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ONS-2014-093

July 10, 2014

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, Maryland 20852

Subject: Duke Energy Carolinas, LLC
             Oconee Nuclear Station
             Docket Numbers 50-269, 50-270, and 50-287
             Technical Specification (TS) Bases Change

Please find attached a change to the Oconee Nuclear Station (ONS) TS Bases. This change
was processed in accordance with the provisions of Technical Specification 5.5.15, "Technical
Specifications (TS) Bases Control Program." TS Bases Change 2014-070 revises TS Bases
3.4.12, "Reactor Coolant System (RCS) - Low Temperature Overpressure Protection (LTOP)
System." The change revises Administrative Item No. 8 and ensures that certain HPI
components with a dual PSW power supply, are completely deenergized/tagged-out in order to
prevent a LTOP event.

Any questions regarding this information should be directed to Steve Newman at
(864) 873-4388.

Sincerely,

Scott L. Batson
Vice President
Oconee Nuclear Station

Attachment

A001
NRR

cc: Mr. Victor McCree, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Marquis One Tower
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(By electronic mail only)
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Mr. Eddy Crowe
Senior Resident Inspector
Oconee Nuclear Station

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Dave Corlett   - HNP
Richard Hightower - RNP
Julia Olivier - Fleet

<u>w/attachments</u>
Document Management
ELL
NSRB
MR Coordinator (Ron Harris)
Licensing Working Group

DUKE ENERGY.

July 10, 2014

Re: Oconee Nuclear Station
       Technical Specification Bases Change

Please replace the corresponding pages in your copy of the Oconee Technical Specifications
Bases Manual as follows:

REMOVE THESE PAGES

List of Effective Pages (LOEP) 1- 17

TS Bases Page B 3.4.12-1 thru 12

INSERT THESE PAGES

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If you have any questions concerning the contents of this Technical Specification Bases update,
contact Steve Newman at (864) 873-4388.

Chris Wasik
Regulatory Affairs Manager

Attachment

Oconee Nuclear Station

Revised Technical Specification Bases Pages

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B 3.7.10-2	Deleted 338/339/339	6/1/04
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B 3.9.4-1	BASES REVISION	05/16/12
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B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.12 Low Temperature Overpressure Protection (LTOP) System

BASES

BACKGROUND
The LTOP System limits RCS pressure at low temperatures so the integrity of the reactor coolant pressure boundary (RCPB) is not compromised by violating the pressure and temperature (P/T) requirements of 10 CFR 50, Appendix G (Ref. 1). The reactor vessel is the limiting RCPB component for providing such protection. LCO3.4.3, "RCS Pressure and Temperature (P/T) Limits," provides the allowable combinations for operational pressure and temperature during cooldown, shutdown, and heatup to keep from violating the Reference1 limits.

The reactor vessel material is less ductile at reduced temperatures than at normal operating temperature. Also, as vessel neutron irradiation accumulates, the material becomes less resistant to pressure stress at low temperatures (Ref. 2). RCS pressure must be maintained low when temperature is low and may be increased only as temperature is increased.

Operational maneuvering during cooldown, heatup, or related anticipated transients must be controlled to not violate LCO3.4.3. Exceeding these limits could lead to brittle fracture of the reactor vessel. LCO3.4.3 presents requirements for administrative control of RCS pressure and temperature to prevent exceeding the P/T limits.

This LCO provides RCS overpressure protection in the applicable MODES by ensuring an adequate pressure relief capacity and a limit on coolant addition capability. The pressure relief capacity requires the power operated relief valve (PORV) lift setpoint to be reduced and administrative controls implemented which assure≥ 10 minutes available for operator action to mitigate an LTOP event. The administrativecontrols include limits on pressurizer level, limits on RCS pressure when RCS temperature is < 325°F, limits on RCS makeup flow, the number of available pressurizer heater banks, requirements for alarms and restrictions upon use of the High Pressure Nitrogen System.

