DISTRIBUTION:
Docket File bcc: TERA
LB#1 Rdg. PDR
DEisenhut LPDR
JYoungblood NSIC
JSnell TIC
KKiper ACRS (16)
MRushbrook
SHanauer
RVollmer
TMurley
RMattson
RHartfield, MPA
OELD
OIE (3)
Core Performance Branch

AUG 24 1981

Docket Nos. STN 50-454
and DTN 50-455

Mr. Louis O. DelGeorge
Director of Nuclear Licensing
Commonwealth Edison Company
Post Office Box 767
Chicago, Illinois 60690

Dear Mr. DelGeorge:

Subject: Request for Additional Information for the Review of the Byron Plant, Unit 1 & 2, Regarding Core Performance

As a result of our continuing review of the Byron Plant, Unit 1 & 2 FSAR, we find that we need additional information to complete our evaluation. The specific information required is in the area of Core Performance and is presented in the Enclosure.

To maintain our licensing review schedule for the Byron Plant FSAR, we will need responses to the enclosed request by October 12, 1981. If you cannot meet this date, please inform us within seven days after receipt of this letter of the date you plan to submit your responses so that we may review our schedule for any necessary changes.

Please contact J. C. Snell, Byron Licensing Project Manager, if you desire any discussion or clarification of the enclosed request.

Sincerely,

Original signed by:
B. J. Youngblood

B. J. Youngblood, Chief
Licensing Branch #1
Division of Licensing

RECEIVED AUG 26 1981 U.S. NUCLEAR REGULATORY COMMISSION

Enclosure:
As stated

cc w/encl:
See next page

OFFICE	DL:LB#1	DL:LB#1					
SURNAME	JSnell:lb	BJYoungblood					
DATE	8/21/81	8/24/81					

Mr. Louis O. Del George
Director of Nuclear Licensing
Commonwealth Edison Company
Post Office Box 767
Chicago, Illinois 60690

ccs:

Mr. William Kortier
Atomic Power Distribution
Westinghouse Electric Corporation
P. O. Box 355
Pittsburgh, Pennsylvania 15230

Paul M. Murphy, Esq.
Isham, Lincoln & Beale
One First National Plaza
42nd Floor
Chicago, Illinois 60603

Mrs. Phillip B. Johnson
1907 Stratford Lane
Rockford, Illinois 61107

Professor Axel Meyer
Department of Physics
Northern Illinois University
DeKalb, Illinois 60115

C. Allen Bock, Esq.
P. O. Box 342
Urbanan, Illinois 61801

Thomas J. Gordon, Esq.
Waaler, Evans & Gordon
2503 S. Neil
Champaign, Illinois 61820

Ms. Bridget Little Rorem
Appleseed Coordinator
117 North Linden Street
Essex, Illinois 60935

Kenneth F. Levin, Esq.
Beatty, Levin, Holland,
Basofin & Sarsany
11 South LaSalle Street
Suite 2200
Chicago, Illinois 60603

Mr. Edward R. Crass
Nuclear Safeguards and Licensing Division
Sargent & Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603

Nuclear Regulatory Commission. Region III
Office of Inspection and Enforcement
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Myron Cherry, Esq.
Cherry, Flynn and Kanter
1 IBM Plaza, Suite 4501
Chicago, Illinois 60611

Section 4.4

FSAR Byron/Braidwood Units 1 and 2

221.0 Thermal-Hydraulics Section/Core Performance Branch

221.2 (4.4.6) The staff has reviewed the applicant's response to question 221.1 which describes the Byron/Braidwood Loose Parts Monitoring System (LPMS). Before the staff can determine the acceptability of the Byron/Braidwood LPMS we require the following:

(1) a description of the plans for a signature analysis during initial startup;

(2) a statement concerning the operating conditions for the LPMS (i.e., normal containment environment, system sensitivity, and alarm settings); and

(3) a description of the training program for plant personnel.

