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SOUTHERN COMPANY
Energy to Serve Your World℠

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Docket Nos.: 50-348
50-364

NL-03-2395

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant
Request for Relaxation of Order EA-03-009

Ladies and Gentlemen:

NRC Order EA-03-009, issued February 11, 2003, established interim inspection requirements for reactor pressure vessel (RPV) heads at pressurized water reactors. The RPV heads at both units of the Farley Nuclear Plant (FNP) fall into the "High" category for susceptibility to primary water stress corrosion cracking (PWSCC) by the criteria specified in the Order. For plants in the High category, item IV.C.(1) of the Order requires RPV head and penetration nozzle inspection at every refueling outage, with item IV.C.(1)(a) calling for a bare metal visual (BMV) examination of the RPV head surface and item IV.C.(1)(b) specifying options for other non-destructive examination (NDE) techniques for the penetration nozzles.

In accordance with the provisions of item IV.F of Order EA-03-009, Southern Nuclear Operating Company (SNC) requests a one-time relaxation of the inspection requirements of item IV.C.(1)(b) of the Order with respect to the FNP Unit 2 RPV head based on a demonstration of good cause. This relaxation request (reference enclosure) would extend the required interval for performance of non-visual NDE of the nozzles per IV.C.(1)(b) by one refueling outage. Relaxation of this requirement would permit SNC to forgo further non-visual NDE of the existing Unit 2 RPV head if it is replaced as planned following the next operating cycle. Performance of the BMV required by item IV.C.(1)(a) of the Order is sufficient in this case to address the relevant safety concerns (circumferential cracking of the nozzles and corrosion of the head material) cited by the Order; the additional examination required by item IV.C.(1)(b) is unnecessary and would result in a hardship (increased personnel radiation exposure) without a compensating increase in the level of quality and safety.

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Mr. J. B. Beasley, Jr. states he is a Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

This letter contains no NRC commitments. If you have any questions, please advise.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

J. B. Beasley, Jr.

Sworn to and subscribed before me this 3rd *day of* December, *2003.*

Notary Public

My commission expires: October 9, 2005

JBB/DWD/sdl

Enclosure: Relaxation Request for Order EA-03-009 Item IV.C.(1)(b)

cc: Southern Nuclear Operating Company
Mr. J. D. Woodard, Executive Vice President
Mr. D. E. Grissette, General Manager – Plant Farley
Document Services RTYPE: CFA04.054; LC# 13876

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
Mr. S. E. Peters, NRR Project Manager – Farley
Mr. T. P. Johnson, Senior Resident Inspector – Farley

Alabama Department of Public Health
Dr. D. E. Williamson, State Health Officer

Enclosure

Joseph M. Farley Nuclear Plant – Unit 2

Relaxation Request for Order EA-03-009 Item IV.C.(1)(b)

Pursuant to Section IV.F of the Order, Southern Nuclear Operating Company (SNC) is required to seek relaxation of any conditions of the Order for good cause with respect to any proposed deviations or alternatives to the inspection requirements with which SNC is unable to comply or as to which compliance is unnecessary. A request for relaxation regarding inspection of specific nozzles for good cause is required to address the following criteria:

(1) The proposed alternative(s) for inspection of specific nozzles will provide an acceptable level of quality and safety, or
(2) Compliance with this Order for specific nozzles would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Component Affected

Joseph M. Farley Nuclear Plant (FNP) Unit 2 reactor pressure vessel (RPV) closure head and head penetration nozzles.

Order Requirement for which Relaxation is Requested

By the criteria specified in section IV of the Order, the FNP Unit 2 RPV head is classified in the "High" category for susceptibility to primary water stress corrosion cracking (PWSCC). For plants in the High category, item IV.C.(1) of the Order requires RPV head and penetration nozzle inspection at every refueling outage, with item IV.C.(1)(a) calling for a bare metal visual (BMV) examination of the RPV head surface and item IV.C.(1)(b) specifying options for other non-destructive examination (NDE) techniques for the penetration nozzles.

Relaxation is sought to extend the interval for performance of nozzle inspection per IV.C.(1)(b). This relaxation is sought for one time only, for the FNP Unit 2 refueling outage scheduled to start in March, 2004. Replacement of the Unit 2 RPV head is planned at the following fall 2005 outage. If the planned head replacement is delayed, examination of the existing RPV head will be performed in accordance with the Order and/or any superceding requirements during the fall 2005 outage.

