October 14, 1987

Docket No. 50-483

LICENSEE: Union Electric

FACILITY: Callaway Plant

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SUBJECT: SUMMARY OF MEETING WITH UNION ELECTRIC REGARDING THE TRANSITION CORE DNBR PENALTY FOR CYCLE 3

On October 6, 1987, the licensee and representatives from Westinghouse met with the staff to discuss the transition core departure from nucleate boiling ratio (DNBR) penalty for Cycle 3 operation at Callaway. Participants at the meeting are listed in Enclosure 1. The licensee's letter documenting their findings is provided in Enclosure 2. Nonproprietary slides used during the meeting are in Enclosure 3. The proprietary slides used during the meeting are being withheld from public disclosure under 10 CFR 2.790 of the Commissions regulations.

The licensee stated that as a result of a generic assessment which affects the magnitude of the Vantage 5 DNBR transition core penalty, an evaluation was performed for Callaway Cycle 3 which indicated the need for a small (1.5 percent) increase to the DNBR transition core penalty. However, the licensee stated that the small increase continues to be offset by the margin which is maintained between the design and safety limit DNBR's, and that the safety evaluation and significant hazards evaluation conclusions provided in the original reload submittal (dated March 31, 1987) remain valid.

The staff indicated that this new information will be included in the review of the reload application. The staff did not identify any outstanding issues at the meeting.

/s/

Thomas W. Alexion, Project Manager
Project Directorate III-3
Division of Reactor Projects

Enclosures:
1. Participants
2. Licensee's letter
3. Non proprietary slides
   (proprietary slides withheld - 2.790)

cc: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

October 14, 1987

Docket No. 50-483

Enclosure(s) contain(s)
10 CFR 2.790 MATERIAL. Decontrolled
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Callaway Plant
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Enclosure 1

TRANSITION CORE DNBR PENALTY MEETING
OCTOBER 6, 1987

ATTENDANCE LIST

NAME	ORGANIZATION
T. Alexion	NRC/PD III-3
M. Hodges	NRC/SRXB
L. Phillips	NRC/SRXB
W. Brooks	NRC/SRXB
F. Orr	NRC/PDI-4
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W. Bobnar	UE/Licensing & Fuels
K. Connelly	UE/Licensing & Fuels
P. Loftus	W/ Nuclear Safety
K. Mc Atee	W/Thermal-Hydraulic Design
E. Novendstern	W/Thermal-Hydraulic Design

UNION ELECTRIC

1901 Gratiot Street, St. Louis

Donald F. Schnell
Vice President

Enclosure 2

October 6, 1987

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

Gentlemen:

ULNRC-1643

DOCKET NUMBER 50-483
CALLAWAY PLANT
REVISED VANTAGE 5 TRANSITION CORE EFFECTS FOR CYCLE 3

References: 1) ULNRC 1470 dated March 31, 1987
2) Westinghouse Letter NS-NRC-87-3268 dated October 2, 1987 from W. J. Johnson to M. W. Hodges

Reference 1 transmitted the Reload License Amendment Application for Callaway Plant using Westinghouse 17 x 17 VANTAGE 5 fuel assemblies. As part of the application, Union Electric referenced WCAP-10444-P-A, "Westinghouse Reference Core Report, VANTAGE 5 Fuel Assembly" as the approved methodology for assessing the transition to VANTAGE 5 fuel.

Westinghouse has recently completed an assessment which affects the magnitude of the VANTAGE 5 DNB transition core penalty. The results of this generic assessment were provided to NRC via Reference 2. An evaluation has been performed for Callaway Cycle 3 which demonstrates the safety evaluation conclusions presented in Reference 1 remain valid, but indicates the need for a small (1.5 percent) correction to the magnitude of the DNB transition core penalty. The small increase in the magnitude of the DNB transition core penalty continues to be offset by the margin which is maintained between the design and safety limit DNBRs made available due to the improved DNB performance of the IFM grids described in WCAP-10444. The VANTAGE 5 DNB transition core penalty increases from 11 percent to 12.5 percent and the DNB margin decreases from 5.5 percent to 4 percent. The revised transition core penalty and revised DNB margin are provided in the enclosed replacement pages to Reference 1.

8710090206 6pp.