The LTOP approach to protecting the vessel by limiting coolant addition capability requires controls upon RCS makeup flow, the number of available pressurizer heater banks, and requires deactivating HPI, and isolating the core flood tanks (CFTs).

Should one or more HPI pumps inject on an HPI actuation (HPIES) or a CFT discharge to the RCS, the pressurizer level and PORV may not prevent overpressurizing the RCS.

BASES

BACKGROUND (continued)	The administrative controls upon pressurizer level provides a compressible vapor space or cushion (either steam or nitrogen) that can accommodate a coolant insurge and prevent a rapid pressure increase, allowing the operator time to stop the increase. The PORV, with reduced lift setting, is the overpressure protection device that acts as backup to the operator in terminating an increasing pressure event.

With HPI-ES deactivated, the ability to provide RCS coolant addition is restricted. To balance the possible need for coolant addition, the LCO does not require the makeup system to be deactivated. Due to the lower pressures associated with the LTOP MODES and the expected decay heat levels, the makeup system can provide flow with the HPI pumps providing RCS makeup through the makeup control valve.

PORV Requirements

As required for LTOP, the PORV is signaled to open if the RCS pressure approaches a limit set in the LTOP actuation circuit. The LTOP actuation circuit monitors RCS pressure and determines when an overpressure condition is approached. When the monitored pressure meets or exceeds the setting, the PORV is signaled to open. Maintaining the setpoint within the limits of the LCO ensures the Reference 1 limits will be met in any event analyzed for LTOP.

When a PORV is opened in an increasing pressure transient, the release of coolant causes the pressure increase to slow and reverse. As the PORV releases steam, the RCS pressure decreases until a reset pressure is reached and the valve is signaled to close. The pressure continues to decrease below the reset pressure as the valve closes.

Administrative Control Requirements

Administrative controls are necessary to assure the operator has at least ten minutes available to mitigate the most limiting LTOP event. These administrative controls include the following:

1) Limits on RCS pressure based on RCS temperature;

2) Limits upon pressurizer level;

3) Limits upon makeup flow capability;

4) OPERABLE Alarms;

5) Controls upon use of the High Pressure Nitrogen System; and

6) Restricting the number of available pressurizer heater banks.

BASES
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BACKGROUND   Administrative Control Requirements (continued)

Limiting RCS pressure based on RCS temperature provides a minimum
margin to the RCS P/T limit. Restricting RCS makeup flow capability and
pressurizer level and controls on the use of high pressure nitrogen limit
the pressurization rate during an LTOP event. Restricting the number of
available pressurizer heater banks limits the pressurization rate during an
LTOP event. Alarms ensure early operator recognition of the occurrence
of an LTOP event. The combination of minimum margin to the limit,
limited pressurization rate and OPERABLE alarms ensure ten minutes are
available for operator action to mitigate an LTOP event.

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APPLICABLE   Safety analyses (Ref. 3) demonstrate that the reactor vessel can be
SAFETY ANALYSES   adequately protected against overpressurization transients during
shutdown. In MODES 1, 2, and in MODE 3 with RCS temperature
exceeding 325°F, the pressurizer safety valves will prevent RCS pressure
from exceeding the Reference 1 limits. At nominally 325°F and below,
overpressure prevention falls to an OPERABLE PORV, a restricted
coolant level in the pressurizer and other administrative controls.

The actual temperature at which the pressure in the P/T limit curve falls
below the pressurizer safety valve setpoint increases as vessel material
toughness decreases due to neutron embrittlement. Each time the P/T
limit curves are revised, the LTOP System will be reevaluated to ensure
that its functional requirements can still be met with the PORV and
pressurizer level/administrative controls method.

