CORE PROTECTION CALCULATOR ADDRESSABLE CONSTANTS

2.2.2 Core Protection Calculator Addressable Constants are defined in Table 2.2-2. Type I Addressable constants are expected to change frequently during plant operation. Type II Addressable constant values are determined (or confirmed) during PHYSICS TESTS following each fuel loading and are not expected to change during plant operation. Changes to Type I Addressable constants outside the Allowable Value range require Plant Safety Committee review prior to implementation. Changes to Type II Addressable constants made other than as a result of post fuel loading PHYSICS TESTS shall require Plant Safety Committee review prior to implementation unless the changes are required for Technical Specification Compliance.

APPLICABILITY: As shown for Core Protection Calculators in Table 3.3-1.

ACTION: With a Core Protection Calculator Addressable constant found to be non-conservative, declare the channel inoperable and apply the applicable ACTION statement requirement of Specification 3.3.1.1 until the channel is restored to OPERABLE status.

TABLE 2.2-1

REACTOR PROTECTIVE INSTRUMENTATION TRIP SETPOINT LIMITS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not Applicable	Not Applicable
2. Linear Power Level - High		
a. Four Reactor Coolant Pumps Operating	≤ 110% ~~≤ 123%~~ of RATED THERMAL POWER	< 110.712% ~~≤ 123.712%~~ of RATED THERMAL POWER
b. Three Reactor Coolant Pumps Operating	*	*
c. Two Reactor Coolant Pumps Operating - Same Loop	*	*
d. Two Reactor Coolant Pumps Operating - Opposite Loops	*	*
3. Logarithmic Power Level - High (1)	≤ 0.75% of RATED THERMAL POWER	≤ 0.819% of RATED THERMAL POWER
4. Pressurizer Pressure - High	≤ 2362 ~~2345~~ psia	≤ 2370.887 ~~2353.887~~ psia
5. Pressurizer Pressure - Low	≥ 1766 ~~1740~~ psia (2)	≥ 1712.757 ~~1686.75~~ psia (2)
6. Containment Pressure - High	≤ 18.4 psia	≤ 19.024 psia
7. Steam Generator Pressure - Low	≥ 751 ~~728~~ psia (3)	≥ 729.613 ~~706.6~~ psia (3)
8. Steam Generator Level - Low	≥ 46.7 ~~46.5%~~ (4)	≥ 45.811 ~~45.61%~~ (4)

* These values left blank pending NRC approval of ~~ECCS~~ Safety analyses for operation with less than four reactor coolant pumps operating.

TABLE 2.2-1 (Continued)

REACTOR PROTECTIVE INSTRUMENTATION TRIP SETPOINT LIMITS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
9. Local Power Density - High	$\leq$ 20.3 kw/ft (5)	$\leq$ 20.3 kw/ft (5)
10. DNBR - Low	$\geq$ ~~1.3~~ 1.24 (5)	$\geq$ ~~1.3~~ 1.24 (5)
11. Steam Generator Level - High	$\leq$ ~~93.6%~~ 93.7% (4)	$\leq$ ~~94.489%~~ 94.589% (4)

TABLE NOTATION

(1) Trip may be manually bypassed above 10^{-4}% of RATED THERMAL POWER; bypass shall be automatically removed when THERMAL POWER is $\leq 10^{-4}$% of RATED THERMAL POWER.

(2) Value may be decreased manually, to a minimum value of 100 psia, ~~as pressurizer pressure is reduced,~~ during a planned reduction in pressurizer pressure provided the margin between the pressurizer pressure and this value is maintained at $\leq$ 200 psi; the setpoint shall be increased automatically as pressurizer pressure is increased until the trip setpoint is reached. Trip may be manually bypassed below 400 psia; bypass shall be automatically removed whenever pressurizer pressure is $\geq$ 500 psia.

(3) Value may be decreased manually ~~as steam generator pressure is reduced,~~ during a planned reduction in steam generator pressure provided the margin between the steam generator pressure and this value is maintained at $\leq$ 200 psi; the setpoint shall be increased automatically as steam generator pressure is increased until the trip setpoint is reached.

(4) % of the distance between steam generator upper and lower level instrument nozzles.