Mailing Address: P.O. Box 149, St. Louis, MO 63166

The results of the Significant Hazards Evaluation transmitted by Reference 1 remain unchanged. If there are any questions with respect to this subject, please contact us.

Very truly yours,

Donald F. Schnell

DS/kaa

Attachments: ULNRC-1470, dated March 31, 1987, Replacement Pages
1) Attachment 1, Safety Evaluation, Page 17
2) Attachment 2, Technical Specification Changes, Bases page B3/4.2-4
3) Attachment 3, References, page 40

STATE OF MISSOURI)
) S S
CITY OF ST. LOUIS)

Donald F. Schnell, of lawful age, being first duly sworn upon oath says that he is Vice President-Nuclear and an officer of Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Donald F. Schnell
Donald F. Schnell
Vice President
Nuclear

SUBSCRIBED and sworn to before me this 6th day of October, 1987.

Barbara J. Pfaff
BARBARA J. PFAFF
NOTARY PUBLIC, STATE OF MISSOURI
MY COMMISSION EXPIRES APRIL 22, 1989
ST. LOUIS COUNTY

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follows. A fraction of the margin is utilized to accommodate the transition core DNBR penalty (2% for OFA fuel and 12.5% for VANTAGE 5 fuel) and the appropriate fuel rod bow DNBR penalty, Reference 11, which is less than 1.5%. The existing 7% margin in the OFA fuel and 18% margin in the VANTAGE 5 fuel between the design and safety analysis DNBR limits also includes a greater than 3% DNBR margin in the OFA fuel and 4% DNBR margin in the VANTAGE 5 fuel reserved for flexibility in the design. The VANTAGE 5 transition core penalty is discussed in References 27 and 28.

The LOPAR, and OFA, and VANTAGE 5 designs have been shown to be hydraulically compatible in Reference 1.

The phenomenon of fuel rod bowing, as described in Reference 11, must be accounted for in the DNBR safety analysis of Condition I and Condition II events for each plant application. Applicable generic credits for margin resulting from retained conservatism in the evaluation of DNBR and/or margin obtained from measured plant operating parameters (such as $F^N_{\Delta H}$ or core flow) which are more restrictive than those required by the plant safety analysis, can be used to offset the effect of rod bow. The safety analysis for the Callaway Plant maintains sufficient margin between the safety analysis limit DNBRs and the design limit DNBRs to accommodate full-flow and low-flow DNBR penalties.

The transition core DNB methodology given in References 2 and 17 has been approved by the NRC via Reference 18. Using this methodology, transition cores are analyzed as if they were full cores of one assembly type (full OFA or full VANTAGE 5), applying the applicable transition core penalties of two percent for OFA fuel and eleven percent for VANTAGE 5 fuel. The safety analyses for the Callaway Plant maintains sufficient margin between the safety analysis limit DNBRs and the design limit DNBRs to accommodate the transition core DNBR penalty and the appropriate rod bow DNBR penalty.

The fuel temperatures for use in safety analysis calculations for the VANTAGE 5 fuel are the same as those used for the OFA fuel. Westinghouse uses the PAD fuel performance code, Reference 6, to perform both design and licensing calculations. When the code is used to calculate fuel temperatures to be used as initial conditions in safety analyses, a conservative thermal safety model, Reference 7, is used.

BASES

3/4.2.2 and 3/4.2.3 HEAT FLUX HOT CHANNEL FACTOR AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

Each of these is measurable but will normally only be determined periodically as specified in Specifications 4.2.2 and 4.2.3. This periodic surveillance is sufficient to ensure that the limits are maintained provided:

a. Control rods in a single group move together with no individual rod insertion differing by more than ± 12 steps, indicated, from the group demand position.

b. Control rod banks are sequenced with overlapping groups as described in Specification 3.1.3.6.

c. The control rod insertion limits of Specification 3.1.3.6 are maintained.

d. The axial power distribution, expressed in terms of AXIAL FLUX DIFFERENCE, is maintained within the limits.

$F^N_{\Delta H}$ will be maintained within its limits provided conditions a. through d. above are maintained. The relaxation of $F^N_{\Delta H}$ as a function of THERMAL POWER allows changes in the radial power shape for all permissible rod insertion limits.

When an F_Q measurement is taken, an allowance for both experimental error and manufacturing tolerance must be made. An allowance of 5% is appropriate for a full-core map taken with the incore detector flux mapping system and a 3% allowance is appropriate for manufacturing tolerance.