Transients that are capable of overpressurizing the RCS have been
identified and evaluated. These transients relate to either mass input or
heat input: actuating the HPI System, discharging the CFTs, energizing
the pressurizer heaters, failing the makeup control valve open, losing
decay heat removal, starting a reactor coolant pump (RCP) with a large
temperature mismatch between the primary and secondary coolant
systems, and adding nitrogen to the pressurizer. LTOP limits and
restrictions take into account the presence of nitrogen and/or air in the
RCS during LTOP conditions.

HPI actuation and CFT discharge are the transients that may result in
exceeding P/T limits within < 10 minutes in which time no operator action
is assumed to take place. Starting an RCP and adding nitrogen to the
pressurizer are self limiting events. In the rest, operator action after that
time precludes overpressurization. The analyses demonstrate that the
time allowed for operator action is adequate, or the events are self limiting
and do not exceed P/T limits.

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BASES
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APPLICABLE	The following controls are required during the LTOP MODES to ensure
SAFETY ANALYSES	that transients do not occur, which either of the LTOP overpressure
(continued)	protection means cannot handle:

a.   Limiting RCS makeup flow capability;

b.   Deactivating HPI-ES;

c.   Immobilizing CFT discharge isolation valves in their closed
     positions; and

d.   Limiting the number of available pressurizer heater banks.

The Reference 3 analyses demonstrate the PORV can maintain RCS
pressure below limits when both makeup flow capability and the number
of available pressurizer heater banks is restricted. Consequently, the
administrative controls require makeup flow capability and the number of
available pressurizer heater banks to be limited in the LTOP MODES.

Since the PORV cannot protect the reactor vessel for engineered
safeguards actuation of one or more HPI pumps, or discharging the CFTs,
the LCO also requires the HPI-ES actuation circuits be deactivated and
the CFTs isolated. The isolated CFTs must have their discharge valves
closed and the valve power breakers fixed in their open positions.

Fracture mechanics analyses established the temperature of LTOP
Applicability at 325°F. Above this temperature, the pressurizer safety
valves provide the reactor vessel pressure protection. The vessel
materials were assumed to have a neutron irradiation accumulation equal
to 54 effective full power years (EFPYs) of operation for Units 1, 2, and 3.

This LCO will deactivate the HPI-ES actuation when the RCS temperature
is $\leq 325°F$.

Reference 3 contains the acceptance limits that satisfy the LTOP
requirements. Any change to the RCS must be evaluated against these
analyses to determine the impact of the change on the LTOP acceptance
limits.

PORV Performance

The fracture mechanics analyses show that the vessel is protected when
the PORV is set to open at ≤ 535 psig. The setpoint is derived by
modeling the performance of the LTOP system for different LTOP events.
The PORV setpoint at or below the derived limit ensures the Reference 1
limits will be met.

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BASES

APPLICABLE SAFETY ANALYSES (continued)	The PORV setpoint is re-evaluated for compliance when the revised P/T limits conflict with the LTOP analysis limits. The P/T limits are periodically modified as the reactor vessel material toughness decreases due to embrittlement induced by neutron irradiation. Revised P/T limits are determined using neutron fluence projections and the results of examinations of the reactor vessel material irradiation surveillance specimens. The Bases for LCO 3.4.3 discuss these examinations.

The PORV is considered an active component. Therefore, its failure represents the worst case LTOP single active failure.

Administrative Controls Performance

Limiting RCS pressure when RCS temperature is < 325°F provides a minimum margin to the RCS P/T limit. Restricting RCS makeup flow capability, the number of available pressurizer heater banks, pressurizer level, and controls on the use of high pressure nitrogen limit the pressurization rate during an LTOP event. Alarms ensure early operator recognition of the occurrence of an incipient LTOP event. The combination of minimum margin to the limit, limited pressurization rate and OPERABLE alarms ensure ten minutes are available for operator action to mitigate an LTOP event.

