Commonwealth Edison Company
Dresden Generating Station
6500 North Dresden Road
Morris, IL 60450
Tel 815-942-2920

ComEd

July 26, 1999

JMHLTR: #99-0078

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

Dresden Nuclear Power Station, Units 2 and 3
Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Subject: Relief Request for Alternative Weld Examination of Circumferential Reactor Pressure Vessel Shell Welds

References:
(1) NRC Generic Letter 98-05, "Boiling Water Reactor Licensees Use Of The BWRVIP-05 Report To Request Relief from Augmented Examination Requirements On Reactor Pressure Vessel Circumferential Shell Welds," dated November 10, 1998.

(2) Letter from the Boiling Water Reactor Vessel Internals Projects (BWRVIP) to the US NRC, "BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations," document BWRVIP-05, dated April 14, 1998.

(3) Letter from the US NRC to the BWRVIP, "Final Safety Evaluation of the BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations, BWRVIP-05," dated July 28, 1998.

The purpose of this letter is to request permanent relief from the inservice inspection requirements of 10 CFR 50.55a(g) for the volumetric examinations of circumferential reactor pressure vessel shell welds. Inspection of these welds is required by the 1989 Edition of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, "Rules for the In-service Inspection of Nuclear Power Plant Components," paragraph IWB-2500, Examination Category B-A, Item No. B1.10, and the augmented examinations specified in 10CFR50.55a(g)(6)(ii)(A)(2).

Commonwealth Edison (ComEd) Company, in accordance with 10 CFR 50.55a(a)(3)(i) and 50.55a(g)(6)(ii)(A)(5), requests approval of this alternative proposal for examination

9908030181 990726
PDR ADOCK 05000237
Q PDR

A047

of the Dresden Nuclear Power Station, Units 2 and 3, reactor pressure vessel (RPV) circumferential shell welds as described in the attached relief request.

In NRC Generic Letter (GL) 98-05, "Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Shell Welds," Reference 1, the NRC has indicated that it would consider technically justified requests for permanent relief from the inspection of boiling water reactor (BWR) circumferential shell welds if the licensee meets the following criteria:

1) At the expiration of the license, the RPV shell circumferential welds will continue to satisfy the limiting conditional failure probability for RPV shell circumferential welds that is established in the July 30, 1998, Safety Evaluation, and

2) Licensees have implemented operator training and established procedures that limit the frequency of cold over-pressure events to the amount specified in the July 30, 1998, Safety Evaluation.

The basis for this alternative inspection is discussed in Section III of the attached relief request. This basis is consistent with the methodology used in Boiling Water Reactor Vessel Internal Projects report, Reference 2, and the provisions of the NRC's Final Safety Evaluation, Reference 3, and meets the aforementioned criteria contained in GL 98-05. Based on our review, we have concluded that this alternative inspection provides an acceptable level of quality and safety and satisfies the requirement of 10CFR50.55a(a)(3)(i). We are requesting that this permanent relief be granted by February 16, 2000.

Should you have any questions concerning this letter, please contact Mr. D.F. Ambler at (815) 942-2920 extension 3800.

Respectfully,

J.M. Heffley
Site Vice President
Dresden Nuclear Power Station

Attachment

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station

**Attachment**
**Relief Request No. CR-18**

RELIEF REQUEST No. CR-18
Revision 0

I. IDENTIFICATION OF COMPONENTS

Class 1 pressure retaining reactor pressure vessel (RPV) shell circumferential and longitudinal welds, Examination Category B-A, Item Numbers B1.11 and B1.12.

II. CODE AND REGULATORY REQUIREMENTS

In accordance with the provisions of 10CFR50.55a(a)(3) and 50.55a(g)(6)(ii)(A)(5), Dresden Nuclear Power Station requests permanent relief for the remaining term of the operating licenses for Units 2 and 3, from the following requirements:

1. Volumetric examination of all Reactor Pressure Vessel (RPV) shell circumferential welds in the Reactor Vessel in accordance with the requirements of American Society of Mechanical Engineers (ASME) Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 1989 Edition, Examination Category B-A, Item B 1.11.