(5) As stored within the Core Protection Calculator (CPC). Calculation of the trip setpoint includes measurement, calculational and processor uncertainties, and dynamic allowances. Trip may be manually bypassed below 10^{-4}% of RATED THERMAL POWER; bypass shall be automatically removed when THERMAL POWER is $\geq 10^{-4}$% of RATED THERMAL POWER.

TABLE 2.2-2

CORE PROTECTION CALCULATOR ADDRESSABLE CONSTANTS

I. TYPE I ADDRESSABLE CONSTANTS

POINT ID NUMBER	PROGRAM LABEL	DESCRIPTION	ALLOWABLE VALUE
60	FC1	Core coolant mass flow rate calibration constant (~~Type I addressable constant~~)	≤ 1.15
61	FC2	Core coolant mass flow rate calibration constant (~~Type I addressable constant~~)	0.0
62	CEANOP	CEAC/RSPT inoperable flag (~~Type I addressable constant~~)	0, 1, 2 or 3
63	TR	Azimuthal tilt allowance (~~Type I addressable constant~~)	≥ 1.02
64	TPC	Thermal power calibration constant (~~Type I addressable constant~~)	≥ 0.90
65	KCAL	Neutron flux power calibration constant (~~Type I addressable constant~~)	≥ 0.85
66	DNBRPT	DNBR pretrip setpoint (~~Type I addressable constant~~)	unrestricted
67	LPDPT	Local power density pretrip setpoint (~~Type I addressable constant~~)	unrestricted

POOR ORIGINAL

TABLE 2.2-2 (CONTINUED)

CORE PROTECTION CALCULATOR ADDRESSABLE CONSTANTS

II. TYPE II ADDRESSABLE CONSTANTS

POINT ID NUMBER	PROGRAM LABEL	DESCRIPTION
68	BERR0	Thermal power uncertainty bias ~~(Type II addressable constant)~~
69	BERR1	Power uncertainty factor used in DNBR calculation ~~(Type II addressable constant)~~
70	BERR2	Power uncertainty bias used in DNBR calculation ~~(Type II addressable constant)~~
71	BERR3	Power uncertainty factor used in local power density calculation ~~(Type II addressable constant)~~
72	BERR4	Power uncertainty bias used in local power density calculation ~~(Type II addressable constant)~~
73	EOL	End of life flag ~~(Type II addressable constant)~~
74	ARM1	Multiplier for planar radial peaking factor ~~(Type II addressable constant)~~
75	ARM2	Multiplier for planar radial peaking factor ~~(Type II addressable constant)~~
76	ARM3	Multiplier for planar radial peaking factor ~~(Type II addressable constant)~~
77	ARM4	Multiplier for planar radial peaking factor ~~(Type II addressable constant)~~
78	ARM5	Multiplier for planar radial peaking factor ~~(Type II addressable constant)~~
79	ARM6	Multiplier for planar radial peaking factor ~~(Type II addressable constant)~~
80	ARM7	Multiplier for planar radial peaking factor ~~(Type II addressable constant)~~
81	SC11	Shape annealing correction factor ~~(Type II addressable constant)~~
82	SC12	Shape annealing correction factor

TABLE 2.2-2 (CONTINUED)

CORE PROTECTION CALCULATOR - ADDRESSABLE CONSTANTS

II. TYPE II ADDRESSABLE CONSTANTS (continued)

POINT ID NUMBER	PROGRAM LABEL	DESCRIPTION
83	SC13	Shape annealing correction factor [redacted]
84	SC21	Shape annealing correction factor [redacted]
85	SC22	Shape annealing correction factor [redacted]
86	SC23	Shape annealing correction factor [redacted]
87	SC31	Shape annealing correction factor [redacted]
88	SC32	Shape annealing correction factor [redacted]
89	SC33	Shape annealing correction factor [redacted]
90	PFMLTD	DNBR penalty factor correction multiplier [redacted]
91	PFMLTL	LPD penalty factor correction multiplier [redacted]
92	ASM2	Multiplier for CEA shadowing factor [redacted]
93	ASM3	Multiplier for CEA shadowing factor [redacted]

TABLE 2.2-2 (CONTINUED)