RCS Vent Requirements for Testing

With the RCS depressurized, analyses show:

a. For HPI System testing, a vent of ≥ 3.6 square inches is capable of mitigating the transient resulting from HPI-ES actuation testing in which three HPI pumps inject to the RCS through two injection flow paths.

b. For CFT Discharge Testing, a vent of ≥ 201 square inches is capable of mitigating the transient resulting for discharge of both CFTs to the RCS.

The capacity of vents of these minimum sizes is sufficient to limit the RCS pressure to ≤ 400 psig, which is less than the maximum allowable pressure at minimum RCS temperature.

The RCS vent size will also be re-evaluated for compliance each time P/T limit curves are revised based on the results of the vessel material surveillance.

These vents are passive and not subject to active failure.

The LTOP System satisfies Criterion 2 and Criterion 3 of 10 CFR 50.36 (Ref. 4).

BASES

LCO	The LCO requires an LTOP System OPERABLE with a limited coolant input capability and a pressure relief capability. The LCO requires HPI to be deactivated and the CFTs to be isolated. For pressure relief, it requires the pressurizer coolant at or below a maximum level and the PORV OPERABLE with a lift setting $\leq$ the LTOP limit.

The PORV is OPERABLE when its block valve is open, its lift setpoint is set at $\leq$ 535 psig and testing has proven its ability to open at that setpoint, and power is available to the PORV and its control circuit.

An RCS vent path capable of mitigating the most limiting LTOP event (except for HPI-ES actuation or CFT discharge) has a minimum equivalent diameter of 1-3/32 inches, which is equal to the inner throat diameter of the PORV.

Implementation of the following administrative controls assure that$\geq$ 10 minutes are available for operator action to mitigate an LTOP event:

1. RCS pressure:

   < 375 psig when RCS temperature $\leq$ 220°F

   < 525 psig when RCS temperature > 220°F and $\leq$ 325°F

2. Pressurizer level is maintained within the following limits:

   a. RCS pressure is > 100 psig:

      $\leq$ 220 inches when RCS temperature $\leq$ 325°F

   b. RCS pressure is $\leq$ 100 psig:

      $\leq$ 310 inches when RCS temperature $\leq$ 220°F.

      $\leq$ 380 inches while filling or draining the RCS when RCS temperature $\leq$ 160°F and no HPI pumps are running.

      When the RCS pressure is $\leq$ 100 psig, pressurizer level is normally maintained $\leq$ 220 inches except for certain RCS evolutions. The specified pressurizer level limits provide assurance that at least 10 minutes is available for operator action during those evolutions. The temperature limits are based on operational limits for the evolutions and are used in the analyses to determine allowable pressurizer levels.

3. Makeup flow is restricted with the HP-120 (makeup control valve) travel stop set to $\leq$ 98.0 gpm for all three units.

BASES
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LCO (continued)	4.	Three audible pressurizer level alarms at ≤ 225 inches, ≤ 260 inches, and ≤ 315 inches from the temperature compensated pressurizer level indication.

5. Two audible RCS pressure alarms at 375 psig and 525 psig.

6. High pressure nitrogen system is administratively controlled to prevent inadvertent pressurization of the RCS.

7. Core Flood Tank(s) are isolated as required by the LCO by closing the appropriate isolation valve(s) (either CF-1 and/or CF-2), tagging open the valve breaker(s), and tagging the valve(s) in the closed position.

8. The HPI safety injection flowpaths must be deactivated.

Note: The Protected Service Water (PSW) System actions given below are only applicable to units with PSW-HPI power transfer capability installed.

 a. Deactivating Train A of HPI is accomplished by either:

  1) Shutting and deactivating valve HP-26 by tagging open the valve breakers (including breaker from PSW power) and tagging the valve handwheel in the closed position, shutting valves HP-140, HP-409 and HP-410, and tagging each valve switch in the closed position, or

  2) Deactivating all HPI pumps aligned to HPI train A, tagging the HPI-ES actuation pump breakers open, and tagging HPI Pump Start from PSW Power switch.

 b. Deactivating Train B of HPI is accomplished by either:

  1) Shutting and deactivating valve HP-27 by tagging open the valve breaker and tagging the valve handwheel in the closed position, shutting valves HP- 140, HP-409 and HP-410, and tagging each valve switch in the closed position, or

  2) Deactivating all HPI pumps aligned to HPI train B, tagging the HPI-ES actuation pump breakers open, and tagging the HPI Pump Start from PSW Power switch.

