April 2, 1991

TO: ALL HOLDERS OF OPERATING LICENSES OR CONSTRUCTION PERMITS FOR NUCLEAR POWER REACTORS

SUBJECT: CHANGES IN TECHNICAL SPECIFICATION SURVEILLANCE INTERVALS TO ACCOMMODATE A 24-MONTH FUEL CYCLE (Generic Letter 91-04)

Improved reactor fuels allow licensees to consider an increase in the duration of the fuel cycle for their facilities. The staff has reviewed requests for individual plants to modify surveillance intervals to be compatible with a 24-month fuel cycle. Enclosure 1 provides generic guidance for preparing such license amendment requests.

Technical specifications (TS) that specify an 18-month surveillance interval could be changed to state that these surveillances are to be performed once per refueling interval. The notation for surveillance intervals would then be changed to include the definition of a "Refueling Interval" with the existing "R" notation for surveillances that are generally performed during a refueling outage. The frequency for the interval indicated by this notation would also be changed from 18 months to "At least once every 24 months." The provision to extend surveillances by 25 percent of the specified interval would extend the time limit for completing these surveillances from the existing limit of 22.5 months to a maximum of 30 months.

The interval for conducting steam generator (SG) inservice inspections (ISIs) is worthy of special consideration in extending the surveillance intervals to be compatible with a 24-month fuel cycle. The frequency of SG tube ruptures and their possible effect on safety has prompted the staff to provide an alternative with which to extend the existing 24-month interval requirements for ISIs. This alternative provides conservative methods for verifying SG integrity, including increasing the number of tubes in the sample for an inspection based upon the TS category of the results from the previous inspection. In some cases, the results of previous inspections may warrant analyzing SG tube integrity and reducing the TS limit on leakage between the primary and secondary coolant systems. Finally, an extension of the inspection interval would not be appropriate if the results of the previous inspection of SG tube integrity were in the lowest (C-3) category.

Licensees must 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. Enclosure 2 describes information required to address the effect that instrument drift caused by an increased calibration interval can have on safety.

For other 18-month surveillances, licensees should evaluate the effect on safety of the change in surveillance intervals to accommodate a 24-month fuel

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cycle. This evaluation should support a conclusion that the effect on safety is small. In addition, licensees should confirm that historical maintenance and surveillance data do not invalidate this conclusion. 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, the licensees need not quantify the effect of the change in surveillance intervals on the availability of individual systems or components.

The TS changes do not alter the required 24-month testing interval for performing Type B and C tests under the current testing requirements of Appendix J to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50). The U.S. Nuclear Regulatory Commission (NRC) is considering changes to Appendix J that would accommodate a 24-month fuel cycle. However, it is anticipated that licensees will desire an extension of the current 24-month testing interval of Appendix J to accommodate a 24-month fuel cycle instead of a unit shutdown to perform these tests. An increase in the testing interval for Type B and C tests will require a request for an exemption from the Appendix J requirements. Licensees desiring an exemption from the 24-month testing interval should provide supporting leak testing data to demonstrate that the requested test interval would not provide unacceptable results. Enclosure 3 provides guidance on the information needed to support a request for an exemption to the Type B and C test interval requirements in Appendix J.

The enclosed guidance is provided to support proposed TS changes and a request for an exemption to Appendix J requirements for licensees that plan to adopt a 24-month fuel cycle. Proposed amendments that deviate from this guidance will lengthen the time required to complete the review. Please contact the NRC project manager or the contact indicated below if you have questions on this matter.

Any response to the NRC suggestion for TS changes is voluntary. Therefore, any action taken in response to the guidance provided in this generic letter is not a backfit under 10 CFR 50.109. Likewise, an Office of Management and Budget clearance is not required.

Sincerely,

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Enclosures:
As stated

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Generic Letter 91-04 Enclosure 1

GUIDANCE ON PREPARATION OF A LICENSE AMENDMENT REQUEST FOR CHANGES IN SURVEILLANCE INTERVALS TO ACCOMMODATE A 24-MONTH FUEL CYCLE

DISCUSSION

Licensees are planning to use improved reactor fuels because of the significant economic benefits associated with a longer fuel cycle. A longer fuel cycle increases the time interval between refueling outages and the

performance of the associated technical specification (TS) surveillance requirements. This guidance addresses TS changes to accommodate a 24-month fuel cycle for those surveillances that are performed at each 18-month or other refueling outage interval.

