Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

July 26, 1991

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Dresden Nuclear Power Station Units 2 and 3
Quad Cities Nuclear Power Station Units 1 and 2
Revision to Bases Section 3.6.B of Facility
Operating Licenses DPR-19, DPR-25, DPR-29 and DPR-30,
Appendix A, Technical Specifications
NRC Docket Nos. 50-237/249 and 50-254/265

References: (a) R. Stols (CECo) letter to T. Murley (NRC), dated October 23, 1989.

(b) R. Stols (CECo) letter to T. Murley (NRC), dated March 23, 1990.

Dr. Murley:

Reference (a) submitted proposed amendments to the Technical Specifications for Dresden Station Units 2 and 3 (Operating Licenses DPR-19 and DPR-25) and Quad Cities Station Units 1 and 2 (Operating Licenses DPR-29 and DPR-30). The proposed amendments revised the pressure-temperature operating limits to reflect the requirements of Regulatory Guide 1.99, Revision 2 (Radiation Embrittlement of Reactor Vessel Materials). Reference (b) provided additional information with respect to the amendment request.

As a result of recent discussions with your staff, the bases section for the pressure-temperature operating limits (Bases Section 3.6.B, Pressurization Temperature) previously proposed in Reference (a) has been rewritten/revised for each unit (Dresden Units 2 and 3, Quad Cities Units 1 and 2). The revision enhances the bases section discussion on the pressure-temperature operating limits, and provides a consistent bases format for each unit. Attachment 'A' presents a summary of the bases section changes, and Attachment 'B' provides the marked-up Technical Specification pages with the requested changes.

Additionally, an enhanced copy of the Pressure-Temperature Curves previously presented in Reference (a) are provided in Attachments 'C' and 'D' for Dresden (Units 2 and 3) and Quad Cities (Units 1 and 2) Stations, respectively.

Commonwealth Edison Company (CECo) is notifying the State of Illinois of this revision to the Reference (a) amendment request by transmitting a copy of this letter and its attachments to the designated State Official.

ZNLD/ID963:4

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Please contact this office should further information be required.

Respectfully,

Milton H. Richter

M. H. Richter
Nuclear Licensing Administrator

Attachments: A - Summary of Proposed Changes
B - Proposed Changes to Appendix A Technical Specifications
C - Figure 3.6.1 for Dresden Units 2 and 3
D - Figure 3.6-1 for Quad Cities Units 1 and 2

cc: A.B. Davis - Regional Administrator, Region III
B.L. Siegel - NRR Project Manager, Dresden
W.G. Rogers - Senior Resident Inspector, Dresden
L.N. Olshan - NRR Project Manager, Quad Cities
T. Taylor - Senior Resident Inspector, Quad Cities
Illinois Department of Nuclear Safety

Signed before me on this 26th day
of July, 1991
by [signature]
Notary Public

" OFFICIAL SEAL "
SANDRA C. LARA
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 6/25/94

ATTACHMENT A

SUMMARY OF PROPOSED CHANGES

Facility Operating License DPR-19 (Dresden Unit 2)

- Page B3/4.6-26:
    - Replace text with Insert 1.

Facility Operating License DPR-25 (Dresden Unit 3)

- Page B3/4.6-26:
    - Replace text with Insert 2.

Facility Operating License DPR-29 (Quad Cities Unit 1)

- Pages 3.6/4.6-16 and 3.6/4.6-17:
    - Replace text for bases section 3.6.B with Insert 3.

Facility Operating License DPR-30 (Quad Cities Unit 2)

- Pages 3.6/4.6-8 and 3.6/4.6-9:
    - Replace text for bases section 3.6.B with Insert 4.

INSERT '1'

B. Pressurization Temperature - The reactor vessel is a primary barrier against the release of fission products to the environs. In order to provide assurance that this barrier is maintained at a high degree of integrity, pressure-temperature limits have been established for the operating conditions to which the reactor vessel can be subjected. Figure 3.6.1 presents the pressure-temperature curves for those operating conditons; Inservice Hydrostatic Testing (Curve A), Non-Nuclear Heatup/Cooldown (Curve B), and Core Critical Operation (Curve C). These curves have been established to be in conformance with Appendix G to 10 CFR 50 and Regulatory Guide 1.99, Revision 2, and take into account the change in reference nil-ductility transition temperature (RT_{NDT}) as a result of neutron embrittlement. The adjusted reference temperature (ART) of the limiting vessel material is used to account for irradiation effects.

