Industry/TSTF Standard Technical Specification Change Traveler

Revision to RCP Flywheel Inspection Program (WCAP-15666)

Classification: 1) Technical Change

Priority: 2)Medium

NUREGs Affected: ☐ 1430 ☑ 1431 ☐ 1432 ☐ 1433 ☐ 1434

1.0 DESCRIPTION

Westinghouse Owners Group (WOG) Letter OG-01-051, dated August 24, 2001, transmitted WCAP-15666, Rev. 0 (Non-Proprietary Class 3), "Extension of Reactor Coolant Pump Motor Flywheel Examination" to the NRC for review and approval. WCAP-15666 provides the technical basis to extend the reactor coolant pump (RCP) motor flywheel examination frequency for all domestic WOG plants from the currently approved 10 year inspection interval to an interval not to exceed 20 years.

2.0 PROPOSED CHANGE

ISTS Specification 5.5.7 is revised to change the frequency of the inspection of each RCP flywheel to be conducted at a maximum of 20 year intervals. Reviewer's Notes are revised or deleted consistent with the discussion in WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination."

3.0 BACKGROUND

An integral part of the reactor coolant system (RCS) in pressurized water reactor (PWR) plants is the RCP, a vertical, single stage, single-suction, centrifugal, shaft seal pump. The RCP ensures an adequate cooling flow rate by circulating large volumes of primary coolant water at high temperature and pressure through the RCS. Following an assumed loss of power to the RCP motor, the flywheel, in conjunction with the impeller and motor assembly, provide sufficient rotational inertia to assure adequate primary coolant flow during RCP coastdown, thus resulting in adequate core cooling.

During normal power operation, the RCP motor flywheel possesses sufficient kinetic energy to produce high-energy missiles in the event of flywheel failure. Conditions which may result in overspeed of the RCP, such as a postulated loss of coolant accident (LOCA), increase both the potential for failure and the kinetic energy of the flywheel. This concern led to the Nuclear Regulatory Commission (NRC) issuing Regulatory Guide (RG) 1.14, which described a range of actions to ensure flywheel integrity, including inservice inspections (ISI) at 40-month intervals.

A previous WOG program established the technical basis that allowed for relaxation of RCP motor flywheel examinations for all domestic WOG plants and several Babcock and Wilcox plants. This was summarized in Westinghouse report WCAP-14535, which concluded that flywheels are well-designed, manufactured from excellent materials, have an excellent inspection history, and are structurally sound based on deterministic stress and fracture analyses. An assessment concluded that flywheel inspections beyond 10 years of plant life would have no significant benefit on reducing the likelihood of flywheel failure.

WCAP-14535 was submitted for NRC review in January 1996. The NRC issued a Safety Evaluation Report (SER) in September 1996, wherein they accepted the technical arguments, but did not allow for total elimination of the examinations. The SER did provide for partial relief from the examination requirements of NRC Regulatory Guide 1.14, by allowing for an extension of the examination frequency from 40 months to 10 years, and a reduction in the required examination volume. The NRC stated in the SER that they had not reviewed the risk assessment in WCAP-14535, but had relied solely on the deterministic methodology to review the submittal. The final NRC-approved version of the report, which includes the SER is WCAP-14535A, which was issued in November 1996.

4.0 TECHNICAL ANALYSIS

The currently approved 10-year inspection interval does not coincide with actual RCP refurbishment schedules at many WOG plants. Refurbishment currently occurs at 10 to 15 year intervals at all domestic WOG plants, but could be extended to 20 years, at most. The current WOG program summarized in WCAP-15666, provides the technical basis for the extension of the RCP motor flywheel examination frequency for all domestic WOG plants from the currently approved 10-years to a maximum of 20 years. The current WOG program builds on the WCAP-14535A justification, which assumed that a Leak-Before-Break (LBB) limits the RCP overspeed to 1500 rpm. It also provides additional rationale, including a risk assessment of all credible flywheel speeds, following the guidance of Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis," to justify the interval extension to 20 years. The change in risk for extending the ISI interval is 3 to 4 orders of magnitude below the Regulatory Guide 1.174 core damage frequency (CDF) and large early release frequency (LERF) acceptance guidelines. The extension of the inservice inspection frequency for the RCP motor flywheel from 10 years to 20 years satisfies the Regulatory Guide 1.174 risk criteria as an acceptable change.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

The TSTF has evaluated whether or not a significant hazards consideration is involved with the proposed generic change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

   Response: No.