The NRC staff has reviewed a number of requests to extend 18-month surveillances to the end of a fuel cycle and a few requests for changes in surveillance intervals to accommodate a 24-month fuel cycle. The staff has found that the effect on safety is small because safety systems use redundant electrical and mechanical components and because licensees perform other surveillances during plant operation that confirm that these systems and components can perform their safety functions. Nevertheless, licensees should evaluate the effect on safety of an increase in 18-month surveillance intervals to accommodate a 24-month fuel cycle. This evaluation should support a conclusion that the effect on safety is small. Licensees should confirm that historical plant maintenance and surveillance data support this conclusion. Also, licensees should confirm that assumptions in the plant licensing basis would not be invalidated on the basis of performing any surveillance at the bounding surveillance interval limit provided to accommodate a 24-month fuel cycle. In consideration of these confirmations, the licensees need not quantify the effect of the change in surveillance intervals on the availability of individual systems or components.

TECHNICAL SPECIFICATION CHANGES

Licensees should propose TS changes to accommodate a 24-month fuel cycle by modifying 18-month surveillances to indicate that they are to be performed ". . . at least once each REFUELING INTERVAL." In addition, the proposed changes should modify the surveillance interval notation in Table 1.1 in the Definitions Section of the TS to include the term "REFUELING INTERVAL" along with the "R" notation to define the frequency for surveillances that are specified to be performed once each refueling interval. (Capitalization of the term "refueling interval" is used in the TS to designate a defined term.) The proposed TS change should modify the frequency for this surveillance interval notation from "At least once per 18 months" to "At least once per 24 months" to define the nominal frequency for surveillances that are specified to be performed each refueling interval or with the "R" notation. The bounding time interval for these surveillances would then be 30 months under the provision of TS 4.0.2 that allows a surveillance to be extended by 25 percent of the specified interval.

Licensees may omit the TS qualification that an 18-month surveillance is to be performed "during shutdown" when specifying the surveillance interval as ". . . at least once per REFUELING INTERVAL." Because the terms "Hot" and "Cold Shutdown" are defined in the TS as operating modes or conditions, the added restriction to perform certain surveillances during shutdown may be mis-interpreted. This restriction ensures that a surveillance would only be

performed when it is consistent with safe plant operation. However, this consideration is valid for other surveillances that are performed during power operation, plant startup, or shutdown, but is not addressed by restricting the conduct of these surveillances.

The staff concludes that the TS need not restrict surveillances as only being performed during shutdown. Nevertheless, safety dictates that when refueling interval surveillances are performed during power operation, licensees give proper regard for their effect on the safe operation of the plant. If the performance of a refueling interval surveillance during plant operation would adversely affect safety, the licensee should postpone the surveillance until the unit is shut down for refueling or is in a condition

or mode that is consistent with the safe conduct of that surveillance.

The NRC provided an updated basis for TS 4.0.2 in Generic Letters (GLs) 87-09, "Sections 3.0 and 4.0 of Standard Technical Specifications on the Applicability of Limiting Conditions for Operation and Surveillance Requirements," and 89-14, "Line-Item Improvements in Technical Specifications - Removal of the 3.25 Limit on Extending Surveillance Intervals." However, the TS changes to accommodate a longer fuel cycle will also alter the basis for TS 4.0.2. Therefore, licensees should update the Bases Section of TS 4.0.2 to be consistent with these TS changes and particularly with respect to the safe conduct of refueling interval surveillances. The changes to the associated paragraph of the previous guid-ance on the Bases Section of TS 4.0.2 are underlined, as follows:

> It also provides flexibility to accommodate the length of a fuel cycle for surveillances that are specified to be performed at least once each REFUELING INTERVAL. It is not intended that this provision be used repeatedly as a convenience to extend surveillance intervals beyond that specified for surveillances that are not performed once each REFUELING INTERVAL. Likewise, it is not the intent that REFUELING INTERVAL surveillances be performed during power operation unless it is consistent with safe plant operation. The limitation of Specification 4.0.2 is . . .

Licensees should incorporate these changes to the Bases Section of TS 4.0.2 where they have been modified as identified in GLs 87-09 and 89-14. Otherwise, the Bases Section should be updated to reflect the intent of this guidance. The proposed amendment request should include a copy of the updated Bases Section for TS 4.0.2.

The surveillance interval for performing the second inservice inspection of steam generators is currently specified with a bounding time limit of 24 calendar months after the previous inspection. The interval for subsequent inspections may be extended to a maximum of 40 months if the results from two consecutive inspections, excluding the preservice inspection, are within the C-1 Category or if two consecutive inspections demonstrate that previously observed degradation has not continued and no additional degradation has occurred. However, for plants having inspection results in the C-2 Category from inspections of steam generators (SGs) during either of the two previous inspections, the bounding interval for the next inspection would be 24 months from the last inspection.

