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Mail Section

Mr. Dennis L. Ziemann, Chief
Operating Reactors - Branch 2
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Dresden Station Unit 3
Supplement A to Reload 4 License Amendment
to Facility Operating License No. DPR-25
NRC Docket No. 50-249

Reference (a): D. L. Ziemann Letter to R. L. Bolger dated
October 4, 1976, NRC Docket No. 50-249.

Dear Mr. Ziemann:

Enclosed is the response to the request for additional information in Reference (a). These items were telecopied to Mr. Silver of your staff earlier in the month. Also included are calculations of dynamic void coefficient previously discussed with your staff.

Please address any additional questions to this office.

One (1) signed original and 39 copies are provided for your use.

Very truly yours,

G. A. Abrell
Nuclear Licensing Administrator
Boiling Water Reactors

Enclosure (1): Supplement A to Dresden Unit 3 Reload 4
Licensing Amendment

10763

SUPPLEMENT A TO DRESDEN UNIT 3 RELOAD 4 LICENSING AMENDMENT

QUESTION 1: What inputs to the transient models were changed from the previous values to produce the plant specific results for the overpressurization analysis and the turbine trip without bypass transient? Were any model changes made other than the inputs?

RESPONSE 1: The inputs to the transient models for Dresden 3 Reload 4 are given on page 6-9 of the license submittal, NEDO-21338. The inputs to the transient models for the previous reload can be found in the Byron Lee letter to D.L. Ziemann, "Quad Cities Unit 2, Reload No. 1 License Submittal, Supplement A, NRC Dkt. No. 50-265", dated February 20, 1975. This letter was also referenced on the Dresden 3 docket for reload 3. The models used are the same ones previously used which are described in NEDO-10802.

QUESTION 2: Discuss the overpressure transient resulting from closure of all main steam isolation valves with (1) scram on high neutron flux; (2) no credit for relief valves; (3) failure of one safety valve; and (4) void reactivity coefficient and scram curve applicable to this reload. If a previous analysis is referenced, justify its applicability to this reload.

RESPONSE 2: A sensitivity study of valve operability is contained in the December 23, 1975 letter from I.F. Stuart, GE, to V. Stello, NRC, "Code Overpressure Protection Analysis - Sensitivity of Peak Vessels to Valve Operability". The sensitivity analysis transmitted by the above referenced letter was performed for a typical high power density BWR. This study is applicable to the Dresden 3 reactor and is supplemental to the specific analysis provided for the reload. A plant specific analysis for Dresden 3 would show results less than that given in the sensitivity study since Dresden 3 is a lower power density plant.

QUESTION 3: In Table 4-2, NEDO-21338, the radial peaking factor is listed as 1.68. Why is this value so much higher than the radial peaking factor for the 7x7 fuel in reload 4?

RESPONSE 3: The differences between the two radial power factors are directly related to the MCPR operating limits of the two fuel types. The radial power factors are selected such that the initial MCPR is equal to or greater than the MCPR operating limit. Because the rod withdrawal error is much more restricting for the 7x7 fuel, its radial power factor was reduced so as to satisfy the operating limit.

QUESTION 4: Provide curves(for BOC and EOC) of the void coefficient of reactivity as a function of void fraction.

RESPONSE 4: The curves are provided in the attached void fraction figure.

QUESTION 5: Figure 6-6 of NEDO-21338 shows scram reactivity curves labeled EOC 3 and 1500 MWd/t before EOC 3. Explain why cycle 3 curves apply to Dresden Unit 3 cycle 5. What improvements were made to achieve the scram reactivity curves used for the transient analysis for reload 4? When the scram reactivity curve is utilized as a transient input parameter, what conservative factor is applied to the design scram reactivity curve.

RESPONSE 5: These scram curves are incorrect. The Quad Cities 2, Reload 2 scram curves were inserted in error and will be replaced by the correct scram curves. A safety conservatism factor of 0.80 is applied to the applicable scram reactivity curve.

QUESTION 6: Provide a list and briefly describe each physics startup test to be performed for the cycle 4 reload. Also provide the acceptance criterion for each test and discuss how the measured parameter(s) relate(s) to the values in the accident analysis.

