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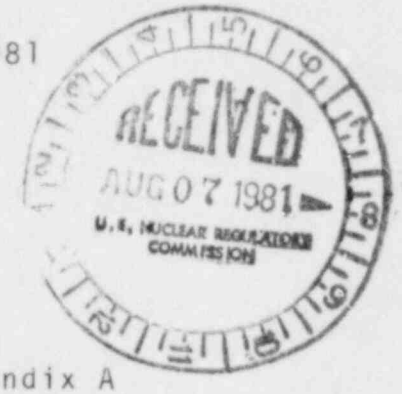

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Quad Cities Station Unit 2
Proposed Amendment to Appendix A
Technical Specifications to Facility
Operating License DPR-30 to
Implement 10 CFR 50.59 Reload
Licensing with Barrier Fuel and ODYN
Analyses
NRC Docket No. 50-265

References (a): Letter, T. A. Ippolito to D. L. Peoples dated March 20, 1980 (QC-2 Am. 51)

(b): NEDO-24259-A, "Generic Information for Barrier Fuel Demonstration Bundle Licensing", February, 1981. Reviewed in R. L. Tedesco letter to R. E. Engle (GE) dated November 12, 1980

(c): NEDO-24146A "Loss-of-Coolant Accident Analysis Report for Dresden Units 2, 3 and Quad Cities 1, 2 Nuclear Power Stations" Revision 1, April, 1979 as subsequently modified by Erratta and Addenda Nos.1, 2, 3, 4, 5, and 6 (Attached).

(d): NEDO-24154 and NEDE-24154-P, Volumes I, II, and III, "Qualification of the One-Dimensional Core Transient Model for Boiling Water Reactors," October, 1978.

(e): Letter, R. H. Buchholz (GE) to P. S. Check, "Response to NRC Request for Information on ODYN Computer Model," September 5, 1980.

(f): Letter, R. H. Buchholz (GE) to P.S. Check, "ODYN Adjustment Methods for Determination of Operating Limits," January 19, 1981.

(g): Letter, R. F. Janecek to H. R. Denton dated May 12, 1981.

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Dear Mr. Denton:

Pursuant to 10 CFR 50.59, Commonwealth Edison proposes to amend Appendix A, Technical Specifications, to Facility Operating License DPR-30 to support the review of future reloads for Quad Cities Unit 2 by Commonwealth Edison in accordance with the provisions of 10 CFR 50.59. The preparatory changes approved previously in Reference (a) do not sufficiently bound the impending Quad Cities Unit 2 Reload 5 Cycle 6 reload primarily because the barrier fuel demonstration core design includes new bundle designs not addressed previously and because this will be the first time the unit is analyzed with the ODYN transient code.

The proposed changes in Attachment 1 have received On-Site and Off-Site review and approval. The significant changes are discussed below.

Barrier Fuel

The only preparatory changes proposed are:

a. the use of alternate wording in the Safety Limit Bases discussion of the cladding's role as one of the physical "barriers" for release to the environs, (pg. 1.1/2.1-4) and

b. incorporation of the generic barrier fuel topical report (Reference (b)) as a reference in the discussion of the MCPR safety limit (pgs. 1.1/2.1-4 and 5), and

c. including barrier fuel MAPLHGR curves (discussed in the next section).

The first item is intended to avoid multiple uses of the term "barrier" with respect to the clad and the second is recommended for completeness and to establish the barrier topical as the base licensing document.

MAPLHGR Limits

NEDO 24146 (Reference (c)) contains the previously approved ECCS analysis for Dresden Units 2 and 3 and Quad Cities Units 1 and 2 and continues to serve as the basis for the generation of MAPLHGR limits for new fuel types.

New MAPLHGR limits for barrier fuel types P8DGB298, P8DGB263L, P8DGB284 and P8DGB265L are included in the proposed changes to Figure 3.5-1. The limits are based on Errata and Addenda Nos. 5 and 6 to Reference (c), which are provided for your use in Attachment 2 to this letter. A non-barrier fuel type which is otherwise identical to the P8DGB265L design is also utilized in the Quad Cities 2 Cycle 6 reload core. General Electric has stated

that the barrier fuel type MAPLHGRs apply directly to the corresponding non-barrier fuel types for otherwise identical designs. The lower figure of Sheet 2 of the proposed Fig. 3.5-1 reflects this.