Three vessel regions are considered for the development of the pressure-temperature curves: 1) the core beltline region; 2) the non-beltline region (other than the closure flange region); and 3) the closure flange region. The beltline region is defined as that region of the reactor vessel that directly surrounds the effective height of the reactor core (between the bottom and top of active fuel), and is subject to an RT_{NDT} adjustment to account for irradiation embrittlement. The non-beltline and closure flange regions receive insufficient fluence to necessitate an RT_{NDT} adjustment. These regions contain components which include; the reactor vessel nozzles, closure flanges, top and bottom head plates, control rod drive penetrations, and shell plates that do not directly surround the reactor core. Although the closure flange region is a non-beltline region, it (the closure flange region) is treated separately for the development of the pressure-temperature curves to address 10 CFR 50 Appendix G requirements.

In evaluating the adequacy of the steel which comprises the reactor vessel, it is necessary that the following be established: 1) the RT_{NDT} for all vessel and adjoining materials; 2) the relationship between RT_{NDT} and integrated neutron flux (fluence, at energies greater than one Mev); and 3) the fluence at the location of a postulated flaw.

Boltup Temperature

The initial RT_{NDT} of the main closure flanges, the shell and head materials connecting to these flanges, the connecting welds, and the vertical electroslag welds which terminate immediately below the vessel flange are all 20°F or lower. Therefore, the minimum allowable boltup temperature is established as 80°F (RT_{NDT} + 60°F) which includes a 60°F conservatism required by the original ASME Code of construction.

Curve A - Hydrotesting

As indicated in Curve A of Figure 3.6.1 for system hydrotesting, the minimum metal temperature of the reactor vessel shell is 80°F for reactor pressures less than 312 psig. This 80°F minimum boltup temperature is based on a RT_{NDT} of 20°F for the top head plate (most limiting material) and a 60°F conservatism required by the original ASME Code of construction.

At reactor pressures greater than 312 psig the minimum vessel metal temperature is established as 110°F. The 110°F minimum temperature is based on a closure flange region RT_{NDT} of 20°F and a 90°F conservatism required by 10 CFR 50 Appendix G for pressure in excess of 20% of the preservice hydrostatic test pressure (1563 psig).

At approximately 620 psig reactor pressure the effects of pressurization become more limiting than the boltup stresses at the closure flange region, as shown by the non-linear portion of Curve A intersecting the vertical 110°F line. The non-linear portion of the curve is dependent on the non-beltline region (which is actually more limiting than the beltline region through a vessel exposure of 22 effective full power years), and based on a RT_{NDT} of 40°F.

Curve B - Non-Nuclear Heatup/Cooldown

Curve B of Figure 3.6.1 applies during heatups with non-nuclear heat (e.g. recirculation pump heat) and during cooldowns when the reactor is not critical (e.g. following a scram). The curve provides the minimum reactor vessel metal temperatures based on the most limiting vessel stress (non-beltline stresses).

As indicated by the vertical 80°F line, the boltup stresses at the closure flange region are most limiting below approximately 80 psig. Above approximately 80 psig, pressurization and thermal stresses become more limiting than the boltup stresses, which is reflected by the non-linear portion of Curve B. The non-linear portion of the curve is dependent on the non-beltline region (which is actually more limiting than the beltline region through a vessel exposure of 22 effective full power years), and based on a RT_{NDT} of 40°F.

Curve C - Core Critical Operation

Curve C, the core critical operation curve shown in Figure 3.6.1, is generated in accordance with 10 CFR 50 Appendix G which requires core critical pressure-temperature limits to be 40°F above any Curve A or B limits. Since Curve B is more limiting, Curve C is Curve B plus 40°F.

INSERT '2'

B. Pressurization Temperature - The reactor vessel is a primary barrier against the release of fission products to the environs. In order to provide assurance that this barrier is maintained at a high degree of integrity, pressure-temperature limits have been established for the operating conditions to which the reactor vessel can be subjected. Figure 3.6.1 presents the pressure-temperature curves for those operating conditions; Inservice Hydrostatic Testing (Curve A), Non-Nuclear Heatup/Cooldown (Curve B), and Core Critical Operation (Curve C). These curves have been established to be in conformance with Appendix G to 10 CFR 50 and Regulatory Guide 1.99, Revision 2, and take into account the change in reference nil-ductility transition temperature (RT_{NDT}) as a result of neutron embrittlement. The adjusted reference temperature (ART) of the limiting vessel material is used to account for irradiation effects.

Three vessel regions are considered for the development of the pressure-temperature curves: 1) the core beltline region; 2) the non-beltline region (other than the closure flange region); and 3) the closure flange region. The beltline region is defined as that region of the reactor vessel that directly surrounds the effective height of the reactor core (between the bottom and top of active fuel), and is subject to an RT_{NDT} adjustment to account for irradiation embrittlement. The non-beltline and closure flange regions receive insufficient fluence to necessitate an RT_{NDT} adjustment. These regions contain components which include; the reactor vessel nozzles, closure flanges, top and bottom head plates, control rod drive penetrations, and shell plates that do not directly surround the reactor core. Although the closure flange region is a non-beltline region, it (the closure flange region) is treated separately for the development of the pressure-temperature curves to address 10 CFR 50 Appendix G requirements.