RESPONSE 6: Response to be provided by CECO.

QUESTION 7: State your schedule for submitting to NRC a brief summary report of physics startup tests. This report should include both measurement and predicted values. If the difference between the measured and predicted value exceeded the acceptance criterion, the report should discuss the actions that were taken and justify the adequacy of these actions.

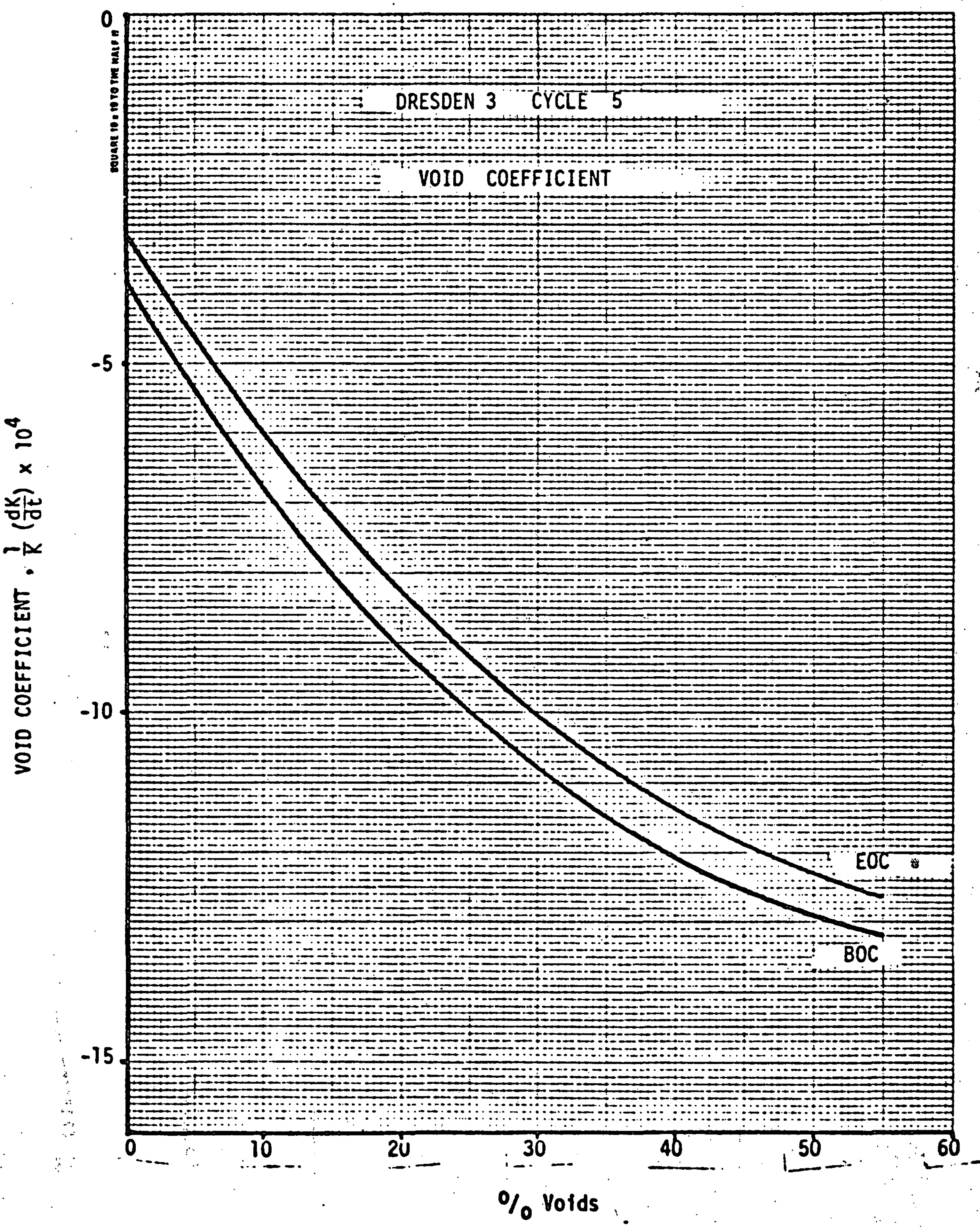
RESPONSE 7: Response to be provided by CECO.