Also, in the response to question 221.1, the applicant stated that the LPMS was not built for a seismic event. Regulatory Guide 1.133 states that the LPMS be built to perform its functions following all seismic events that do not require plant shutdown, "i.e., up to and including the Operation Basis Earthquake (OBE)." The applicant must provide a design analyses which evaluates the LPMS's capability to function during a seismic event in accordance with the requirements of Regulatory Guide 1.133 and justify any deviations.

221.3 (4.4.1.1) In our Safety Evaluation Report on WCAP-9500 "Reference Core Report 17X17 Optimized Fuel Assembly" the staff required that those plants using the Westinghouse Improved Thermal Design Procedure (ITDP) supply additional information on the plant specific application of the ITDP. Since the applicant is using the ITDP to perform their thermal-hydraulic analyses, they must comply with the following:

(1) provide the sensitivity factors (S_i) and their range of applicability;

(2) if the S_i values used in the Byron/Braidwood analyses are different than those used in WCAP-9500, then the applicant must re-evaluate the use of an uncertainty allowance for application of equation 3-2 of WCAP-8567, "Improved Thermal Design Procedure" and the linearity assumption must be validated;

(3) provide and justify the variances and distributions for input parameters;

(4) justify that the nominal conditions used in the analyses bound all permitted modes of plant operation;

(5) provide a discussion of what code uncertainties, including their values, are included in the DNBR analyses;

(6) provide a block diagram depicting sensor, processing equipment, computer and readout devices for each parameter channel used in the uncertainty analysis. Within each element of the block diagram identify the accuracy, drift, range, span, operating limits, and setpoints. Identify the overall accuracy of each channel transmitter to final output and specify the minimum acceptable accuracy for use with the new procedure. Also identify the overall accuracy of the final output value and maximum accuracy requirements for each input channel for this final output device; and

(7) If there are any changes to the THINC-IV correlation, or parameter values outside of previously demonstrated acceptable ranges, the staff requires a re-evaluation of the sensitivty factors and of the use of equation 3-2 of WCAP-8567.

221.4 (4.4.1.1) The applicant has reported the following minimum DNBRs in the FSAR:

Description	FSAR Section	Cell Thimble	Cell Typical
Employed in Safety Analyses	4.4.1.1	1.82	1.85
MDNBR for Design Transients	Table 4.4-1	1.47	1.49
MDNBR for Design Transients WCAP-9500	Table 4.4-1	1.82	1.85

Provide the following:

(1) a discussion of how the MDNBRs of 1.82 and 1.85, (Section 4.4.1.1 Bryon/Braidwood FSAR) were employed in the safety analyses;

(2) an explanation of why the MDNBRs "employed" in the safety analyses (Section 4.4.1.1 of the Bryon/Braidwood FSAR) differ from those obtained for the design transients (Table 4.4-1 of the Bryon/Braidwood FSAR); and

(3) an explanation of why the Design Transient MDNBRs reported in the Byron/Braidwood FSAR are different than those reported in WCAP-9500.

221.5 (RSP) The staff has developed interim criteria for evaluating the effects of rod bow on DNB for application to the Westinghouse 17X17 Optimized Fuel Assembly. The resultant reduction in DNBR due to rod bow is given by:

Burnup (MWD/MTU)	DNBR Reduction (%)
0	0
3500	0
5000	0
10000	2.15
15000	4.64
20000	6.74
25000	8.59
30000	10.27
35000	13.07
40000	19.09

The applicant should present to the staff an acceptable method of accommodating the thermal margin reduction shown above prior to issuance of an OL so that the appropriate provisions may be incorporated into the Technical Specifications.

Also, insert into the basis of the Technical Specifications any generic or plant specific margin that has been used to offset the reduction in DNBR due to rod bowing. Identify the source and reference previous staff approval of each generic margin.