CORE PROTECTION CALCULATOR ADDRESSABLE CONSTANTS

II. TYPE II ADDRESSABLE CONSTANTS (continued)

POINT ID NUMBER	PROGRAM LABEL	DESCRIPTION
94	ASM4	Multiplier for CEA shadowing factor ~~(Type II addressable constant)~~
95	ASM5	Multiplier for CEA shadowing factor ~~(Type II addressable constant)~~
96	ASM6	Multiplier for CEA shadowing factor ~~(Type II addressable constant)~~
97	ASM7	Multiplier for CEA shadowing factor ~~(Type II addressable constant)~~
98	CORR1	Temperature shadowing correction factor multiplier ~~(Type II addressable constant)~~
99	BPPCC1	Boundary point power correlation coefficient ~~(Type II addressable constant)~~
100	BPPCC2	Boundary point power correlation coefficient ~~(Type II addressable constant)~~
101	BPPCC3	Boundary point power correlation coefficient ~~(Type II addressable constant)~~
102	BPPCC4	Boundary point power correlation coefficient

TABLE 4.3-1 (Continued)

REACTOR PROTECTIVE INSTRUMENTATION SURVEILLANCE REQUIREMENTS

FUNCTIONAL UNIT	CHANNEL CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	MODES IN WHICH SURVEILLANCE REQUIRED
10. DNBR - Low	S	S(7), D(2,4), M(8), R(4,5)	M, R(6)	1, 2
11. Steam Generator Level - High	S	R	M	1, 2
12. Reactor Protection System Logic	N.A.	N.A.	M	1, 2 and *
13. Reactor Trip Breakers	N.A.	N.A.	M	1, 2 and *
14. Core Protection Calculators	S, W(9)	D(2,4),R(4,5)	M,R(6)	1, 2
15. CEA Calculators	S	R	M,R(6)	1, 2

TABLE 4.3-1 (Continued)

TABLE NOTATION

* - With reactor trip breakers in the closed position and the CEA drive system capable of CEA withdrawal.

(1) - If not performed in previous 7 days.

(2) - Heat balance only (CHANNEL FUNCTIONAL TEST not included), above 15% of RATED THERMAL POWER; adjust the Linear Power Level signals and the CPC addressable constant multipliers to make the CPC ΔT power and CPC nuclear power calculations agree with the calorimetric calculation if absolute difference is > 2%. During PHYSICS TESTS, these daily calibrations may be suspended provided these calibrations are performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau.

(3) - Above 15% of RATED THERMAL POWER, verify that the linear power subchannel gains of the excore detectors are consistent with the values used to establish the shape annealing matrix elements in the Core Protection Calculators.

(4) - Neutron detectors may be excluded from CHANNEL CALIBRATION.

(5) - After each fuel loading and prior to exceeding 70% of RATED THERMAL POWER, the incore detectors shall be used to determine the shape annealing matrix elements and the Core Protection Calculators shall use these elements.

(6) - This CHANNEL FUNCTIONAL TEST shall include the injection of simulated process signals into the channel as close to the sensors as practicable to verify OPERABILITY including alarm and/or trip functions.

(7) - Above 70% of RATED THERMAL POWER, verify that the total RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by either using the reactor coolant pump differential pressure instrumentation (conservatively compensated for measurement uncertainties) or by calorimetric calculations (conservatively compensated for measurement uncertainties) and if necessary, adjust the CPC addressable constant flow coefficients such that each CPC indicated flow is less than or equal to the actual flow rate. The flow measurement uncertainty may be included in the BERR1 term in the CPC and is equal to or greater than 4%.

(8) - Above 70% of RATED THERMAL POWER, verify that the total RCS flow rate as indicated by each CPC is less than or equal to the actual RCS total flow rate determined by calorimetric calculations (conservatively compensated for measurement uncertainties).

(9) - The correct values of addressable constants (See Table 2.2-2) shall be verified to be installed in each OPERABLE CPC.

a.	RCS Cold Leg Temperature-Low	$\geq$ 465°F
b.	RCS Cold Leg Temperature-High	$\leq$ 605°F
c.	Axial Shape Index-Positive	Not more positive than +0.6
d.	Axial Shape Index-Negative	Not more negative than -0.6
e.	Pressurizer Pressure-Low	$\geq$ 1705 psia
f.	Pressurizer Pressure-High	$\leq$ 2400 psia
g.	Integrated radial Peaking Factor-Low	$\geq$ 1.28
h.	Integrated Radial Peaking Factor-High	$\leq$ 4.28
i.	Quality Margin-Low	$\geq$ 0

Steam Generator Level-High

The Steam Generator Level-High trip is provided to protect the turbine from excessive moisture carry over. Since the turbine is automatically tripped when the reactor is tripped, this trip provides a reliable means for providing protection to the turbine from excessive moisture carry over. This trip's setpoint does not correspond to a Safety Limit and no credit was taken in the accident analyses for operation of this trip. Its functional capability at the specified trip setting is required to enhance the overall reliability of the Reactor Protection System.