When $F^N_{\Delta H}$ is measured, (i.e., inferred), no additional allowances are necessary prior to comparison with the limits of Section 3.2.3. An error allowance of 4% has been included in the limits of Section 3.2.3.

Margin between the safety analysis DNBR limits (1.42 and 1.45 for the Optimized fuel thimble and typical cells, respectively, and 1.61 and 1.69 for the VANTAGE 5 thimble and typical cells) and the design DNBR limits (1.32 and 1.34 for the Optimized fuel thimble and typical cells and 1.32 and 1.33 for the VANTAGE 5 thimble and typical cells, respectively) is maintained. A fraction of this margin is utilized to accommodate the transition core DNBR penalty (2% for Optimized fuel, ~~4%~~ for VANTAGE 5 fuel) and the appropriate fuel rod bow DNBR penalty (less than 1.5% per WCAP-8691, Rev. 1). The margin between design and safety analysis DNBR limits of 7% for Optimized fuel and 18% for VANTAGE 5 fuel includes greater than 3% margin for Optimized fuel and ~~greater than 5%~~ 4% margin for VANTAGE 5 fuel for plant design flexibility.

The hot channel factor $F^N_Q(z)$ is measured periodically and increased by a cycle and height dependent power factor appropriate to either ~~Normal~~ Operation or RESTRICTED AFD OPERATION, $W(z)_{NO}$ or $W(z)_{RAFDO}$, to provide assurance that the limit on the hot channel factor, $F_Q(z)$, is met. $W(z)_{NO}$ accounts for the effects

22. Lee, N., Rupprecht, S. D., Schwartz, W. R., Tauche, W. D., "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," WCAP-10054-P-A (Proprietary) and WCAP-10081-A (Non-Proprietary) August 1985.

23. Esposito, V. J., Kesavan, K., and Maul, B. J.; "W-FLASH-A Fortran-IV Computer Program for Simulation of Transients in a Multi-Loop PWR," WCAP-8200 (Proprietary), July 1973.

24. Meyer, P. E., "NOTRUMP, A Nodal Transient Small Break and General Network Code," WCAP-10079-P-A (Proprietary) and WCAP-10080-A (Non-Proprietary), August 1985.

25. Letter C. E. Rossi (NRC) to E. P. Rahe, Jr. (W), "Acceptance for Referencing of Licensing Topical Report WCAP-10266," November 1986.

26. Letter W. Johnson (W) to J. Lyons (NRC), "Submittal of WCAP-10266 Addendum 1, BASH Power Shape Sensitivity Studies," January 1987.

27. Letter from W. J. Johnson (Westinghouse) to M. W. Hodges (NRC) dated October 2, 1987, NS-NRC-87-3268, Subject: "VANTAGE 5 Transition Core Effects".

28. ULNRC - 1643 dated October 6, 1987, "Revised Vantage 5 Transition Core Effects for Cycle 3".

Enclosure 3

CALLAWAY CYCLE 3 LICENSING MEETING

NRC/UNION ELECTRIC/WESTINGHOUSE

OCTOBER 6, 1987

I. INTRODUCTION - UNION ELECTRIC

- o BACKGROUND AND PURPOSE OF THE MEETING

II. CALLAWAY LICENSING ACTIVITIES STATUS AND SCHEDULE OVERVIEW - UNION ELECTRIC

III. VANTAGE 5 DNB TRANSITION CORE EFFECTS

- o BACKGROUND (INCLUDING GENERAL INFORMATION/ LICENSING STATUS) - WESTINGHOUSE
- o THERMAL & HYDRAULIC CONSIDERATIONS - WESTINGHOUSE
- o LICENSING CONSIDERATIONS - WESTINGHOUSE

IV. CALLAWAY CYCLE 3 LICENSING APPROACH/ ISSUE RESOLUTION - UNION ELECTRIC

V. DISCUSSION/WRAP-UP

CONCLUSION

EFFECT OF SMALL INCREASE IN THE VANTAGE 5 TRANSITION CORE PENALTY DOES NOT ALTER ANY CONCLUSIONS REPORTED IN BOTH THE CALLAWAY LICENSING SUBMITTAL AND WCAP-10444.