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Florida Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302

September 30, 1991
3F0991-01

Chief, Regulatory Publications Branch
Division of Freedom of Information and Publications Services
Office of Administration
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Generic Issue 23 - Reactor Coolant Pump Seals

Reference: 56 Federal Register 16130 (April 19, 1991)

Dear Sir:

Florida Power Corporation (FPC) is submitting this letter to respond to the request in the reference Federal Register notice for comments on the NRC's proposed resolution of Generic Issue (GI) 23 - Reactor Coolant Pump Seals. FPC is a member of Nuclear Utility Management and Resources Council (NUMARC), the Babcock & Wilcox Owners Group (B&WOG), and the Byron Jackson (BJ) N-9000 Seal Users Group. FPC represented the B&WOG on the committee that assisted NUMARC in preparing the industry response. FPC was also involved in the Nuclear Utility Group on Station Blackout (NUGSBO) that addressed the GI 23 issue during the development of station blackout rules. Separate comments are being submitted by these organizations and FPC endorses them.

The Attachment provides plant specific responses to Questions 1.1 through 1.3, 2, 3.1 through 3.5, and 6 in the reference notice for Crystal River Unit 3 (CR-3). The letter submitted by the BJ N-9000 Seal Users Group provides information considered generic to the N-9000 seals. The BJ N-9000 Seal User Group's submittal is also providing information which describes the N-9000 Development Program and the Station Blackout Test that was performed on a prototype seal.

The development of an improved, reliable reactor coolant pump seal design has been a goal of the N-9000 seal users. FPC and the other members of the BJ N-9000 Seal Users Group recognize the economic benefit and improvement in safety to be derived and have expended considerable resources to achieve this goal. The proposed generic resolution to GI 23 gives no credit to the utilities for the increase in safety attained from the efforts of the N-9000 owners to improve performance and reliability. FPC considers the actions we have taken both

independently and with our vendors provide improved seal performance and increased safety. These actions effectively resolve the concerns described by the NRC in their proposed resolution of GI 23.

Further regulatory requirements are not supported by the backfit analysis which is contained in draft NUREG-1401. The NRC has not developed an adequate technical record to support its proposed backfit, in that it is relying on pre-1986 seal failure data, and has apparently not taken into account more recent data that shows an improved picture. The NRC should not justify the imposition of the GI 23 requirements based upon a cost "savings" through improved plant availability or averted on-site accident costs. The most appropriate analysis assesses the cost/benefit of a backfit on the basis of the direct costs of the change itself, without consideration of speculative economic factors. The "design solution" suggested in NUREG-1401 does not appear to have considered the regulatory or technical difficulties of interfacing a cooling water system with a fire protection system. The sheer magnitude of the range between high and low estimates casts doubt on the validity of the selection of a best estimate. Additionally, the cost/benefit data does not consider the impact of this backfit on other licensing issues. For example, the NRC does not consider costs that FPC will incur to re-evaluate its plan for coping with station blackout.

As NUMARC states in their response to this issue, they will serve as the industry focal point in coordinating and facilitating discussions between the industry and NRC. If, after review of this information and the submittals provided by the B&WOG and the BJ N-S Users Group, the NRC still considers further discussions warranted, requests that the Staff contact NUMARC to establish a meeting to address any remaining questions or concerns.

As requested in the notice, FPC is providing this letter on the enclosed 3.5 inch diskette in ASCII code.

Sincerely,

P. M. Beard, Jr.
Senior Vice President
Nuclear Operations

PMB/JWT

Enclosure

Attachment

xc: Regional Administrator, Region II
Senior Resident Inspector
NRR Project Manager
NUMARC
Document Control Desk
E. L. Jordan, NRC Chairman CRGR

Attachment to 3F0991-01

QUESTION 1.1

Has your operation experience with RCP seals changed since 1983? If it has, then information regarding the history of RCP seal failures, including occurrences of forced outages is of interest. Information regarding all types of operation including start-up is desired.

RESPONSE

Performance of the SU design seals has improved over the years due to increased attention to maintenance, training, and operating parameters. Until March 1990, FPC replaced all four of the RCP seals at each refueling as a preventative measure. Seals were replaced in Refuel 3 (9-81), Refuel 4 (3-83), Refuel 5 (3-85), and Refuel 6 (9-87). Refuel 7 in March 1990 saw the installation of the N-9000 seals. Since CR-3 is operating on a 24 month fuel cycle, FPC presently plans to replace two N-9000 seals each refueling outage. Experience with the N-9000 seals has been good to-date.