In evaluating the adequacy of the steel which comprises the reactor vessel, it is necessary that the following be established: 1) the RT_{NDT} for all vessel and adjoining materials; 2) the relationship between RT_{NDT} and integrated neutron flux (fluence, at energies greater than one Mev); and 3) the fluence at the location of a postulated flaw.

Boltup Temperature

The initial RT_{NDT} of the main closure flanges, the shell and head materials connecting to these flanges, and connecting welds is 10°F; however, the vertical electroslag welds which terminate immediately below the vessel flange have an RT_{NDT} of 40°F. Therefore, the minimum allowable boltup temperature is established as 100°F (RT_{NDT} + 60°F), which includes a 60°F conservatism required by the original ASME Code of construction.

Curve A - Hydrotesting

As indicated in Curve A of Figure 3.6.1 for system hydrotesting, the minimum metal temperature of the reactor vessel shell is 100°F for reactor pressures less than 312 psig. This 100°F minimum boltup temperature is based on a RT_{NDT} of 40°F for the electroslag weld immediately below the vessel flange and a 60°F conservatism required by the original ASME Code of construction.

At reactor pressures greater than 312 psig the minimum vessel metal temperature is established as 130°F. The 130°F minimum temperature is based on a closure flange region RT_{NDT} of 40°F and a 90°F conservatism required by 10 CFR 50 Appendix G for pressure in excess of 20% of the preservice hydrostatic test pressure (1563 psig).

At approximately 650 psig the effects of pressurization are more limiting than the boltup stresses at the closure flange region, hence a family of non-linear curves intersect the 130°F vertical line. Beltline as well as non-beltline curves have been provided to allow separate monitoring of the two regions. Beltline curves as a function of vessel exposure for 12, 14 and 16 effective full power years (EFPY) are presented to allow the use of the appropriate curve up to 16 EFPY of operation.

Curve B - Non-Nuclear Heatup/Cooldown

Curve B of Figure 3.6.1 applies during heatups with non-nuclear heat (e.g., recirculation pump heat) and during cooldowns when the reactor is not critical (e.g., following a scram). The curve provides the minimum reactor vessel metal temperatures based on the most limiting vessel stress.

As indicated by the vertical 100°F line, the boltup stresses at the closure flange region are most limiting for reactor pressures below approximately 110 psig. For reactor pressures greater than approximately 110 psig, pressurization and thermal stresses become more limiting than the boltup stresses, which is reflected by the non-linear portion of Curve B. The non-linear portion of the curve is dependent on non-beltline and beltline regions, with the beltline region temperature limits having been adjusted to account for vessel irradiation (up to a vessel exposure of 16 EFPY). The non-beltline region is limiting between approximately 110 psig and 830 psig. Above approximately 830 psig, the beltline region becomes limiting.

Curve C - Core Critical Operation

Curve C, the core critical operation curve shown in Figure 3.6.1, is generated in accordance with 10 CFR 50 Appendix G which requires core critical pressure-temperature limits to be 40°F above any Curve A or B limits. Since Curve B is more limiting, Curve C is Curve B plus 40°F.

INSERT '3'

B. Pressurization Temperature

The reactor vessel is a primary barrier against the release of fission products to the environs. In order to provide assurance that this barrier is maintained at a high degree of integrity, pressure-temperature limits have been established for the operating conditions to which the reactor vessel can be subjected. Figure 3.6-1 presents the pressure-temperature curves for those operating conditions; Inservice Hydrostatic Testing (Curve A), Non-Nuclear Heatup/Cooldown (Curve B), and Core Critical Operation (Curve C). These curves have been established to be in conformance with Appendix G to 10 CFR 50 and Regulatory Guide 1.99, Revision 2, and take into account the change in reference nil-ductility transition temperature (RT_{NDT}) as a result of neutron embrittlement. The adjusted reference temperature (ART) of the limiting vessel material is used to account for irradiation effects.

Three vessel regions are considered for the development of the pressure-temperature curves: 1) the core beltline region; 2) the non-beltline region (other than the closure flange region); and 3) the closure flange region. The beltline region is defined as that region of the reactor vessel that directly surrounds the effective height of the reactor core (between the bottom and top of active fuel), and is subject to an RT_{NDT} adjustment to account for irradiation embrittlement. The non-beltline and closure flange regions receive insufficient fluence to necessitate an RT_{NDT} adjustment. These regions contain components which include; the reactor vessel nozzles, closure flanges, top and bottom head plates, control rod drive penetrations, and shell plates that do not directly surround the reactor core. Although the closure flange region is a non-beltline region, it (the closure flange region) is treated separately for the development of the pressure-temperature curves to address 10 CFR 50 Appendix G requirements.