QUESTION 8: Are finger springs used on all reload 4 assemblies? What criteria are used to determine if finger springs are required on certain assemblies?

RESPONSE 8: Finger springs are not used on reload 4 fuel assemblies. The criteria used to determine the necessity for finger spring is bypass flow. Design bypass flow should be maintained between 10% and 12% of the total core flow. The bypass flow for Dresden 3 with no finger springs on reload 4 fuel is 11.7%.

QUESTION 9: What would be the impact on Dresden Unit 3 plant operations if the operating MCPR limit was raised 0.07 to assure that the safety limit MCPR (1.06) was not violated by a fuel loading error?

RESPONSE 9: An increase in MCPR value of 0.07 would result in a minimum plant derate of 1% power and a maximum derate of up to approximately 7%. In addition to a general derate, an increase in operating MCPR of this magnitude could severely restrict plant maneuverability during startup and power ascension. This question has been reviewed previously on the Browns Ferry and Vermont Yankee reactors and the limitation was not imposed.


DRESDEN 3 CYCLE 5
VOID COEFFICIENT
EOC
BOC
0
-5
-10
-15
0
10
20
30
40
50
60
VOID COEFFICIENT, $\frac{1}{K}\left(\frac{dK}{dt}\right) \times 10^4$
% Voids

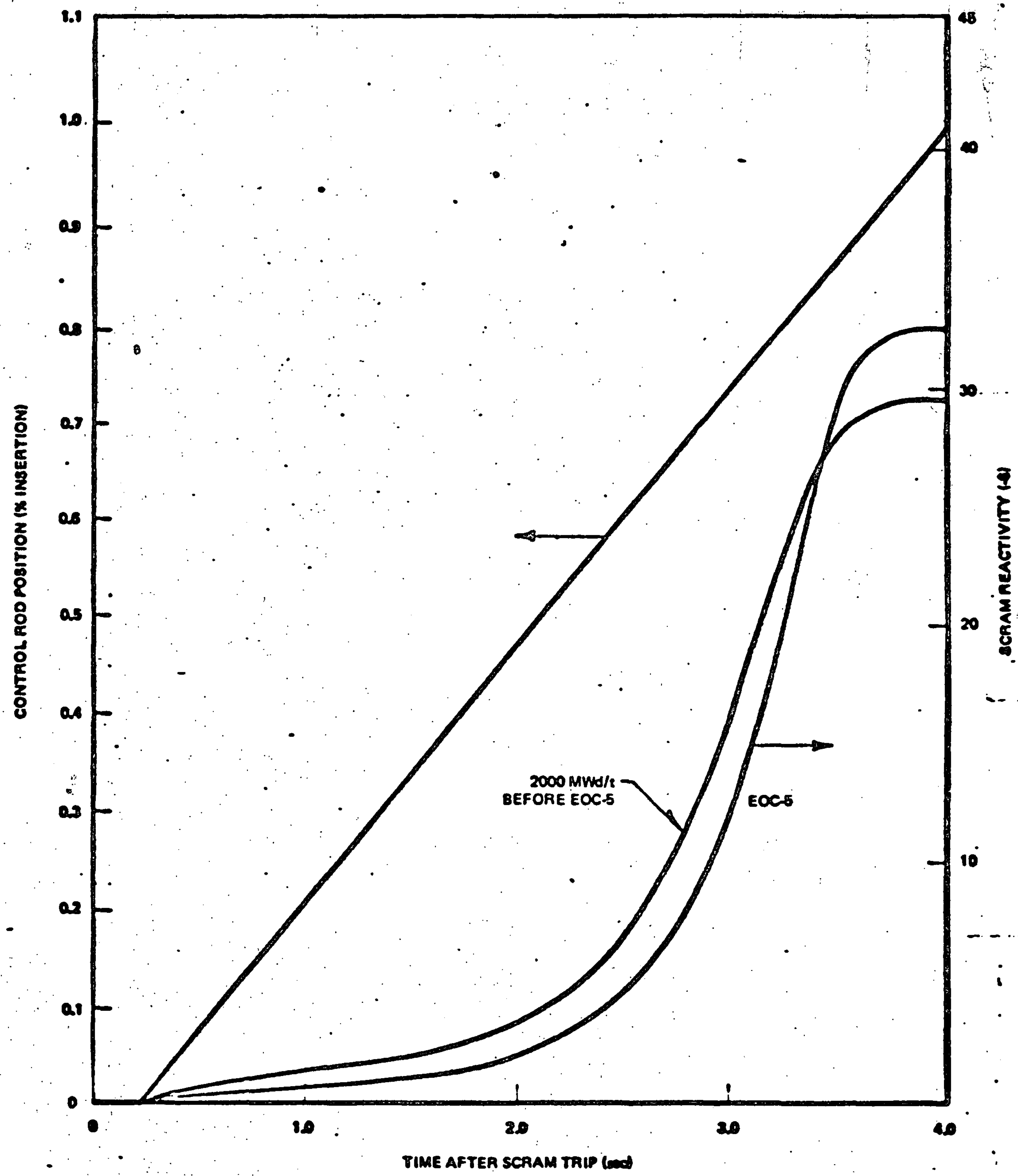


Figure 6-6. Scram Reactivity and Control Rod Drive Specification Dresden 3 Cycle 5

ANSWERS TO NRC QUESTIONS REGARDING
RELOAD 4 FOR DRESDEN UNIT 3

QUESTION 6: Provide a list and briefly describe each physics startup test to be performed for the Cycle 5 reload. Also provide the acceptance criterion for each test and discuss how the measured parameter(s) relate(s) to the values in the accident analysis.

ANSWER: Several startup tests are planned for initial Cycle 5 operation. Most of the tests are for the purpose of checking and calibrating various plant systems and instruments. The following are the Cycle 5 startup tests which are considered physics tests by Dresden Station:

TEST NO. 1 - Core Verification

Description: The core reloading is checked visually or with the aid of an underwater television system for correct loading and orientation of all fuel assemblies. The reload pattern is determined by the appropriate core management organization.

