Consumers Energy

A CMS Energy Company

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

DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT
TECHNICAL SPECIFICATIONS CHANGE REQUEST - PRIMARY COOLANT PUMP FLYWHEEL INSPECTIONS

On January 18, 1996, Consumers Power Company (now Consumers Energy Company) submitted proposed changes to the Palisades Technical Specifications which would delete the requirements for inservice inspections (ISI) of the primary coolant pump (PCP) flywheels. These changes were submitted as part of a Combustion Engineering Owners Group (CEOG) effort since the changes were determined to be generic to all Combustion Engineering nuclear units. The initial Technical Specifications Change Request (TSCR) was submitted under the Cost Beneficial Licensing Action (CBLA) program described in NRC Administrative Letter 95-02 dated February 23, 1995. The justification for the CBLA was contained in the January 18, 1996 submittal.

On August 14, 1996, Consumers Power Company submitted proposed changes to the Palisades Technical Specifications which would delete the required inservice inspections (ISI) of the primary coolant pump (PCP) flywheels for the 1996 refueling outage only. This proposed change incorporated the no significant hazards determination of the January 18, 1996, submittal by reference since that determination was bounding. The NRC issued Amendment 175 to the Palisades Technical Specifications granting this request on November 7, 1996 (TAC No. M96469).

A001

On May 21, 1997, the NRC issued an "Acceptance for Referencing of Topical Report SIR-94-080, 'Relaxation of Reactor Coolant Pump Flywheel Inspection Requirements'"

to Entergy Operations, Inc. for Arkansas Nuclear One as the lead plant for the subject topical report. The conclusion stated that the flywheel inspection period could be lengthened to 10 years for the plants identified in the SER. Within the SER, a requirement was identified to verify the reference temperature (RT_{NDT}) for the PCP flywheels and to demonstrate that the corresponding fracture toughness (K_{Ic}) are equivalent to those reported in the topical report.

The attached TSCR proposes that the Technical Specifications flywheel inspection period be lengthened to 10 years. The note added by Amendment 175, for the deletion of the inspection at the end of Cycle 12, is also to be deleted. The January 18, 1996, TSCR submittal proposed a deletion of the flywheel examinations; this submittal only decreases the frequency of those examinations. Therefore, the conclusions reached in the no significant hazards discussion submitted in the January 18, 1996, TSCR submittal have therefore not been altered. The January 18, 1996, no significant hazards discussion is therefore incorporated by reference for this TSCR. The Description of the Proposed Change and the Reasons for Change are modified due to the additional information required and are included in Attachment 1. Attachment 2 contains the proposed Technical Specifications page. Attachment 3 contains the existing Technical Specifications page marked up to show the proposed change.

Palisades requests this Technical Specifications Change to be effective immediately upon approval. Although this request is neither exigent nor emergency, your approval by January 17, 1998, is requested. Approval by this date will allow the inspection to be deleted from the schedule for the 1998 refueling outage, currently scheduled to begin on April 24, 1998.

SUMMARY OF COMMITMENTS

This letter contains no new commitments and no revisions to existing commitments.

Thomas C. Bordine
Manager, Licensing

CC Administrator, Region III, USNRC
Project Manager, NRR, USNRC
NRC Resident Inspector - Palisades

3 Attachments

CONSUMERS ENERGY COMPANY

To the best of my knowledge, the contents of this technical specifications change request concerning primary coolant pump flywheel inspections, are truthful and complete.

By _____
Thomas C. Bordine
Manager, Licensing

Sworn and subscribed to before me this 1st day of October 1997.