In previous MAPLHGR revisions, calculated limits for non-prepressurized fuel have been conservatively applied to otherwise identical prepressurized fuel due to the unavailability of the slightly relaxed prepressurized MAPLHGRs. As indicated in the lower figure of Sheet 2, this distinction is now possible for the 2.65 standard P8x8R design and both curves are therefore included.

It should be noted that the current Sheet 1 for 7x7 fuel is replaced by the 2.97 barrier P8x8R curve and that the 2.65 standard 8x8R and 2.82 standard P8x8R curves are unchanged but merely replotted on the revised Sheets 2 and 4, respectively. Also note that although the 2.82 standard P8x8R curve only extends to 30,000 MWD/T, it is not yet being used in Quad Cities Unit 2. All fuel types to be used in Cycle 6 have MAPLHGR limits which extend to 40,000 MWD/T planar exposure. This easily exceeds the maximum conceivable nodal exposures for the scheduled cycle length.

DELETION OF 7x7 FUEL LIMITS

MCPR, MAPLHGR, and LHGR operating limits for 7x7 fuel have all been removed as there will be no 7x7 fuel in the Quad Cities 2 Cycle 6 core.

PRESSURE SAFETY LIMIT CHANGES DUE TO ATWS RPT

The NRC required installation and implementation of Recirculation Pump Trip (RPT) for ATWS mitigation as of January 1, 1981. Although it reduces peak pressures for transients without scram, it carries a side effect of increasing the peak pressures for severe pressurization events with scram (such as LR w/o BP or MSIV closure w/o valve position trip). On the positive side, pressurization events which exceed the RPT set point (1250 psig) can reach high steam dome pressures without exceeding the peak vessel or coolant system pressure criteria as a result of the lower reactor pressure drop which occurs without forced recirculation flow. Without RPT maximum pressure differences from the steam dome to the bottom of the vessel were less than 30 psi. With RPT the total reactor ΔP is reduced to less than 20 psi.

The assumption in the current bases for the pressure safety limit is a 50 psi ΔP (i.e. 1375psi — 1325psi) which is conservative in either case. The proposed change retains adequate conservatism by resetting the safety limit at only 1345 psig as measured in the steam dome. The assumed pressure difference is still 30 psig to the bottom of the vessel which will assure compliance with the ASME code criteria of 110% of vessel design

pressure (i.e. 110% x 1250=1375 psig). Since the vessel peak pressure (bottom) is specifically calculated for each reload for the postulated multiple failure MSIV closure event (no valve position trip scram and no Electromatic Relief Valve Flow), the proposed change does not affect our ability to identify potential problems with ASME compliance.

Wording changes in the bases have also been incorporated which clarify that compliance of the peak vessel pressure with the ASME criteria also assures compliance of the primary system piping pressures with the USASI criteria for the limiting point (i.e. less than 1410 psig at the lowest point in the recirc. suction line). These changes were recommended by GE due to the false implication in the current bases that all points in the primary system must remain less than the ASME criteria for the vessel (1375 psig).

ODYN TRANSIENT CODE IMPLEMENTATION

The ODYN transient analysis computer code is used for analyzing rapid pressurization events in a more sophisticated manner than its predecessor, the REDY code. Reference (d) is the three volume generic topical report which describes the model and its qualification. Reference (e) contains responses to NRC questions but also forms the primary reference for the implementation procedure, i.e. adjustment of ODYN MCPR results to account for statistical treatment of four parameters:

a. initial core thermal power

b. CRD scram times

c. model uncertainty

d. regressional fitting uncertainty

This statistical approach ("Option B") was negotiated with the staff during the first 9 months of 1980 and is intended to establish a "95/95" basis for licensing ODYN. That is, the MCPR operating limit should provide a 95% probability with 95% confidence that the limiting pressurization event will not cause MCPR to fall below the fuel cladding integrity safety limit. In order to accomplish this, a statistically based scram time distribution which is faster than those in the current Technical Specifications was applied for each of several plant groupings of similar design in order to define generic Statistical Adjustment Factors (SAFs) which can be applied to plant specific results. The SAFs also incorporate the statistical treatment of power level, model, and fitting uncertainties. The net result for BWR2 and 3's is a SAF of +0.006

which is added to the ODYN calculated ΔCPR/ICPR. The new ICPR is then calculated using the Reference (f) equation of:

$$ICPR_{new} = \frac{SL}{1 - \left[\frac{\Delta CPR_c}{ICPR_c} + .006\right]}$$

where SL=MCPR Safety Limit (1.07)
ΔCPR_c= ODYN calculated transient ΔCPR (unadjusted)
$ICPR_c = \Delta CPR_c + SL$

To assure and demonstrate consistency of operations with the assumed scram time distribution in the calculation of the SAFs, a "scram time conformance procedure" is now required which basically makes the MCPR operating limit a function of scram times as measured during the normal surveillance. Specifically, the overall average of all 20% insertion scram time data measured to date in the current cycle ($\bar{\tau}$ave) must be evaluated with respect to the 5% significance level criteria for the distribution ($\bar{\tau}_B$) assumed in deriving the generic SAF. If the running average exceeds $\bar{\tau}_B$ a MCPR penalty is required.

The MCPR penalty is applied in the form of a linearly increasing limit between the Option B value at $\bar{\tau}_B$ to a more conservative NRC-determined value ("Option A" MCPR limit) at $\bar{\tau}_A$, which is the CRD surveillance limit for 20% insertion from specification 3.3C.2.

The Option A limit is also defined in References (e) and (f) and is simply equal to $ICPR_c$ multiplied by 1.044 (i.e. a 4.4% penalty on the unadjusted ODYN results).

The scram time dependence of the MCPR limit is reflected in the proposed changes to Technical Specifications and bases sections 3.3.c/4.3.c and 3.5.k. The MCPR limits were chosen to bound future reloads with a limiting fuel type ΔCPR of up to .29. It should be noted that bases page 3.3/4.3-10, concerning scram insertion times, includes changes previously proposed in Reference (g) associated with RPS delay and response times.

The proposed form of the scram time dependent MCPR limits is an attempt to simplify the actual Technical Specification implementation of the conformance procedure. General Electric originally suggested either an explicit version (full equations and definitions in the LCO text) or a graphical version. Both methods are extremely complex and would have presented significant challenges in plant implementation and operator training. The proposed approach, while still complicated relative to previous MCPR specifications, offers significant advantages over other alternatives while incorporating small conservatisms which should

not impact p'ant operation.

The conservatisms include:

a. the assumption of maximum scram timing frequency allowed by Specification 4.3.C.2 (that is, a full core data set at BOC and half core data sets every 16 weeks thereafter),

b. The assumption of an operating cycle length of 24 months (excluding refueling) which is longer than what is currently considered technically feasible without excessive coastdown and associated economic constraints,

c. a conservative choice of the nearest RPIS switch (dropout of pos. 39) in the selection of the mean (μ) and standard deviation (σ) associated with calculating the 5% significance level criteria (τ B),

d. conservative rounding of both τ B and τ A values, and

e. use of the rounded down τ B and τ A values in calculation of the slope and intercept values for the linear MCPR penalty between τ B and τ A.

Pursuant to 10 CFR 120, Commonwealth Edison has determined that the proposed amendment is Class III. As such, a fee remittance in the amount of $4,000 has been enclosed.

Please address any questions you may have concerning this matter to this office.

Three (3) signed originals and thirty-seven (37) copies of this transmittal are provided for your use.

Very truly yours,

E. Douglas Swartz

E. Douglas Swartz
Nuclear Licensing Administrator

Attachments
cc: RIII Inspector - Quad Cities

SUBSCRIBED and SWORN to
before me this 31st
day of July, 1981

Rosalie A Pierta
Notary Public
2326N