Criteria: Prior to startup, every fuel assembly in the reactor will be verified for correct location and orientation. Any discrepancies in the loading pattern will be corrected prior to startup. Safety analyses, except misoriented bundle analyses, assume that the core is loaded as intended.

TEST NO. 2 - Shutdown Margin Demonstration

Description: The purpose of this test is to demonstrate that the reactor will be subcritical in its most reactive condition during the ensueing cycle with the strongest operable control rod in the full withdrawn position with all other operable control rods fully inserted. This is demonstrated by withdrawing (via a special control rod withdrawal sequence) the strongest control rod and one or two more nearby control rods to predetermined positions or until criticality is achieved. Control rod worth information obtained from General Electric can then be directly used to determine how much reactivity was inserted by the withdrawal of the second, or second and third, control rods.

Criteria: A shutdown margin of R + .25% Δ K must be demonstrated with the strongest rod fully withdrawn. R is assumed to include any increase possible in core reactivity during the cycle from the time of shutdown margin calculation. For Dresden 3 Cycle 5, R is .21% Δ K, .04% Δ K due to inverted control blade poison tubes, and .17% Δ K is the maximum increase in reactivity from BOC. These values were chosen

TEST NO. 2 (Continued)

Criteria (Continued):
for the Dresden Unit 3 Limiting Conditions for Operation to conservatively assure that K effective will be less than one with any one control rod fully withdrawn and all other control rods fully inserted at any point in the cycle.

TEST NO. 3 - Moderator Temperature Coefficient

Description: The purpose of this test is to determine the moderator temperature coefficient of reactivity as a function of temperature. Positive periods are obtained for a given control rod pattern at two slightly different moderator temperatures. This enables a reactivity coefficient to be obtained at the mean value of the two temperatures. Repeating this process for different temperatures allows a moderator temperature coefficient curve to be generated.

Criteria: The moderator temperature coefficient must be negative at all temperatures greater than 450°F. If the coefficient becomes positive between 212°F and 450°F, then appropriate precautions will be issued to operating personnel.