9. Pressurizer heater bank 3 or 4 must be deactivated.

Operational parameters identified in TS 3.4.12 and this TS Bases include allowances for instrument uncertainty.

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BASES (continued)

APPLICABILITY	This LCO is applicable in MODE 3 when any RCS cold leg temperature is ≤ 325°F, and in MODES 4, 5 and 6 when an RCS vent capable of mitigating the most limiting LTOP event is not open. The Applicability temperature of 325°F is established by fracture mechanics analyses. The pressurizer safety valves provide overpressure protection to meet LCO 3.4.3 P/T limits above 325°F. With the vessel head off, overpressurization is not possible. With an RCS vent capable of mitigating the most limiting LTOP event open, an LTOP event (including HPI-ES actuation or CFT discharge) is incapable of pressurizing the RCS above the RCS P/T limits.

A RCS vent ≥ 3.6 square inches is capable of mitigating a HPI-ES actuation of three pumps through two flow paths to the RCS. A RCS vent ≥ 201 square inches is capable of mitigating a discharge of both CFTs.

LCO 3.4.3 provides the operational P/T limits for all MODES LCO 3.4.10, "Pressurizer Safety Valves," requires the pressurizer safety valves OPERABLE to provide overpressure protection during MODES 1, 2, and 3 above 325°F.

The Applicability is modified by two Notes. Note 1 states that CFT isolation is only required when the CFT pressure is more than or equal to the maximum RCS pressure for the existing RCS temperature, as allowed in LCO 3.4.3. This Note permits the CFT discharge valve surveillance performed only under these pressure and temperature conditions.

Note 2 permits the PORV to be inoperable when no HPI pumps are running and RCS pressure is < 100 psig. PORV operability is not required when RCS pressure is < 100 psig and HPI pumps are not operating since credible LTOP events progress relatively slowly, thus giving the operator ample time to respond.

ACTIONS	A.1

With the HPI activated, immediate actions are required to deactivate HPI. Emphasis is on immediate deactivation because inadvertent injection with one or more HPI pump OPERABLE is the event of greatest significance, since these events cause the greatest pressure increase in the shortest time.

The immediate Completion Times reflect the urgency of quickly proceeding with the Required Actions.

B.1, C.1, and C.2

An unisolated CFT requires isolation within 1 hour only when the CFT pressure is at or more than the maximum RCS pressure for the existing temperature allowed in LCO 3.4.3.

BASES

| ACTIONS | B.1, C.1, and C.2 (continued) |

If isolation is needed and cannot be accomplished in 1 hour, Required Action C.1 and Required Action C.2 provide two options, either of which must be performed in 12 hours. By placing the unit in MODE 4 with the RCS temperature > 200°F, the CFT pressure of 650 psig cannot exceed the LTOP limits if both tanks are fully injected. Depressurizing the CFTs below the LTOP limit of 373 psig also prevents exceeding the LTOP limits in the same event.

The Completion Times are based on operating experience that these activities can be accomplished in these time periods and on engineering judgement indicating that a limiting LTOP event is not likely in the allowed times.

D.1, E.1, and E.2

With the PORV inoperable, overpressure relieving capability is lost, and restoration of the PORV within 1 hour is required.

If restoration cannot be completed within 1 hour, either Required Action E.1 or Required Action E.2 must be performed. Required Action E.1 requires increasing RCS temperature within 23 hours to exit the Applicability of the specification. With RCS temperature > 325°F, the CFTs are not required to be isolated. Required Action E.2 requires the RCS be depressurized to less than 100 psig within 35 hours. With reactor pressure < 100 psig more time is available for operator action to mitigate an LTOP event.