2.2.2 CPC Addressable Constants

The Core Protection Calculator (CPC) addressable constants are provided to allow calibration of the CPC system to more accurate indications such as colorimetric measurements for power level and RCS flowrate and incore detector signals for axial flux shape, radial peaking factors and CEA deviation penalties. Other CPC addressable constants allow penalization of the calculated DNBR and LPD values based on measurement uncertainties or inoperable equipment. Administrative controls on changes and periodic checking of addressable constant values (see also Technical Specifications 3.3.1.1 and 6.8.1) ensures that inadvertent misloading is unlikely.

6.7 SAFETY LIMIT VIOLATION

6.7.1 The following actions shall be taken in the event a Safety Limit is violated:

a. The unit shall be placed in at least HOT STANDBY within one hour.

b. The Safety Limit violation shall be reported to the Commission, the Director, Nuclear operations and to the SRC within 24 hours.

c. A Safety Limit Violation Report shall be prepared. The report shall be reviewed by the PSC. This report shall describe (1) applicable circumstances preceding the violation, (2) effects of the violation upon facility components, systems or structures and (3) corrective action taken to prevent recurrence.

d. The Safety Limit Violation Report shall be submitted to the Commission, the SRC and the Director, Nuclear Operations within 14 days of the violation.

6.8 PROCEDURES

6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below:

a. The applicable procedures recommended in Appendix "A" of Regulatory Guide 1.33, Revision 2, February 1978.

b. Refueling operations.

c. Surveillance and test activities of safety related equipment.

d. Security Plan implementation.

e. Emergency Plan implementation.

f. Fire Protection Program implementation.

g. Modification of Core Protection Calculator (CPC) Addressable Constants

NOTE: Modification to the CPC addressable constants based on information obtained through the Plant Computer - CPC data link shall not be made without prior approval of the Plant Safety Committee.

6.8.2 Each procedure of 6.8.1 above, and changes thereto, shall be reviewed by the PSC and approved by the General Manager prior to implementation and reviewed periodically as set forth in administrative procedures.

AXIAL SHAPE INDEX

LIMITING CONDITION FOR OPERATION

3.2.7 The core average AXIAL SHAPE INDEX (ASI) shall be maintained within the following limits:

a) COLSS OPERABLE
$-0.28 \leq \text{ASI} \leq +0.28$

b) COLSS OUT OF SERVICE (CPC)
$-0.20 \leq \text{ASI} \leq +0.20$

APPLICABILITY: MODE 1 above 20% of RATED THERMAL POWER

ACTION:

With the core average AXIAL SHAPE INDEX (ASI) exceeding its limit, restore the ASI to within its limit within 2 hours or reduce THERMAL POWER to less than 20% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.6

The core average AXIAL SHAPE INDEX shall be determined to be within its limits at least once per 12 hours using the COLSS or any OPERABLE Core Protection Calculator channel.

* See Special Test Exception 3.10.2

SPECIAL TEST EXCEPTIONS

GROUP HEIGHT, INSERTION AND POWER DISTRIBUTION LIMITS

LIMITING CONDITION FOR OPERATION

3.10.2 The group height, insertion and power distribution limits of Specifications 3.1.1.4, 3.1.3.1, 3.1.3.5, 3.1.3.6, 3.2.2, 3.2.3, 3.2.7 and the Minimum Channels OPERABLE requirement of Functional Unit 15 of Table 3.3-1 may be suspended during the performance of PHYSICS TESTS provided.

a. The THERMAL POWER is restricted to the test power plateau which shall not exceed 85% of RATED THERMAL POWER, and

b. The limits of Specification 3.2.1 are maintained and determined as specified in Specification 4.10.2.2 below.

APPLICABILITY: During startup and PHYSICS TESTS.