A 24-month inspection interval may not coincide with the next refueling outage when operating on a 24-month fuel cycle, particularly if any outage time is accumulated over the duration of the fuel cycle or if startup for the next fuel cycle is delayed following the completion of a SG inspection. Therefore, the staff developed an alternative to compensate for any delay that could cause the interval for SG inspections to occur near the end of a 24-month fuel cycle but before the refueling outage. The alternative includes the following: (1) an increase in the sample size of tubes examined during the previous inspection, (2) a suitable analysis of the integrity of SG tubes if the results of either of the two previous inspections were in the C-2 Category, and (3) a more restrictive limit for leakage between the primary and secondary coolant systems for operation beyond 24 months after the previous inspection. These considerations provide an acceptable basis with which to permit the next inspection interval to be compatible with the 30-month bounding limit for refueling interval surveillances if the results of either of the two previous inspections were not in the C-3 Category.

The current TS requirements permit inspections to be conducted at 40-month intervals if the results of two previous inspections are in the C-1 Category. However, this may not provide a practical alternative for facilities that would operate on a 24-month fuel cycle. The inspection results would be in the C-2 Category if only one defective tube were found during either of the two previous inspections, and this would preclude the use of the provision for extending the inspection interval to 40 months.

The alternatives for the TS section on SG inspection frequencies are shown underlined based on the current STS requirements.

4.4.5.3 Inspection Frequencies - The above required inservice inspections of steam generator tubes shall be performed at the following frequencies:

a. The first inservice inspection shall be performed after 6 Effective Full Power Months but within 24 calendar months of initial criticality. Subsequent inservice inspections shall be performed at intervals of not less than 12 nor more than 24 calendar months after the previous inspection. If 20 percent of the tubes were inspected and the results were in the C-1 Category or if 40 percent of the tubes were inspected and were in the C-2 Category during the previous inspection, the next inspection may be extended up to a maximum of 30 months in order to correspond with the next refueling outage if the results of the two previous inspections were not in the C-3 Category. However, if the results of either of the previous two inspections were in C-2 Category, an engineering assessment shall be performed before operation beyond 24 months and shall provide assurance that all tubes will retain adequate structural margins against burst throughout normal operating, transient, and accident conditions until the end of the fuel cycle or 30 months, which ever occurs first. If two consecutive inspections, not including the preservice inspection, result in all inspection results falling within the C-1 Category or if two consecutive inspections demonstrate that previously observed degradation has not continued or no additional degradation has occurred, the inspection interval may be extended to a maximum of once per 40 months;

b. If the results of the inservice inspection of a steam generator conducted in accordance with Table 4.4.2 at 40-month intervals fall into Category C-3, the inspection frequency shall be increased to at least once per 20 months. The increase in inspection frequency shall apply until the subsequent inspections satisfy the criteria of Specification 4.4.5.3a.; the interval may then be extended to a maximum of once per 30 or 40 months, as applicable;

c. (no change to unscheduled inservice inspection requirements.); and

d. The provisions of Specification 4.0.2 do not apply for extending the frequency for performing inservice inspections as specified in Specifications 4.4.5.3a. and b.

The staff added TS 4.4.5.3d. to clarify its position that the provision of TS 4.0.2 does not apply to extend SG inspection intervals because TS 4.4.5.3a. addresses those conditions under which the 24-month surveillance interval for SG tube inspections may be extended and TS 4.4.5.3b. addresses

conditions under which the surveillance interval for inspections shall be reduced to at least once every 20 months.

Licensees should update the Bases Section of TS 3/4.5.4 to clarify the intent of the engineering assessment of SG tube integrity addressed in the above addition to TS 4.4.5.3a. by adding the following:

> An engineering assessment of steam generator tube integrity will confirm that no undue risk is associated with plant operation beyond 24 months of the previous steam generator tube inspection. To provide this confirmation, the assessment would demonstrate that all tubes will retain adequate structural margins against burst during all normal operating, transient, and accident conditions until the end of the fuel cycle. This evaluation would include the following elements:
>
> 1. An assessment of the flaws found during the previous inspection.
>
> 2. An assessment of the maximum flaw size that can be expected before the end of the current fuel cycle or 30 months, which ever comes first, and the corresponding structural margins relative to the criteria of Regulatory Guide 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes."
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> 3. An update of the assessment model, as appropriate, based on comparison of the predicted results of the steam generator tube integrity assessment with actual inspection results from previous inspections.