These Completion Times also consider these activities can be accomplished in these time periods. A limiting LTOP event is not likely in these times.

F.1 and G.1

With Administrative Controls that assure ≥ 10 minutes are available to mitigate the consequences of an event not implemented, the capability for operator action to mitigate an LTOP event may be lost. In this circumstance, compensatory measures must be established to monitor for initiation of an LTOP event. Establishing a dedicated operator within 4 hours to monitor for initiation of an LTOP event is sufficient to compensate for inoperability of makeup flow restrictions, having too many pressurizer heater banks available, inoperability of required alarms, or deviation from pressure, temperature or level limits. Establishing a dedicated operator is not sufficient to compensate for not deactivating HPI or isolating CFTs. If the Required Action and associated Completion Time of Condition F is not met, the RCS must be depressurized and an RCS vent path capable of

BASES

ACTIONS   F.1 and G.1 (continued)

mitigating the most limiting LTOP event must be established within 12 hours. These Completion Times also consider that these activities can be accomplished in these time periods. A limiting LTOP event is not likely in these periods.

H.1 and H.2

With administrative controls which assure ≥ 10 minutes are available to mitigate the consequences of an LTOP event not implemented and the PORV inoperable; or the LTOP System inoperable for any reason other than cited in Condition A through G, the system must be restored to OPERABLE status within one hour. When this is not possible, Required Action H.2 requires the RCS depressurized and vented within 12 hours.

One or more vents may be used. A vent path capable of mitigating the most limiting LTOP event is specified. Because makeup may be required, the vent size accommodates inadvertent full makeup system operation. Such a vent keeps the pressure from full flow of the makeup pump(s) with a wide open makeup control valve within the LCO limit.

The Completion Time is based on operating experience that these activity can be accomplished in this time period and on engineering judgement indicating that a limiting LTOP transient is not likely in this time.

SURVEILLANCE   SR 3.4.12.1 and SR 3.4.12.2
REQUIREMENTS
Verifications must be performed that HPI is deactivated, and the CFTs are isolated. These Surveillances ensure the minimum coolant input capability will not create an RCS overpressure condition to challenge the LTOP System. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.12.3

Verification that the pressurizer level is less than the volume necessary to assure ≥ 10 minutes are available for operator action to mitigate an LTOP event by observing control room or other indications ensures a cushion of sufficient size is available to reduce the rate of pressure increase from potential transients.

BASES

SURVEILLANCE REQUIREMENTS	<u>SR 3.4.12.3</u> (continued)

The 30 minute Surveillance Frequency during heatup and cooldown must be performed for the LCO Applicability period when temperature changes can cause pressurizer level variations. This Frequency may be discontinued when the ends of these conditions are satisfied, as defined in plant procedures.

The subsequent Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

<u>SR 3.4.12.4</u>

Verification that the PORV block valve is open ensures a flow path to the PORV.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

<u>SR 3.4.12.5</u>

A CHANNEL FUNCTIONAL TEST is required periodically. PORV actuation is not needed, as it could depressurize the RCS.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

<u>SR 3.4.12.6</u>

Verification that administrative controls, other than limits for pressurizer level, that assure ≥ 10 minutes are available for operator action to mitigate the consequences of an LTOP event are implemented is necessary periodically. This verification consists of a combination of administrative checks for alarm availability, verification that pressurizer heater bank 3 or 4 is deactivated, appropriate restrictions on pressurizer level, controls for High Pressure Nitrogen, etc., as well as visual confirmation using available indications that associated physical parameters are within limits.

BASES

SURVEILLANCE REQUIREMENTS	SR 3.4.12.6 (continued)

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.12.7

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.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix G.

2. Generic Letter 88-11.

3. UFSAR, 5.2.3.7.

4. 10 CFR 50.36.