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Detroit Edison

September 11, 1998
NRC-98-0130

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

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) BWRVIP-05 BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations, dated September 28, 1995

3) NRC Information Notice 97-63: Status of NRC Staff's Review of BWRVIP-05, dated August 7, 1997

4) NRC Information Notice 97-63 Supplement 1: Status of NRC Staff's Review of BWRVIP-05, dated May 7, 1997

5) NRC Letter to Carl Terry, BWRVIP Chairman, "Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report, dated July 28, 1998

Subject: Proposed Alternative to Circumferential Weld Examinations RR-A25

Pursuant to 10CFR55.55a(a)(3), Detroit Edison requests approval of an alternate reactor vessel weld examination for the Fermi 2 Power Plant. Approval of this alternative examination is requested in accordance with the provisions of 10CFR55.55a(a)(3)(i) for a 40 month period.

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Fermi 2 proposes to defer full ultrasonic examination of the Reactor Pressure Vessel (RPV) circumferential shell welds for a period of 40 months. The justification for this deferral is provided in the attached request for relief (RR-A25) and is further supported by Reference 2. Examination of longitudinal RPV shell welds will be completed as scheduled. Additionally, a partial exam of one of the four circumferential welds was completed during the Second Refueling Outage.

Approximately 5 percent of the circumferential seam welds will also be examined at their points of intersection with the longitudinal welds. These inspections are being proposed as an alternative to the augmented examinations specified in 10CFR55.55a(g)(6)(ii)(A)(2) for circumferential welds and as an alternative to the inservice inspection requirements for circumferential welds in the ASME Code, Section XI, 1980 Edition with Winter 1981 Addenda.

The NRC issued Reference 5 on July 28, 1998. Based on the safety evaluation, the NRC staff concluded that Inservice Inspection (ISI) of the BWR RPV circumferential welds is not necessary during the current license term since these welds have low failure frequencies.

The NRC staff has issued a draft Generic Letter (Volume 63 FR 42460, dated August 7, 1998) to grant BWR licensees relief from the requirements to conduct volumetric examinations of the BWR RPV circumferential welds and plans to further clarify this issue in a future revision of 10CFR55.55a.

The enclosure to this letter provides the detailed basis of this proposed alternative examination. If you have any questions or requests for additional information, please contact Mr. Norman K. Peterson at (734) 586-4258.

Sincerely,

Enclosure

cc: B. L. Burgess
G. A. Harris
A. J. Kugler
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

ENCLOSURE TO
NRC-98-0130
RELIEF REQUEST
RR-A25 REVISION 0
6 PAGES

RELIEF REQUEST
RR-A25 REVISION 0

COMPONENT FUNCTION/DESCRIPTION:
Pressure Retaining Reactor Pressure Vessel (RPV) Circumferential Shell Welds
(Welds 4-308A, 4-308B, 1-313, and 9-307)

SYSTEM:
Reactor (B11)

ASME CODE CLASS:
Class 1

ASME SECTION XI REQUIREMENTS:
ASME Section XI, 1980 Edition with Winter 1980 Addenda, Subsection IWB, Table IWB 2500-1, Examination Category B-A, Item No. B1.11, and the augmented examination requirement of 10CFR50.55a(g)(6)(ii)(A)(2) requires volumetric examination of essentially 100% of RPV circumferential weld and base material regions in the reactor pressure vessel each inspection interval.

BASIS FOR ALTERNATIVE:
Pursuant to 10CFR55.55a(a)(3)(i), and consistent with information contained in NRC Information Notice 97-63, Detroit Edison is requesting an alternative from ASME Section XI requirements to examine essentially 100% of accessible Category B-A circumferential welds and is proposing deferral of these examinations for up to 40 months.