Along with the above alternative for inspection intervals, the following addition to the TS section on reactor coolant system operational leakage is required and shown underlined for the current STS requirements.

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3.4.6.2 Reactor Coolant System leakage shall be limited to:

> a. & b. (No change.)
>
> c. 1 GPM total reactor-to-secondary leakage through all steam generators not isolated from the Reactor Coolant System and [500] gallons per day through any one steam generator not isolated from the Reactor Coolant System. For plant operation beyond 24 months from the previous steam generator tube inspection when the results of either of the two previous inspections are in the C-2 Category as defined by Specification 4.4.5.2, the leakage through any one steam generator not isolated from the Reactor Coolant System shall not exceed 100 gallons per day,
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> d. & e. (No change.)

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GUIDANCE FOR ADDRESSING THE EFFECT OF INCREASED SURVEILLANCE INTERVALS ON INSTRUMENT DRIFT AND SAFETY ANALYSIS ASSUMPTIONS

Discussion

The U.S. Nuclear Regulatory Commission (NRC) staff determined that licensees should address the issue of instrumentation errors caused by drift in order to justify an increase in surveillance intervals to accommodate a 24-month fuel cycle. Licensees must evaluate the effects of an increased calibration interval on instrument errors in order to confirm that drift will not result in instrument errors that exceed the assumptions of the safety analysis. Instrument drift affects the capability of a system to perform its safety function and is a consideration for determining safety system setpoints. The amount of instrument drift that occurs over a long interval between calibrations may not be readily available from the instrument vendor. However, operating experience and available vendor data can provide insights on the increase in instrument errors that could occur with an increased calibration interval. 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.

Justification for Increased Calibration Intervals

Licensees should address a number of issues to provide an acceptable basis for increasing the calibration interval for instruments that are used to perform safety functions. The NRC staff has identified a specific action that licensees should address for each of these issues in order to justify a proposed increase in the calibration interval. A summary of the applicable issue is provided after each of the following actions.

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.

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.

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.

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.

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.

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.

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.

Generic Letter 91-04 Enclosure 3

GUIDANCE ON INFORMATION NEEDED TO SUPPORT AN EXEMPTION TO APPENDIX J OF 10 CFR PART 50 TO ACCOMMODATE A 24-MONTH FUEL CYCLE

BACKGROUND

The NRC staff is developing changes to Appendix J to 10 CFR Part 50 to resolve a number of problems that have been encountered with this regulation. These changes include revising the surveillance interval for performing Type B and C leak testing in order to accommodate a longer fuel cycle. However, until such changes are incorporated in the regulation, the current 24-month surveillance interval for Type B and C tests would likely require a plant shutdown to perform Appendix J leak testing before the completion of a 24-month fuel cycle. To temporarily solve this limitation, the NRC staff has prepared guidance on information needed to support an exemption to the requirements of Appendix J until the regulation is revised to accommodate a 24-month fuel cycle.

DISCUSSION

The NRC staff guidance on revising surveillance intervals specified in TS provides a bounding time limit of 30 months to accommodate a 24-month fuel cycle. The exemption to Appendix J will require that a 25-percent increase in the 24-month surveillance interval for Type B and C leak tests be granted in order to be compatible with the change in the TS surveillance intervals that accommodate a 24-month fuel cycle. The NRC staff concludes that licensees should address two issues to justify an exemption to Appendix J in order for the NRC to grant a request to extend the surveillance interval of Type B and C tests up to 30 months.

The first issue is a possible reduction in the combined leakage limit for Type B and C tests based upon an increase in the margin to the TS allowable leakage limit which is proportional to the proposed increase in the surveillance interval. The acceptance criterion for Type B and C leak tests is a combined leakage rate for all penetrations and valves that are subject to Type B and C tests that shall be less than 0.6 of La, where La is the maximum allowable leakage rate that is specified in the TS. This constitutes a margin of 40 percent of La. Licensees should use leak test data to demonstrate that this margin will be preserved with the proposed increase in the test interval, or should consider proposing an acceptance criterion limit of less than 0.6 of La for Type B and C tests as a TS change.

The second issue is that there should be a reasonable basis for licensees to conclude that containment leakage will be maintained within acceptable limits based upon the extrapolation of the results of past Type B and C leak tests to account for an increase in the surveillance interval up to 30 months. The exemption request should include a summary of the methodology used and results obtained that support this conclusion.

In summary, licensees can provide a justification for an exemption to Appendix J by addressing each of the issues noted herein.