   The proposed change to the RCP flywheel examination frequency does not change the response of the plant to any accidents. The RCP will remain highly reliable and the proposed changes will not result in a significant increase in the risk of plant operation. Given the extremely low failure probabilities for the RCP motor flywheel during normal/accident conditions and the extremely low probability of LOCA/LOOP, and even assuming a conditional core damage probability (CCDP) of 1.0 (complete failure of safety systems), the CDF and change in risk would still not exceed the NRC's acceptance guidelines contained in RG-1.174 (<1.0E-6 per year). Even considering the uncertainties involved in this evaluation, the risk associated with the postulated failure of an RCP motor flywheel is significantly low. Even if all four RCP motor flywheels are considered in the bounding plant configuration case, the risk is still acceptably low. Since the evaluation results for CDF and the conservative assumption that failure of the RCP motor flywheel is assumed to result directly in core damage and also a large early release (CDF=LERF), calculations were not performed for the large early release frequency (LERF). The CDF and LERF results are below the NRC's LERF acceptance guidelines.

   The proposed changes do not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, or configuration of the facility, or the manner in which the plant is operated and maintained. The proposed changes do not alter or prevent the ability of structures, systems, and components (SSCs) from performing their intended function to mitigate the consequences of an initiating event within the assumed acceptance limits. The proposed changes do not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated. Further, the proposed changes do not increase the types or amounts of radioactive effluent that may be released offsite, nor significantly increase individual or cumulative occupational/public radiation exposures. The proposed changes are consistent with the safety analysis assumptions and resultant consequences. Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No.

   The proposed change in flywheel inspection frequency does not involve any change in the design or operation of the RCP. The change to examination frequency does not change any existing accident scenarios, nor create any new or different accident scenarios.

   The changes do not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. In addition, the changes do not impose any new or different requirements or eliminate any existing requirements. The changes do not alter any assumptions made in the safety analysis. The proposed changes are consistent with the safety analysis assumptions and current plant operating practice.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

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

Response: No.

The proposed change does not alter the manner in which safety limits, limiting safety system settings or limiting conditions for operation are determined. The safety analysis acceptance criteria are not impacted by this change. The proposed changes will not result in plant operation in a configuration outside of the design basis. The calculated impact on risk is insignificant and meets the acceptance criteria contained in Regulatory Guide 1.174. There are no significant mechanisms for inservice degradation of the RCP flywheel

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, the TSTF concludes that the proposed change 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

General Design Criteria 4, "Environmental and Missile Design Bases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, requires that nuclear power plant structures, systems, and components important to safety be protected against the effects of missiles that might result from equipment failures.

Regulatory Guide 1.14, Revision 1, "Reactor Coolant Pump Flywheel Integrity," describes a method acceptable to the NRC staff of implementing this requirement with regard to minimizing the potential for failures of the flywheels of RCP motors in light water-cooled power reactors.

As justified in WCAP-15666, the extension of the inservice inspection frequency for the RCP motor flywheel from 10 years to 20 years satisfies Regulatory Guide 1.174 risk criteria as an acceptable change. Based on the considerations discussed above and in WCAP-15666, (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 approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

A. WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination," Revision 0.

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Revision History

OG Revision 0 **Revision Status: Active** **Next Action: WOG**

Revision Proposed by: WOG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 18-Jul-01

Owners Group Comments:
(No Comments)