2. Volumetric examination of all RPV shell circumferential welds in the reactor vessel in accordance with the augmented examination of reactor vessel requirements of 10CFR50.55a(g)(6)(ii)(A)(2), during the in-service inspection interval in effect in September 8, 1992.

III. BASIS FOR RELIEF

The technical basis providing justification for relief from the examination requirements of RPV shell circumferential welds is contained in a report submitted from the Boiling Water Reactor Vessel Internals Program (BWRVIP) to the NRC (i.e. Reference 2). This report was evaluated and a safety evaluation was issued by the USNRC to the BWRVIP by Reference 3. Additionally, NRC Generic Letter (GL) 98-05 (i.e. Reference 1) permits BWR licensees to request permanent relief from the in-service inspection requirements of 10 CFR 50.55a(g) for the volumetric examination of RPV shell circumferential welds (ASME Section XI, Table IWB-2500-1, Examination Category B-A, Item 1.11, Circumferential Shell Welds). This relief can be granted by demonstrating two criteria: (1) at the expiration of their license, the RPV shell circumferential welds will continue to satisfy the limiting conditional failure probability for RPV shell circumferential welds that is established in the July 30, 1998, Safety Evaluation, and (2) licensees have implemented operator training and established procedures that limit the frequency of cold over-pressure events to the amount specified in the July 30, 1998, Safety Evaluation.

Criteria 1: Demonstrate that at the expiration of the license, the RPV shell circumferential welds will continue to satisfy the limiting conditional failure probability for RPV shell circumferential welds that is established in the July 30, 1998, Safety Evaluation.

The USNRC evaluation of BWRVIP-05 utilized the FAVOR code to perform a probabilistic fracture mechanics (PFM) analysis to estimate the RPV shell weld failure probabilities. Three key assumptions of the PFM analysis are: 1) the neutron fluence used was the estimated end-of-life mean fluence, 2) the chemistry values are mean values based on vessel types, and 3) the potential for beyond-design-basis events is considered. The following table provides a comparison of the limiting reactor vessel circumferential weld parameters for each unit to those used in the NRC analysis for the first two key assumptions.

**Table 1, Effects of Irradiation on RPV Weld Properties**

| Parameter Description | Dresden Unit 2 Parameters at 32 EFPY Weld Wire Heat / Flux Lot # 71249 / 8504[1] | Dresden Unit 3 Parameters at 32 EFPY, Weld Wire Heat / Flux Lot # 299L44/8650 WF-19/WF-25[1] | USNRC Limiting Plant Specific Analysis (32 EFPY)[2] |
|---|---|---|---|
| Copper, wt.% | 0.23 | 0.34 | 0.31 |
| Nickel, wt.% | 0.59 | 0.68 | 0.59 |
| Chemistry Factor | 168 | 220.6 | 196.7 |
| End-of Life Inside Diameter Fluence, $x10^{19}$ n/cm$^2$ | .036 | .051 | 0.095 |
| $\Delta RT_{NDT}$, °F | 33.05 | 53.33 | 79.8 |
| $RT_{NDT(U)}$, °F | 10 | -5 | 20 |
| Mean $RT_{NDT}$, °F | 43.05 | 48.33 | 99.8 |

(1) Letter from R. Krich (ComEd) to the US NRC, "Response to Request for Additional Information Regarding Reactor Pressure Vessel Integrity," dated July 30,1998.
(2) Letter from the US NRC to the BWRVIP, "Final Safety Evaluation of the BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations, BWRVIP-05 (TAC No. M93925)," dated July 28, 1998, Table 2.6-4.

Although the chemistry composition and chemistry factor for Unit 3 are higher than the limits of the NRC Analysis, the 32 Effective Full Power Years (EFPY) fluence is considerably lower for both Dresden Nuclear Power Station, Units 2 and 3. As a result, the shifts in reference temperature for both units are lower than the 32 EFPY shift from the NRC analysis. In addition, the unirradiated reference temperatures for both Dresden units are lower. The combination of

unirradiated reference temperature and embrittlement shift yields adjusted reference temperatures considerably lower than the NRC mean analysis values. Therefore, the RPV shell weld embrittlement due to fluence is calculated to be less for each unit than the NRC's limiting case and each Unit's RPV shell circumferential weld failure probabilities are considered to be bounded by the conditional failure probability, P(FIE), in the US NRC's Limiting Plant Specific Analysis (32 EFPY) through the projected end of license. Therefore both Units 2 and 3 RPVs are bounded by the NRC's Safety Evaluation.