The basis for this request for inspection relief is documented in the report "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05)," that was transmitted to the NRC in September 1995. The BWRVIP-05 report provides the technical basis for eliminating inspection of BWR RPV circumferential shell welds. The BWRVIP-05 report concludes that the probability of failure of the BWR RPV circumferential shell welds is orders of magnitude lower than that of the longitudinal shell welds. The NRC staff has conducted an independent risk-informed assessment of the analysis contained in BWRVIP-05. This assessment also concluded that the probability of failure of the BWR RPV circumferential welds is orders of magnitude lower than that of the longitudinal shell welds. Additionally, the NRC assessment demonstrated that inspection of BWR RPV circumferential welds does not measurably affect the probability of failure.

As discussed during the ACRS Full Committee meeting on July 9, 1998 the Staff has completed its evaluation of the BWR Vessel and Internals Project (BWRVIP) recommendations for reduced inspections of the reactor pressure vessel shell welds as described in the BWRVIP-05 report. Based on the Staff's review, it has been concluded that inservice inspection (ISI) of the BWR RPV circumferential welds is not necessary during the current license term since these welds have low failure frequencies. The NRC issued a Final Safety Evaluation documenting acceptance of the BWRVIP-05 report on July 28, 1998.

The NRC Staff has issued a draft Generic Letter (63 FR 42460) to grant BWR licensees relief from the requirements to conduct volumetric examinations of the BWR RPV circumferential welds and plans to further clarify this issue in a future revision of 10CFR55.55a. This independent NRC assessment utilized the FAVOR code to perform a probabilistic fracture mechanics (PFM) analysis to estimate RPV failure probabilities. Three key assumptions in the PFM analysis are: the neutron fluence was that estimated to be end-of-license mean fluence, the chemistry values are mean values based on vessels types and the potential for beyond design basis events is considered.

Although BWRVIP-05 provides the technical basis supporting this relief request, the following information is provided to show the conservatism of the NRC analysis for the Fermi 2 Nuclear Power Plant. For plants with RPVs fabricated by Combustion Engineering the mean end-of-license neutron fluence use in the NRC PFM analysis was 5.3×10^{17} n/cm^2. However, at Fermi 2 the highest fluence anticipated at the end of the requested relief period is 2.0×10^{17} n/cm^2. Thus, embrittlement due to fluence effects is much lower and the NRC analysis as described in IN 97-63 is conservative for Fermi 2 in this regard. Therefore, there is significant conservatism in the already low circumferential weld failure probabilities as related to Fermi 2. Other Fermi 2 RPV shell weld information that the NRC staff has requested to be included in this relief request is provided in attached Table 1.

At an August 8, 1997 meeting with industry, the NRC staff indicated that the potential for, and consequences of, nondesign basis events (not addressed in the BWRVIP-05 report) should be considered. In particular, the NRC staff stated that nondesign basis cold over-pressure transients should be considered. It is highly unlikely that a BWR would experience a cold overpressure transient. For a BWR to experience such an event multiple operator errors would be required. At the August 8, 1997 meeting, the NRC staff described several types of events that could be precursors to BWR RPV cold over pressure transients. These were identified as precursors because no cold overpressure event has occurred at a U.S. BWR. Also at the August 8 meeting, the NRC staff identified one actual cold overpressure event that occurred during shutdown at a non-U.S. BWR. This event apparently included several operator errors that resulted in a maximum RPV pressure of 1150 psi with a temperature range of 79°F to 88°F.

As provided in the following discussion, Fermi 2 has in place procedures and Technical Specifications which monitor and control reactor pressure, temperature, and water inventory during all aspects of cold shutdown which would minimize the likelihood of a Low Temperature Over-Pressurization (LTOP) event from occurring. Additionally, these procedures are reinforced through operator training.

The Pressure Test procedures which are used at Fermi 2, have sufficient procedural guidance to prevent a cold, over-pressurization event. Pressure testing is performed at the conclusion of each outage. The system leakage tests include requirements for operations management to perform a "pre-job briefing" with all essential personnel. This briefing details the anticipated testing evolution with special emphasis on: conservative decision making, plant safety awareness, lessons learned from similar in-house or industry operating experiences, the importance of open communications, and finally, the process in which the test would be aborted if plant systems responded in an adverse manner. Vessel temperature and pressure are required to be monitored throughout these tests to ensure compliance with the Technical Specification pressure-temperature curve.