Alora M. Davis
Alora M. Davis, Notary Public
Berrien County, Michigan
(Acting in Van Buren County, Michigan)
My commission expires August 26, 1999

[SEAL]

ATTACHMENT 1

CONSUMERS ENERGY COMPANY
PALISADES PLANT
DOCKET 50-255
LICENSE DPR-20

TECHNICAL SPECIFICATIONS CHANGE REQUEST PRIMARY COOLANT PUMP FLYWHEEL INSPECTIONS

Discussion of Proposed Change

5 Pages

TECHNICAL SPECIFICATIONS CHANGE REQUEST
PRIMARY COOLANT PUMP FLYWHEEL INSPECTIONS

It is requested that the Technical Specifications contained in the Facility Operating License DPR-20, Docket 50-255, issued to Consumers Power Company (now Consumers Energy Company) on February 21, 1991, for the Palisades Plant be changed as described below:

I. DESCRIPTION OF PROPOSED CHANGE

This technical specifications change request (TSCR) proposes that Technical Specification (TS) Section 6.5.6 concerning periodic inservice inspection (ISI) of primary coolant pump (PCP) flywheels be revised. The proposed change would decrease the required volumetric examination frequency of the upper flywheel on each PCP motor from once each refueling outage to once each 10 years. In addition, a clarification was added, stating that the allowance for a 25% extension of the surveillance interval provided by Surveillance Requirement 4.0.2 would apply.

II. REASON FOR CHANGE

Background

The flywheels on primary coolant pump motors provide rotational inertia to prolong pump coastdown in the event pump power is lost, thus ensuring a more gradual decay of primary coolant flow to the reactor core.

General Design Criterion 4, "Environmental and Missile Design Bases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 requires nuclear power plant structures, systems, and components important to safety be protected against the effects of missiles that might result from equipment failures. Conceptually, PCP flywheels could degrade and produce high energy missiles at both normal operating and overspeed conditions (e.g., during a loss of coolant accident). In RG 1.14, Rev. 1, entitled "Reactor Coolant Pump Flywheel Integrity," the NRC provides recommendations for material fabrication, design, and preservice and inservice inspection for PCP flywheels. If those recommendations are followed, the probability of flywheel failure would be reduced to a level that would not require protection (eg. missle shield) against the consequences of failure. The Inservice Inspection (ISI) recommendations in RG 1.14 are identified as providing an acceptable inspection program in Section 5.4.1.1 of the Standard Review Plan. The TS of most licensees include a requirement to provide ISI of PCP flywheels

in accordance with the recommendations of RG 1.14 or other methods acceptable to the Staff.

Discussion of Change

The Combustion Engineering Owners Group (CEOG), contracted with Structural Integrity Associates, Inc. to develop the report entitled "Relaxation of Reactor Coolant Pump Flywheel Inspection Requirements," which was submitted on January 18, 1996. This report provides justification that flywheel integrity can be assured without the requirement to conduct ISI. Consumers Energy Company, Entergy Operations, Florida Power and Light, and Northeast Utilities Service Company participated in this project. The report reviewed previous ISI results, evaluated potential degradation mechanisms and provided stress analyses and fracture mechanics evaluations of flywheels.

The report justified the elimination of the periodic inspection requirements for PCP flywheels as described in Regulatory Guide 1.14, Rev. 1, on a generic basis for the plants studied. The results specific to Palisades were summarized as follows:

1. No service induced flaws have ever been identified in any of the Palisades PCP flywheels (or any other plant studied).

2. Fatigue was found to be the only potentially significant degradation mechanism for the alloy steel PCP flywheels in pressurized water reactors. The allowable flaw size was determined by considering the maximum centrifugal stress at accident speed and shrink-fit stresses at zero speed. The smaller allowable flaw size for these two stresses is the allowable flaw size for the flywheel. For Palisades, the maximum allowable flaw size for the flywheels is > 2.00 inches, corresponding to an accident speed of 150% of the normal (900 rpm) operating speed.

3. Since fatigue is the only degradation mechanism which will result in propagation of existing cracks in the flywheel, a fatigue crack growth evaluation was done to determine the growth of pre-existing cracks. An initial flaw size of 0.25 inches is assumed based upon a conservative detection threshold for ultrasonic examination (UT). The design number of startup/shutdown cycles for a PCP motor will be no more than 500 for plant life. However, for this evaluation 4000 cycles were considered to determine crack growth. Using minimum material properties, accident

speed stresses, and a conservative number of cycles, a pre-existing 0.25 inch crack would grow to 0.2515 inches in a Palisades flywheel. This value is well below the allowable flaw size of > 2.00 inches calculated for Palisades at 150% of normal operating speed.