Criteria 2: Licensees have implemented operator training and established procedures that limit the frequency of cold over-pressure events to the amount specified in the July 30, 1998 Safety Evaluation.

ComEd has procedures in-place for Dresden Nuclear Power Station, Units 2 and 3, that guide operators in controlling and monitoring reactor pressure during all phases of operation, including cold shutdown. Use of these procedures will prevent a Low Temperature Over-Pressurization (LTOP) event, and are reinforced through operator training. Dresden operating procedures have sufficient guidance to prevent an LTOP event. These procedures are performed prior to each restart after a refueling outage. Also, an administrative procedure requires an operations briefing prior to test commencement with all involved personnel. Vessel temperature and pressure is required to be monitored and controlled to within the limitations of the applicable Technical Specifications pressure-temperature (P-T) curve during all portions of testing. The normal and contingency methods to enact pressure control are specified.

A "Test Coordinator", a Senior Reactor Operator, is also designated during cold pressure testing. The Test Coordinator is responsible for the coordination of the test from initiation to conclusion and to maintain cognizance of test status. A controlled rate of pressure increase is administratively limited in the test procedure to no greater than 30 psi per minute. If the rate of pressurization exceeds this limit, a contingency sequence portion of the testing procedures provides directions to reduce the rate of pressure increase by depressurizing through the Reactor Water Clean-Up system, securing Control Rod Drive (CRD) pumps, and opening the reactor vessel head vent valves.

Other than the CRD system, the only high-pressure coolant sources that could inadvertently initiate and result in an LTOP event are the Feedwater and High Pressure Coolant Injection (HPCI) systems. During a normal RPV fill sequence prior to pressure testing, the condensate system is used to fill the reactor. The test procedure then closes the valves downstream of the feed regulating station, which isolates feedwater from the RPV. In any case, the feed pump motors are prevented from starting by the RPV high-level feed pump trip signal present due to the high reactor water levels required during pressure testing. During pressure testing, the reactor is in cold shutdown, and, as a result, there is no steam available to drive the turbine driven HPCI pumps. In addition, the HPCI

steam supply and pump discharge valves are closed and their associated motor operator breakers are opened in accordance with the test procedures.

Low-pressure coolant sources include Emergency Core Cooling Systems (ECCS) (i.e. Core Spray and LPCI) and the condensate system. The ECCS systems are placed into configurations by testing procedure steps that allow pressure testing between the closed containment isolation valves. As a result of the isolation valve closure, the ECCS pumps are isolated from the RPV. In addition, the shut-off head of the ECCS pumps is sufficiently low that an LTOP event that would significantly exceed the P-T curve limits, due to an inadvertent ECCS injection, is not possible. As mentioned above, the condensate system is normally used for RPV fill and then isolated from the reactor.

During cold shutdown when the reactor head is tensioned, an LTOP is prevented by the operating shutdown procedure, which requires the operator to place the reactor vessel head vent valves in an open position when reactor coolant temperatures are below 190°F.

In addition to procedural barriers, Licensed Operators are provided specific training on the P-T Curves and requirements of the Technical Specifications. Simulator sessions are conducted which focus on plant heat-up and cool-down and equipment surveillance where adherence to these specifications is required. Additionally, in response to industry operating experience and events, the Operations Training instructors and staff routinely evaluate and develop operating training programs to reduce the possibility of events such as LTOP.

## IV. ALTERNATE PROVISIONS

In accordance with 10CFR50.55a(a)(3)(i) and 10CFR50.55a(g)(6)(ii)(A)(5), ComEd considers the following alternate provisions for the subject weld examinations.

In-service Inspection Scope

The failure frequency for ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11, "Reactor Pressure Vessel Shell Circumferential Welds," is sufficiently low to justify their elimination from the ISI and the Augmented Examination requirements of 10CFR50.55a(g).