Discussion of Proposed Alternative and Consideration of Criteria

As an alternative to the requirements of the Order, a bare metal visual (BMV) inspection only is proposed, as required by IV.C.(1)(a). No additional inspection is necessary to provide an acceptable level of quality and safety, as discussed below.

Background

An inspection of the Farley Nuclear Plant (FNP) Unit 2 RPV head was conducted during the fall 2002 refueling outage, with the results reported in an SNC letter to the NRC dated November 20, 2002. Although this inspection was conducted prior to issuance of Order EA-03-009, the inspection scope, methods and coverage were consistent with the requirements of the Order as later relaxed for both FNP units by an NRC letter dated April 25, 2003 (except as noted below for leakage assessment of the head vent nozzle). This relaxation of the Order, necessitated by FNP nozzle design features and

inspection equipment limitations, permitted the UT examination zone to extend down to at least 1 inch below the weld rather than all the way to the bottom of the nozzle.

The fall 2002 Unit 2 RPV head inspection included BMV examination of the outer surface of the head and ultrasonic testing (UT) of all 70 head penetration nozzles, with a radiation dose to personnel of 4.5 Rem. The BMV covered 360 degrees around each penetration nozzle, and UT coverage for the 69 – 4 inch diameter nozzles extended from the threaded region at the bottom of each nozzle upward to in all cases at least 2 inches above the weld. The extent of coverage below the weld was not explicitly specified during the Unit 2 inspection, but based on the subsequent Unit 1 inspection experience and the identical layout of the nozzles for the Unit 2 head, the Unit 2 UT coverage extended to at least 1 inch below the weld in all cases, as it did for Unit 1. The UT exams of the 4 inch nozzles included an assessment to determine if leakage had occurred into the interference fit zone. UT coverage of the head vent line extended from as low as achievable to at least 1 inch above the weld, but no leak path assessment was performed since this nozzle was not designed with the interference fit necessary for this assessment.

No cracking, leakage, wastage or other degradation of the Unit 2 RPV head or nozzles was found during the fall 2002 inspection. At this outage the Unit 2 RPV head had reached 15.6 effective degradation years (EDY). By the upcoming spring 2004 refueling outage the Unit 2 RPV head will have reached approximately 16.8 EDY. This is less than the 17.5 EDY that had accrued to the FNP Unit 1 RPV head when it was inspected in accordance with the Order during spring 2003. No cracking, leakage, wastage or other degradation of the Unit 1 RPV head or nozzles was found during the spring 2003 inspection. While the material heats used are not identical between the Unit 1 and Unit 2 RPV heads and nozzles, they are very similar in design and were built by the same manufacturers; hence, Unit 2 is unlikely to exhibit nozzle cracking by the upcoming spring 2004 outage based on the Unit 1 inspection experience.

SNC plans to operate the Unit 2 RPV head for only one more cycle following the spring 2004 outage. Installation of a new Unit 2 RPV head is scheduled for the fall 2005 outage, at which time the existing head will have reached approximately 18.1 EDY.

FNP operates with zinc injection into the reactor coolant system (RCS), a practice which laboratory testing indicates is beneficial in mitigating the initiation of primary water stress corrosion cracking (PWSCC) in Alloy 600, the material used for the FNP RPV head nozzles. The Unit 2 RCS has presently accumulated over 5 years of operating time with zinc treatment and SNC believes that the beneficial effects shown by laboratory testing have been significant in mitigating initiation of PWSCC in the Unit 2 RPV head nozzles.

Safety Concerns of Order EA-03-009

Two safety concerns are cited in Order EA-03-009: corrosion of the RPV head and circumferential cracking of RPV head nozzles, conditions which could create the possibility of a loss-of-coolant accident due to head degradation or nozzle ejection if not detected and repaired.

RPV Head Corrosion Concern

The requested relaxation of IV.C.(1)(b) will not affect the BMV examination required per IV.C.(1)(a). This BMV examination is the primary means for detecting evidence of head corrosion.