When the NRC reviews any historical database entries containing forced outage information about CR-3, it is important to understand that failure of a RCP shaft, not RCP seals, was the cause of the outages in January 1986 and February 1989. These RCP shaft failures were perturbations to an otherwise improving situation, the integrity of the SU seal was not a concern for plant safety. The shaft failures did not cause the SU seal leak rate to be significant. In both shaft failures, the seal leakage was less than 2 gpm.

The BJ N-9000 Seal Users Group response provides an operating overview for all the N-9000 seals in use.

QUESTION 1.2

If your operation experience has changed, to what do you attribute the change (e.g., improved quality assurance and quality control, improved maintenance, better procedures, improved instrumentation, design changes)?

RESPONSE

The major reason for the improvement in seal performance since 1980 came as a result of FPC's involvement in a Seal Improvement Program User's group formed in the early 1980's with Byron Jackson, Babcock and Wilcox, and several Utilities. Recommendations for seal improvement covered the design, procurement, operation, and maintenance of the RCP seals.

Design: Several design improvements were made to the SU seal including increased staging flow, cooling path modifications, secondary seal configuration, and the use of slotted carbides to increase the hydrodynamic film thickness and stability. The major design improvement culminated in the development of the N-9000 seal which was specially designed, fabricated, and tested to address all of the problems experienced to date, as well as, loss of all cooling.

Procurement: A considerable level of detail was added to the procurement process to specifically address critical parameters such as dimensions. FPC recognized the safety and economic importance of the seals such that we decided to procure the seals and all replacement parts under the requirements of 10 CFR 50, Appendix B, with 10 CFR 21 applied.

Operation: A specific set of limits were developed and implemented in plant operating procedures to monitor seal performance. Engineering and Operations personnel observe the performance of each RCP on a 24 hour basis. If problems were to occur, several levels of management are to be advised of the problems so that appropriate actions or contingencies can be implemented.

Maintenance: The involvement of engineering in the actual maintenance process, as well as, many procedural enhancements to both the refurbishment and installation procedures were effective in increasing the overall reliability of the seal. Trained technical personnel from the pump vendor, Byron Jackson, perform maintenance on the RCPs, including the seals, under FPC supervision.

QUESTION 1.3

How often are seals being routinely replaced (e.g., every refueling)?

RESPONSE

Until the installation of the N-9000 design in Refuel 7 (1990), the SU type seals were routinely replaced every refueling outage and during any extended Mode 5 outage. FPC's current plans for the N-9000 seal are to replace two seals every refueling which would mean a seal would be operated approximately 4 years between replacement intervals.

QUESTION 2

The NRC STAFF is interested in obtaining any available data regarding degraded cooling or loss of cooling to the seals to support assertions that seals can survive long periods of time (i.e., HOURS) without cooling.

RESPONSE

During the time period from 1981 to 1991, CR-3 has experienced five prolonged loss of seal injection incidents. The Byron Jackson SU seal design was installed (in various modified forms) for four of these events; with the last event occurring after the new N-9000 seal design had been installed. With the exception of the last event, seal injection has typically been restored within 15-20 minutes. The last event was an operator initiated manual isolation for approximately 60 minutes. During all of these events, seal parameters returned to normal following re-establishment of seal injection.

CR-3 has not experienced any cooling system failures of the magnitude described in the GI 23 issue. Because of the concerns for the seals due to the potential station blackout conditions, FPC actively participated in the development of the N-9000 seal. The BJ N-9000 Seal Users Group is providing information in its response describing why the N-9000 seal is a viable solution to the concern for long-term seal integrity under station blackout conditions.

QUESTION 3.1

Are there procedures currently in place that are intended to prevent seal leaks from becoming small-break LOCAs during both normal plant operation and loss-of-seal cooling events such as station blackout? Are the required operator actions (e.g., isolating leakoff lines) the same for normal plant operation and loss-of-seal cooling events?