Owners Group Resolution: Approved Date: 18-Jul-01

TSTF Review Information

TSTF Received Date: 07-Nov-01 Date Distributed for Review: 07-Nov-01

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 21-Nov-01

NRC Review Information

NRC Received Date: 30-Nov-01

NRC Comments:
(No Comments)

Final Resolution: NRC Action Pending Final Resolution Date:

Incorporation Into the NUREGs

File to BBS/LAN Date: TSTF Informed Date: TSTF Approved Date:

NUREG Rev Incorporated:

Affected Technical Specifications

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

5.5 Programs and Manuals

5.5.4 Radioactive Effluent Controls Program (continued)

i. Limitations on the annual and quarterly doses to a member of the public from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives > 8 days in gaseous effluents released from each unit to areas beyond the site boundary, conforming to 10 CFR 50, Appendix I, and

j. Limitations on the annual dose or dose commitment to any member of the public, beyond the site boundary, due to releases of radioactivity and to radiation from uranium fuel cycle sources, conforming to 40 CFR 190.

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the Radioactive Effluent Controls Program surveillance frequency.

5.5.5 Component Cyclic or Transient Limit

This program provides controls to track the FSAR, Section [ ], cyclic and transient occurrences to ensure that components are maintained within the design limits.

5.5.6 [Pre-Stressed Concrete Containment Tendon Surveillance Program

This program provides controls for monitoring any tendon degradation in pre-stressed concrete containments, including effectiveness of its corrosion protection medium, to ensure containment structural integrity. The program shall include baseline measurements prior to initial operations. The Tendon Surveillance Program, inspection frequencies, and acceptance criteria shall be in accordance with [Regulatory Guide 1.35, Revision 3, 1989].

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the Tendon Surveillance Program inspection frequencies.]

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

This program shall provide for the inspection of each reactor coolant pump flywheel per the recommendations of Regulatory Position C.4.b of Regulatory Guide 1.14, Revision 1, August 1975.

In lieu of Position C.4.b(1) and C.4.b(2), a qualified in-place UT examination over the volume from the inner bore of the flywheel to the circle one-half of the outer radius or a surface examination (MT and/or PT) of exposed surfaces of the removed flywheels may be conducted at ~~approximately~~ 10 year intervals ~~coinciding with the Inservice Inspection schedule as required by ASME Section XI~~ 20

WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination."

5.5 Programs and Manuals

5.5.7 Reactor Coolant Pump Flywheel Inspection Program (continued)

- REVIEWER'S NOTES -

1. The inspection interval and scope for RCP flywheels stated above can be applied to plants that satisfy the staff requirements in the safety evaluation of Topical Report, WCAP-14535A, "Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination."

2. Licensees shall confirm that the flywheels are made of SA 533 B material. Further, licensees having Group-15 flywheels (as determined in WCAP-14535A, "Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination") need to demonstrate that material properties of their A516 material is equivalent to SA 533 B material, and its reference temperature, RT, is less than 30 °F.

3. For flywheels not made of SA 533 B or A516 material, licensees need to either demonstrate that the flywheel material properties are bounded by those of SA 533 B material, or provide the minimum specified ultimate tensile stress, the fracture toughness, and the reference temperature, RT_{NDT}, for that material. For the latter, the licensees should employ these material properties, and use the methodology in the topical report, as extended in the two responses to the staff's RAI, to provide an assessment to justify a change in inspection schedule for their plants.

4. Licensees with Group-10 flywheels need to confirm that their flywheels have an adequate shrink fit to preclude loss of shrink fit of the flywheel at the maximum overspeed, or to provide an evaluation demonstrating that no detrimental effects would occur if the shrink fit was lost as maximum overspeed.

5.5.8 Inservice Testing Program

This program provides controls for inservice testing of ASME Code Class 1, 2, and 3 components. The program shall include the following:

a. Testing frequencies specified in Section XI of the ASME Boiler and Pressure Vessel Code and applicable Addenda as follows:

ASME Boiler and Pressure Vessel Code and applicable Addenda terminology for inservice testing activities	Required Frequencies for performing inservice testing activities
Weekly	At least once per 7 days