221.6 (4.4.2.9.6) The applicant has reported that the thermal design flow rate is 2.5% less than the best estimate loop flow rate. This is the value which was reported in WCAP-9500; however, this uncertainty was a result of the use of the N-16 Transient Time Flowmeter (TTFM). Since the N-16 TTFM has been withdrawn from active review by Westinghouse, the applicant should provide the basis for the 2.5% uncertainty reported in the FSAR. Your response should include a quantitative discussion of how the 2.5% uncertainty was derived and why the uncertainty of approximately 5% reported in previous FSARs (Watts Bar, Docket Nos. 50-390/391) is not applicable to the Byron/Braidwood thermal-hydraulic design.

221.7 (4.4.4. 3.1) The Nuclear Enthalpy Rise Hot Channel Factor ($F_{\Delta H}^{N}$) reported in Table 4.3-2 is 1.55. In other Westinghouse plants, the design $F_{\Delta H}^{N}$ is given by:

$$F_{\Delta H}^{N} = 1.55\ (1 + 0.2\ (1-P))$$

where P is the fraction of full power.

If the reactor was operating at full power, P=1, then $F_{\Delta H}^{N}$ = 1.55 which is in agreement with Table 4.3-2. However the $F_{\Delta H}^{N}$ used in the Byron/Braidwood design was given by:

$$F_{\Delta H}^{N} = 1.49\ (1 + 0.3\ (1 - P))$$

where P is the fraction of full power. If the Byron/Braidwood units are operating at full power $F_{\Delta H}^{N}$ = 1.49.

Provide a discussion of why the $F_{\Delta H}^{N}$ values reported in Table 4.3-2, and Section 4.4.4.3.1 are different. Also, the equations used to define $F_{\Delta H}^{N}$ are not the same, the multiplier on the quantity (1-P) is 0.2 for previous submittals while it is 0.3 for Byron/Braidwood. Provide a discussion on why these equations differ. Your response should include justification for using the $F_{\Delta H}^{N}$ value reported in Section 4.4.4.3.1.

221.8 (4.4.4 5.2) Provide the radial pressure gradient in the upper plenum and at the core outlet for each allowable loop configuration. The NRC approval of the THINC-IV code, for use in the thermal-hydraulic design of Westinghouse reactors, indicates that the pressure gradient at the core exit must be modeled. It should be noted that the staff has approved the use of a uniform pressure gradient in a THINC analysis using the W-3 CHF correlation. However, the applicant is using the WRB-1 CHF correlation and the ITDP; therefore, we require that one of the following options be provided:

(1) A discussion of the effects of non-uniform upper plenum pressure distributions on DNBR. Include a sensitivity study of DNBR when a uniform and non-uniform pressure gradient is used in a THINC/WRB-1 analysis; or

(2) Perform the thermal-hydraulic design calculations using a non-uniform pressure gradient. Provide the following specific information from those calculations.

a. minimum DNBR (value and location)
b. hot channel flow vs axial position
c. hot channel enthalpy vs axial position
d. hot channel quality vs axial position
e. hot channel void fraction vs axial position
f. the assumed core exit gradient

221.9 4.4.6) Operating experience on two pressurized water reactors, not of Westinghouse design, indicate that a significant reduction in the core flow rate can occur over a relatively short period of time as a result of crud depositions on the fuel rods. In establishing the Technical Specifications for the Byron/Braidwood units, we will require provisions to assure that the minimum design flow rates are not exceeded. Therefore, provide a description of the flow measurement capability for the Byron/Braidwood units as well as a description of the procedures to measure flow.

221.10 (4.4) State your intentions with regard to N-1 loop operation.

221.11 Standard format and content of Safety Analysis Reports, Regulatory Guide 1.70, states that in Chapter 4 of the SAR

"...the applicant should provide an evaluation and supporting information to establish the capability of the reactor to perform its safety functions throughout its design lifetime under all normal operation modes..."

Are the analyses presented in Section 4.4 representative of the initial core only or have future cycles been analyzed? Provide a discussion of how power distributions for future cycles are considered in the FSAR analyses. Is there any assurance that Bryon/Braidwood can operate at the licensed power level without excessive DNB trips throughout future cycles? Will revisions to the design methodology be required in order to maintain sufficient thermal margin?