RESPONSE

CR-3 has three procedures that address RCP Seal operation during normal and off normal conditions. They are as follows:

Normal Operation	OP-302	RC Pump Operation
Off Normal Ops.	AP-380	Engineered Safeguards Actuation
	AP-790	Station Blackout

Specific seal parameters, limits and precautions for operating reactor coolant pumps, and required operator actions are detailed in OP-302. For normal operating conditions, abnormalities in RCP operating parameters usually involves securing the pump and, if warranted due to loss of seal injection/seal temperature, securing seal leakoff. The off normal procedures do not specifically address seal performance. The required operator actions are designed to mitigate the consequences of the specific incident. For the most part, this involves securing seal leakoff (i.e, Controlled Bleedoff).

QUESTION 3.2

Has the RCP instrumentation been evaluated to determine whether operators have sufficient information to implement the procedures?

RESPONSE

FPC has evaluated the RCP instrumentation necessary to implement the pump operating procedures. OP-302, RC Pump Operation, has established setpoints for the following seal parameters which are continuously monitored by the plant computer and alarmed should a setpoint be exceeded:

RCP Second Seal Cavity Pressure

RCP Third Seal Cavity Pressure

RCP Seal Return Temperature

RCP Seal Return Flow

RESPONSE 3.2 (Continued)

In addition, each of the parameters monitored has direct instrument readout in the control room, except for RCP Seal Return Flow (Controlled Bleedoff [CBO]). CBO is a calculated value based on RCP seal third stage differential pressure. Although not continuously monitored, additional information about seal performance is available in the form of interstage temperatures and seal leakage. FPC also monitors total seal injection flow to all four RCPs, seal injection to each pump, and seal dumpster flow from each pump.

The format of each instrument display presents the information in the form necessary for direct comparison with the operating limits of the procedure.

QUESTION 3.3

How is RCP seal vendor information used in establishing operation and maintenance practices for the RCP seals?

RESPONSE

Information received from a vendor is processed through the Vendor Technical Information Review cycle. This process is designed to ensure that manufacture maintenance updates and operational changes are reviewed by the correct level of FPC staff for incorporation into maintenance and operational procedures.

The maintenance procedure and the operational limits and precautions for the N-9000 seal were derived directly from the Vendor Technical Manual supplied with the seal. FPC is using the latest revision of the N-9000 Instruction Manual.

QUESTION 3.4

In some cases, industry practice allows continued plant operation with the RCP seal when first or second stages have failed. Do you limit this practice? If so, what are the limiting conditions.

RESPONSE

The N-9000 seal was designed such that each of the three individual sealing stages could withstand full RCS pressure indefinitely with the RCP idle and for a limited period of time with the pump running. OP-302, RC Pump Operation, Section 4.7, Abnormal RCP Seal Temperature and/or Flows, provides the guidance for operation when a parameter is out of specification. The limiting conditions for operation are as follows:

1. Third stage seal temperature $\geq$ 170 °F.
2. Seal stage differential pressure $\geq$ 2/3 RCS pressure.
3. Total seal outflow $\geq$ 2.5 gpm.

RESPONSE 3.4 (Continued)

The operating philosophy at CR-3 concerning continued operation with a degrading seal is one of conservatism. Operation may continue for a short period of time to allow for adequate preparation of a maintenance outage.

QUESTION 3.5

What additional quality assurance and procedural measures can be taken regarding RCP seals to improve safety?

RESPONSE

All maintenance performed on the RCP seals is considered by FPC to be a Safety Related activity with the appropriate quality assurance measures applied. The procurement of RCP seals and all replacement parts are performed under the requirements of 10 CFR 50, Appendix B with 10 CFR 21 applied.

The BJ N-9000 Seal Users Group response also contains an additional discussion of the measures used by Borg Warner Industrial Products Pump Division to maintain seal quality.

QUESTION 6

If, after consideration of public comments, the NRC decides that additional RCP seal requirements are necessary, what method of imposition should be used (e.g., by rulemaking, orders, or generic letter)?

Any imposition of the present or future GI 23 recommendations should be made by the rulemaking process. Rulemaking is the preferred method because it affords the industry with an opportunity to review and discuss all relevant NRC data.

When the NRC Staff is considering establishing new programs and requesting plant modifications, it should proceed by rulemaking or orders, as opposed to adopting regulatory guidance. There are no specific regulatory basis at present for such guidance.

FLORIDA POWER
CORP LETTER
#3F0991-01
IN ASCII FORMAT

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