Such corrosion could stem from leakage of borated water from components above the head or from through-wall cracking in a penetration nozzle or attachment weld. BMV examination therefore provides a means of crack detection in that visual evidence of corrosion or leakage could indicate the presence of such cracking. SNC will supplement the BMV examination with other non-destructive examination (NDE) methods as needed to disposition such evidence of corrosion or leakage.

While non-circumferential through-wall cracks in the nozzles could permit borated water to come into contact with and corrode the low alloy head material, such cracks are not a threat for nozzle ejection. Regarding the potential for such cracks to develop, Westinghouse report WCAP-15925 Rev. 0, "Structural Integrity Evaluation of Reactor Vessel Upper Head Penetrations to Support Continued Operation: Farley Units 1 and 2" (submitted April 11, 2003 by SNC) showed that postulated through-wall axial cracks in the penetration nozzles occurring one-half inch below the weld (i.e. within the zone of UT coverage achieved during the fall 2002 Unit 2 inspection) would not propagate sufficiently to impinge on the pressure boundary within two operating cycles. The WCAP likewise showed that postulated axial flaws sized at the limit of detectibility occurring within the fall 2002 UT examination zone would require more than two operating cycles to reach 75% through-wall. Therefore, if such previously undetected axial flaws in the nozzles do exist, they would be expected to cause no leakage prior to the scheduled replacement of the Unit 2 RPV head in fall 2005.

For postulated cracks through the attachment welds, the performance of NDE as required by the Order does not preclude the possibility of leakage. The nozzle UT option given by the Order at item IV.C.(1)(b)(i) cannot directly detect cracks in the weld, but could infer their existence through UT leak path assessment if leakage had already occurred into the interference fit zone. The wetted surface NDE option provided at item IV.C.(1)(b)(ii) can detect existing cracks, but preliminary calculations for the FNP reactors show that such cracks could potentially initiate and propagate through-wall within the operating cycle following the examination. However, the limitations of these examinations with regard to detecting cracks through the welds are of minimal consequence considering that industry experience has shown that leakage over multiple operating cycles is required for head corrosion to progress sufficiently to threaten a loss-of-coolant accident.

SNC is confident that performance of the BMV examination will detect possible leakage before significant head degradation can occur and that reliance on the BMV examination alone without other NDE per item IV.C.(1)(b) during the upcoming FNP Unit 2 outage adequately addresses the head corrosion concern of the Order.

Circumferential Nozzle Cracking Concern

WCAP-15925 Rev. 0 also addressed prediction of through-wall circumferential crack growth near the top of the penetration nozzle attachment welds and showed that about 24 cycles of operation would be necessary for such cracks to pose a threat of nozzle ejection. Subsequent revision of this curve by Westinghouse using the doubled crack growth rate recommended by EPRI MRP document MRP-55 Rev. 1 has decreased this predicted crack growth time but still shows that about 12 cycles of operation would be required to threaten nozzle ejection. This indicates a robust safety margin (factor of 6) exists with respect to the 2 cycles of operation which will elapse between the UT examination performed in fall 2002 and the planned replacement of the Unit 2 RPV head in fall 2005.

Enclosure

Joseph M. Farley Nuclear Plant – Unit 2

Relaxation Request for Order EA-03-009 Item IV.C.(1)(b)

Conclusion

The crack-free nozzle UT examination results from the fall 2002 Unit 2 inspection, in conjunction with the crack propagation analyses cited above, the crack-free Unit 1 examination results obtained at greater accrued EDY, the PWSCC mitigating effects of zinc injection and the planned BMV inspection combine to make repetition of the NDE examinations required by Order item IV.C.(1)(b) during the upcoming Unit 2 spring 2004 outage of minimal benefit with regard to the safety concerns expressed in the Order. As an alternative to the requirements of the Order, a bare metal visual (BMV) inspection only is proposed, as required by IV.C.(1)(a), which will provide an acceptable level of quality and safety. In addition, performing these examinations will entail an estimated 4.4 Rem radiation dose to the personnel involved. This is a significant amount of personnel radiation exposure and represents a hardship without a compensating increase in the level of quality and safety achieved. Based on the above, relaxation of the requirement to perform inspection per item IV.C.(1)(b) during the Unit 2 spring 2004 outage is warranted.