The topical report states that the Palisades PCP flywheel is made from ASTM A-108 (1017), low carbon steel. The nil ductility transition (NDT) temperature of this material was determined to be no higher than 40°F with an average Charpy V-notch (CVN) energy of 100 ft-lb observed at 70°F. The fracture toughness was determined to be 100 ksi-in$^{1/2}$. This information is supported by the following:

1. A submittal dated August 26, 1969, which was an amendment to the application for the Palisades Reactor Construction Permit and Operating License, stated that the steel used for the PCP flywheel was a low carbon SAE 1017, 1020 type. It also stated that this material had an NDT temperature typically less than +40°F.

2. In the final NRC safety evaluation for the Systematic Evaluation Program (SEP) Topic III-10.B dated February 2, 1982, the NRC stated the following:

   "The disc material is SAE 1017, type 1020, which is equivalent to ASTM A 108 (1017), low carbon steel with a minimum yield strength of 27,000 psi and tensile strength of 50,000 psi. The pump flywheels are machined from cross rolled blanks.

   "Regulatory Guide requires that the nil-ductility transition temperature (NDT) for the flywheel material be no higher than 10°F, that the Charpy V-notch (CVN) upper shelf energy should be at least 50 ft-lb., and that at normal operating temperature the material should have a dynamic stress intensity factor of at least 100 ksi-in$^{1/2}$. This later requirement can be satisfied by demonstrating that the material has a CVN energy level of 50 ft-lb. at normal operating temperature.

   "Based on our review we have determined that the NDT of the flywheel material at Palisades is no more than 40°F and an average CVN energy of 100 ft-lbs. at 70°F. Based on these data we conclude that the NDT requirement of Regulatory Guide 1.14 has not been met while the CVN and fracture toughness

requirement have been met. Based on this information we conclude that the flywheels have adequate fracture toughness. Our conclusion is based on the following: Although the NDT is 40°F rather than 10°F, the operating temperature of 100°F is still 60°F above NDT. This margin above NDT coupled with a CVN energy at 70°F that far exceeds the 50 ft-lbs. required by the Regulatory Guide ensures that brittle fracture is unlikely and that a large tolerance to flaw-induced fracture exists. This flaw tolerance and operation in a temperature region where the potential for brittle fracture is reduced meets the intent of Regulatory Guide 1.14 although one specific requirement of the guide has not been met."

The NDT of 40°F which was determined and documented in the NRC safety evaluation for the Systematic Evaluation Program (SEP) Topic III-10.B is considered to be the RT_{NDT} for the Palisades PCP flywheel material.

The operating temperature of about 100°F is above the 70°F temperature at which the average CVN energy level was determined to be 100 ft-lb. It can be determined conservatively that the fracture toughness K_{Ic} at an operating temperature of 100°F is at least 100 ksi-$in^{½}$. This K_{Ic} value is the value used in the topical report for Palisades. No attempt was made to use the curve in Appendix A of Section XI of the ASME Code to derive this value of K_{Ic} for Palisades.

Based upon the calculation contained in the report, and the additional information provided above, it can be determined that a preservice flaw of 0.25 inches would not grow to the allowable flaw size in the plant's licensed life, or even during life extension. Therefore, inservice inspections of PCP flywheels during each refueling outage have a marginal contribution to safety and can be reduced, thus allowing resources to be used for items of greater safety significance and permitting a reduction in personnel radiation exposure.

Since the flywheel inspection program is essentially a surveillance, the provisions of Surveillance Requirement (SR) 4.0.2 (the allowance for a 25% extension of surveillance interval) should apply. With the current frequency during refueling outages, the allowance was not necessary. When the frequency is stated as a specific time period, SR 4.0.2 becomes applicable. This proposed change is considered administrative, because it simply clarifies that SR 4.0.2 applies even though the requirement has been moved to a program.

TECHNICAL SPECIFICATIONS CHANGE REQUEST
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III. DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

The January 18, 1996, TSCR submittal proposed a deletion of the flywheel examinations whereas this submittal only decreases the frequency of those examinations. The conclusions reached in the no significant hazards discussion submitted in the January 18, 1996, TSCR submittal have therefore not been altered. The January 18, 1996, no significant hazards discussion is therefore incorporated by reference for this TSCR.