Additionally, to ensure a controlled, deliberate pressure increase, the rate of pressure increase is administratively limited throughout the performance of the test. If the pressurization rate exceeds this limit, direction is provided to remove the CRD pumps which are used for pressurization, from service.

With regard to inadvertent system injection resulting in an LTOP condition, the high pressure make-up systems (High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) systems, as well as the normal feedwater supply (via the Reactor Feedwater Pumps) at Fermi 2 are all steam driven. During reactor cold shutdown conditions, no reactor steam is available for the operation of these systems. Therefore, it is not possible for these systems to contribute to an over-pressure event while the unit is in cold shutdown.

In the case of low pressure system initiation, the Fermi 2 pressure-temperature limit curves for hydrostatic testing (Technical Specifications Figure 3.4.6.1-1), permit pressures up to 312 psig at temperatures from 71^0F up to 100^0F. Above 100^0F, the permissible pressure increases immediately to near 600 psig and increases rapidly with increasing temperature. The shutoff head for the Core Spray and Residual Heat Removal Pumps are both below 400 psig. Therefore, the potential for an over-pressurization event which would exceed the pressure-temperature limits, due to an inadvertent actuation of these system is very low.

Procedural control is also in place to respond to an unexpected or unexplained rise in reactor water level which could result from a spurious actuation of an injection system. Actions specified in this procedure included preventing condensate pump injection, securing ECCS system injection, tripping CRD pumps, terminating other injection sources, lowering RPV level via the RWCU system, and the steam line drains.

In addition to procedural barriers, Licensed Operator Training is given which further reduces the possibility of the occurrence of LTOP events. During Initial Licensed Operator Training the following topics are covered: Brittle fracture and vessel thermal stress; Operational Transient (OT) procedures, including the OT on reactor high level; Technical Specifications training, including Section 3.4.6, "RCS Pressure/Temperature (P/T) Limits" and Simulator Training of plant heatup and cooldown including performance of surveillance tests which ensure pressure-temperature curve compliance.

In addition to the above, continuous review of industry operating plant experiences is conducted to ensure that the Fermi 2 procedures consider the impact of actual events, including potential LTOP events. Appropriate adjustments to the procedures and associated training are then implemented to preclude similar situations from occurring at Fermi 2.

Based on the above, the probability of a cold over-pressure transient is considered to be highly unlikely.

The NRC staff has transmitted a Request for Additional Information (RAI) regarding the BWRVIP-05 report to the BWR Vessel and Internals Project (BWRVIP). The BWRVIP has provided a response to the RAI that included additional information on the BWRVIP PFM analysis,

comparisons to the NRC Staff PFM analysis and additional information regarding beyond design basis cold overpressure transients. We believe the BWRVIP-05 report and the NRC Final Safety Evaluation analysis provided sufficient basis to support this relief request.

Based on the documentation in BWRVIP-05, the risk-informed independent assessment performed by the NRC staff and the discussion above, a delay for 40 months in completing this inspection of the RPV circumferential shell welds at Fermi 2 is justified.

TABLE 1
Fermi 2 RPV Shell Weld Information
Bounding Circumferential Weld

Neutron fluence at the end of the requested relief period	2.0×10^{17} n/cm^2
Initial (unirradiated) reference temperature	-50°F
Weld Chemistry factor (CF)	236°F
Weld Copper content	0.23%
Weld Nickel content	1.0%
Increase in reference temperature due to irradiation (ΔRT_{NDT})	31.6°F
Margin term	31.6°F
Mean adjusted reference temperature (ART)	-18.4°F
Upper bound adjusted reference temperature (ART)	13.2°F

ALTERNATIVE DURING THE 40 MONTH DEFERRAL PERIOD:

The beltline circuferential weld (1-313) was partially examined (approximately 54% complete) during RF02 (Spring 1991). Additionally, Detroit Edison will perform examination of approximately 5% of the Fermi 2 RPV circumferential weld areas only at the intersection of longitudinal seams.

RR-A25 Figure 1
Shell Weld Layout