TEST NO. 4 - SRM Performance Check

Description: The purpose of this test is to demonstrate that the operational sources and SRM instrumentation provide adequate information to the operator during a normal startup from shutdown to an intermediate neutron flux level. Required counts on the SRMs are checked and recorded, and a signal to noise ratio check is performed by withdrawing each SRM.

Criteria: There must be at least 3 cps on the required operable SRMs. There must be a minimum signal to noise ratio of at least 3 to 1 on the required operable SRMs. These values are the design bases referred to in the FSAR to insure that adequate neutron flux exists during the approach to criticality.

TEST NO. 5 - Core Power Distribution Symmetry Analysis

Description: The purpose of this test is to determine the magnitude and location of indicated core power distribution asymmetrics. This is accomplished by comparing symmetric integrated TIP data collected in conjunction with full core

TEST NO. 5 (Continued)

Description (Continued):
TIP sets. This test may only be performed if Dresden 3 begins Cycle 5 operation in an "A" sequence which insures octant control rod symmetry. The decision as to which sequence to start the cycle on is based upon the core management engineer's recommendations.

Criteria: The maximum deviation between integrated powers of symmetrical TIP strings should be less than 20%, and the average deviation less than 6% unless the core is not loaded with octant symmetry. This criteria is based upon initial startup test instructions.

TEST NO. 6 - Core Performance Evaluation

Description: The purpose of this evaluation is to verify that the Cycle 5 core loading and rod patterns employed enable operation within Technical Specification thermal and hydraulic parameter limits. The various limits for LHGR, MAPLHGR, MCPR and peaking factor are checked for Technical Specification compliance and possible future problems are noted. Routine methods are used to determine the various parameters.

Criteria: The criteria are the respective Technical Specification limiting conditions for operation. Refer to the Technical Specification bases for a discussion of how each parameter relates to any applicable accident analyses.

QUESTION 7: State your schedule for submitting to NRC a brief summary report of physics startup tests. This report should include both measured and producted values. If the difference between the measured and producted value exceeded the acceptance criterion, the report should discuss the actions that were taken and justify the adequacy of these actions.

ANSWER: Unless the startup testing is performed as part of a startup program for an anticipated operating cycle with unusual characteristics as described in Technical Specification 6.6.A.1, formal reporting does not seem required. The actual startup test data and results are normally available for review at the station within 90 days from the date of completion of the testing program. A copy of the Startup Test Report could be made available upon request within the same time constraint.

DRESDEN 3, RELOAD 4 DYNAMIC VOID COEFFICIENT CALCULATION

The dynamic void coefficient (DVC) for Dresden 3 Reload 4 was calculated directly from the void reactivity data using the following relationship:

$$DVC = \frac{-\Delta K(\$)}{\Delta Rg(\%)} \quad Rgo\%$$

DVC = dynamic void coefficient in ¢/%
ΔK = change in void reactivity in $
ΔRg = change in void fraction in %
Rgo = core average void fraction in %
The void reactivity data for EOC is given in Table 1.

From Table 1 the void reactivity is:

a. 3.49$ at 27.5 % voids, and
b. 5.18$ at 36.3 % voids

Substituting these values in the above equation results in:

$$DVC = \frac{-(5.18 - 3.49)}{(36.3 - 27.5)} (33.5) = -6.434$$

Applying the void coefficient conservatism factor gives:

$$(-6.434)(1.25) = -8.042$$

The value for core average voids given in table 6-1 of NEDO 21333 (D-3, R-4) is the value calculated by the transient analysis computer code. The design safety conservatism factor is used to cover uncertainties in transient parameters.

TABLE 1

NUCLEAR TRANSIENT DATA (EOC)

Void Fraction, %	Void Coefficient, $\frac{1}{k}\frac{dk}{dv} \times 10^3$	Void Reactivity, $
0.0	-0.314	0.0
10.2	-0.603	-0.89
19.0	-0.806	-2.06
27.5	-0.964	-3.49
36.3	-1.093	-5.18
45.3	-1.190	-7.12
54.9	-1.261	-9.32
65.0	-1.304	-11.75

Core average void fraction = 33.5%