In evaluating the adequacy of the steel which comprises the reactor vessel, it is necessary that the following be established: 1) the RT_{NDT} for all vessel and adjoining materials; 2) the relationship between RT_{NDT} and integrated neutron flux (fluence, at energies greater than one Mev); and 3) the fluence at the location of a postulated flaw.

Boltup Temperature

The initial RT_{NDT} of the main closure flanges, the shell and head materials connecting to these flanges, and connecting welds is 10°F; however, the vertical electroslag welds which terminate immediately below the vessel flange have an RT_{NDT} of 40°F. Therefore, the minimum allowable boltup temperature is established as 100°F (RT_{NDT} + 60°F), which includes a 60°F conservatism required by the original ASME Code of construction.

Curve A - Hydrotesting

As indicated in Curve A of Figure 3.6-1 for system hydrotesting, the minimum metal temperature of the reactor vessel shell is 100°F for reactor pressures less than 312 psig. This 100°F minimum boltup temperature is based on a RT_{NDT} of 40°F for the electroslag weld immediately below the vessel flange and a 60°F conservatism required by the original ASME Code of construction.

At reactor pressures greater than 312 psig the minimum vessel metal temperature is established as 130°F. The 130°F minimum temperature is based on a closure flange region RT_{NDT} of 40°F and a 90°F conservatism required by 10 CFR 50 Appendix G for pressure in excess of 20% of the preservice hydrostatic test pressure (1563 psig).

At approximately 650 psig the effects of pressurization are more limiting than the boltup stresses at the closure flange region, hence a family of non-linear curves intersect the 130°F vertical line. Beltline as well as non-beltline curves have been provided to allow separate monitoring of the two regions. Beltline curves as a function of vessel exposure for 12, 14 and 16 effective full power years (EFPY) are presented to allow the use of the appropriate curve up to 16 EFPY of operation.

Curve B - Non-Nuclear Heatup/Cooldown

Curve B of Figure 3.6-1 applies during heatups with non-nuclear heat (e.g., recirculation pump heat) and during cooldowns when the reactor is not critical (e.g., following a scram). The curve provides the minimum reactor vessel metal temperatures based on the most limiting vessel stress.

As indicated by the vertical 100°F line, the boltup stresses at the closure flange region are most limiting for reactor pressures below approximately 110 psig. For reactor pressures greater than approximately 110 psig, pressurization and thermal stresses become more limiting than the boltup stresses, which is reflected by the non-linear portion of Curve B. The non-linear portion of the curve is dependent on non-beltline and beltline regions, with the beltline region temperature limits having been adjusted to account for vessel irradiation (up to a vessel exposure of 16 EFPY). The non-beltline region is limiting between approximately 110 psig and 830 psig. Above approximately 830 psig, the beltline region becomes limiting.

Curve C - Core Critical Operation

Curve C, the core critical operation curve shown in Figure 3.6-1, is generated in accordance with 10 CFR 50 Appendix G which requires core critical pressure-temperature limits to be 40°F above any Curve A or B limits. Since Curve B is more limiting, Curve C is Curve B plus 40°F.

INSERT '3' (CONTINUED)

The withdrawal schedule in Table 4.6-2 is based on the three capsule surveillance program as defined in Section II.C of 10 CFR 50 Appendix H. The accelerated capsule (Near Core Top Guide) are not required by Appendix H.

This surveillance program conforms to ASTM E 185-73 "Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels" with one exception. The base metal specimens of the vessel were made with their longitudinal axes parallel to the principle rolling direction of the vessel plate.

INSERT '4'

B. Pressurization Temperature

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Boltup Temperature

The initial RT_{NDT} of the main closure flanges, the shell and head materials connecting to these flanges, and connecting welds is 10°F; however, the vertical electroslag welds which terminate immediately below the vessel flange have an RT_{NDT} of 40°F. Therefore, the minimum allowable boltup temperature is established as 100°F (RT_{NDT} + 60°F), which includes a 60°F conservatism required by the original ASME Code of construction.

Curve A - Hydrotesting

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Curve B - Non-Nuclear Heatup/Cooldown

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Curve C - Core Critical Operation

Curve C, the core critical operation curve shown in Figure 3.6-1, is generated in accordance with 10 CFR 50 Appendix G which requires core critical pressure-temperature limits to be 40°F above any Curve A or B limits. Since Curve B is more limiting, Curve C is Curve B plus 40°F.

The withdrawal schedule in Table 4.6-2 is based on the three capsule surveillance program as defined in Section II.C of 10 CFR 50 Appendix H. The accelerated capsule (Near Core Top Guide) are not required by Appendix H.

This surveillance program conforms to ASTM E 185-73 "Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels" with one exception. The base metal specimens of the vessel were made with their longitudinal axes parallel to the principle rolling direction of the vessel plate.