1.13	SSF Dixson Indicators		1,2,3RC P0315,0316,0317, 1,2,3RC P0233,	Dixson	indicator	SA101P
OSC-9840	SR 3.10.1.13	SSF Dixson Indicators		1,2,3FDW P0231,0232	Dixson	indicator	SA101P

NOTE 1: ICCM channel electronics not evaluated except as indicated
NOTE 2: RTD's cannot be calibrated
NOTE 3: Operator Aid Computer is NOT QA-1
NOTE 4: Loop Indicator (only)analyzed in OSC-9840