The ISI and Augmented Examination requirements of 10CFR50.55a(g) for ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12, "Reactor Pressure Vessel Shell Longitudinal (also known as vertical or axial) Welds," shall be performed to the extent possible, and shall include inspection of the circumferential welds only at the intersection of these welds with the axial welds, or approximately 2-3% of the RPV shell circumferential welds. ComEd believes that when this examination is performed, an automated ultrasonic system will provide the best possible examination of the RPV shell

vertical welds. These welds are generally only accessible from inside surfaces of the RPV. Inspections from the outside surfaces have limited access due to the close proximity of the biological shield to the RPV shell. Also, the reflective insulation that occupies this space is not designed to be removed.

The procedures for these examinations shall be qualified such that flaws relevant to the RPV integrity can be reliably detected and sized, and the personnel implementing these procedures shall be qualified in the use of these procedures.

Successive Examination of Flaws

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11, "Reactor Pressure Vessel Shell Circumferential Welds," at intersections with longitudinal (axial) welds, successive examinations per IWB-2420, "Successive Inspections," are not required for non-threatening flaws (i.e. original vessel material or fabrication flaws such as inclusions which exhibit negligible or no growth during the design life of the vessel), provided that the following conditions are met:

1. The flaw is characterized as subsurface in accordance with BWR Vessel and Internals Projects Report BWRVIP-05, "Reactor Pressure Vessel Shell Weld Inspection Recommendations;"

2. The NDE technique and evaluation that detected and characterized the flaw as originating from material manufacture or vessel fabrication is documented in a flaw evaluation report; and,

3. The vessel containing the flaw is acceptable for continued service in accordance with IWB-3600, "Analytical Evaluation of Flaws," and the flaw is demonstrated acceptable for the intended service life of the vessel.

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12, "Reactor Pressure Vessel Shell Longitudinal (Axial) Welds," all flaws shall be re-inspected at successive intervals consistent with the ASME Code and regulatory requirements.

Additional Examinations of Flaws

For ASME Section XI, Table IWB-2500-1, Examination Category B-A, Item No.B1.11, "Reactor Pressure Vessel Shell Circumferential Welds," at the intersection with longitudinal (axial) welds, additional requirements per IWB-2430, "Additional Examinations," are not required for flaws provided the following conditions are met:

1. If the flaw is characterized as sub-surface in accordance with BWR Vessel and Internals project Report BWRVIP-05, "Reactor Pressure Shell Weld Inspection Recommendations," then no additional examinations are required;

2. If the flaw is not characterized as subsurface surface in accordance with BWR Vessel and Internals project Report BWRVIP-05, "Reactor Pressure Shell Weld Inspection Recommendations," then an engineering evaluation shall be performed, addressing the following as a minimum:
   - A determination of the root cause of the flaw,
   - An evaluation of any potential failure mechanisms,
   - An evaluation of service conditions which could cause subsequent failure,
   - An evaluation per IWB-3600 demonstrating that the vessel is acceptable for continued service; and

3. If the flaw meets the criteria of IWB-3600 for the intended service life of the vessel, then additional examinations may be limited to those welds subject to the root cause conditions and failure mechanisms, up to the number of examinations required by IWB-2430(a). If the engineering evaluation determines that there are no additional welds subject to the same root cause conditions, or no failure mechanism exists, then no additional examinations are required.

For ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.12, "Longitudinal (axial) Reactor Pressure Vessel Shell Welds," additional examination for flaws shall be in accordance with IWB-2430, "Additional Examinations." All flaws in RPV shell longitudinal welds shall require additional examinations consistent with the ASME Code and regulatory requirements. Examinations of the RPV shell circumferential welds shall be performed if RPV shell longitudinal (axial) welds reveal an active, mechanistic mode of degradation.

In summary, ComEd has reviewed the methodology used in the Boiling Water Reactor Vessel Internals Project report, BWRVIP-05, and, considering Dresden plant specific materials properties, fluence and operational practices, and the provisions of the NRC Safety Evaluation Report TAC No. M93925, ComEd believes that the criteria established in Generic Letter 98-05 are satisfied. Therefore, permanent relief is requested from the examination requirements of 10CFR 50.55a for reactor pressure vessel circumferential shell welds since the proposed alternative provides an acceptable level of quality and safety.