ACTION:

With any of the limits of Specification 3.2.1 being exceeded while any of the above requirements supended, either:

a. Reduce THERMAL POWER sufficiently to satisfy the requirements of Specification 3.2.1, or

b. Be in HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.10.2.1 The THERMAL POWER shall be determined at least once per hour during PHYSICS TESTS in which any of the above requirements are suspended and shall be verified to be within the test power plateau.

4.10.2.2 The linear heat rate shall be determined to be within the limits of Specification 3.2.1 by monitoring it continuously with the Incore Detector Monitoring System pursuant to the requirements of Specifications 4.2.1.3 and 3.3.3.2 during PHYSICS TESTS above 5% of RATED THERMAL POWER in which any of the above requirements are suspended.

SURVEILLANCE REQUIREMENTS (Continued)

2. With 120 volts AC (60 Hz) applied for at least 30 seconds across the input, the reading on the output does not exceed 8 volts DC.

b. For the optical isolators: Verify that the input to output insulation resistence is greater than 10 megohms when tested using a megohmeter on the 500 volt DC range.

4.3.1.1.5 The Core Protection Calculator System shall be determined OPERABLE at lease once per 12 hours by verifying that less than three auto restarts have occurred on each calculator during the past 12 hours.

4.3.1.1.6 The Core Protection Calculator System shall be subjected to a CHANNEL FUNCTIONAL TEST to verify OPERABILITY within 12 hours of receipt of a valid High CPC Room Temperature alarm.

J.C. [illegible]

ZN-0481-03 [illegible]
File# 2-1510

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

April 10, 1981

CLNRAP

Docket No. 50-368

Title: Request for addional info. on ANO 2 Cycle 2 Reload Report.

RECEIVED
APR 16 1981
ARKANSAS POWER & LIGHT CO.
GENERATION & CONSTRUCTION

Mr. William Cavanaugh, III
Senior Vice President
Energy Supply Department
Arkansas Power & Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Dear Mr. Cavanaugh:

The staff has reviewed your February 20, 1981 and March 5, 1981 submittals on the ANO-2 Cycle 2 reload and has identified a need for additional information as set forth in the enclosure.

Please contact us if you have questions regarding the items noted in the enclosure.

Sincerely,

Robert A. Clark

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Enclosure:
As stated

cc: See next page

RECEIVED
APR 16 1981
ARKANSAS POWER & LIGHT CO.
ARKANSAS NUCLEAR ONE

DUPE 8104160768 (7pp.)

48 (3/4 7-8) Describe the bases for the change from less than or equal to 0.10 micro curies per gram dose equivalent I-131 to less than or equal to 0.046 micro curies per gram.

61 (B3/4 7-2) The recent problems you refer to with the electric driven feedwater pump suggest that the pumping capability, although capable of meeting revised safety analysis considerations, may have been reducted somewhat. Outline your plans for evaluating this matter and provide a schedule for reporting to the staff the results of your evaluation and corrective actions to be taken as required.

PART II - INSTRUMENTATION AND CONTROLS SYSTEM

Q-1. The staff feels that AP&L Co., should propose technical specifications to assure that the CPC is not considered operable when environmental conditions including cyclic or ramped temperature fluctuation exceed those for which the CPC has been qualified. Provide justification for the environmental limits proposed. See proposed T.S. 4.3.1.1.6

Q-2. Table 3-4 of CEN 147(s)-P contains upper and lower proposed allowed bounds on addressable constants. These bounds as currently proposed would restrict the values of addressable constants entered into the CPC to avoid only very gross errors. Other, smaller, yet unacceptable values could be entered. For example, a negative value of a diagonal element of the shape annealing correction matrix does not seem justified and such values should be rejected by the computer. Furthermore, there may be values of addressable constants within the current proposed bounds which if entered could lead to violation of DNBR or LPD limits even when the CPC is otherwise functioning properly.

Therefore, please adopt more restrictive bounds on the addressable constants to assure that values may not be entered which are physically unrealistic or which could lead to violation of DNBR or LPD limits even when the CPC is otherwise functioning properly.

Provide a commitment to so modify CPC addressable constant limits at the next CPC software change but not later than six months from the date of this letter.

Q-3. The staff feels that AP&L Co., should propose technical specifications to assure that (a) plant procedures shall be in effect to control modifications to CPC addressable constants (See proposed T.S. 6.8.1.9) (b) these procedures are consistent with Approved Physics and Thermal Hydraulic Methods; the approved methods should be referenced in the bases to the Technical Specifications (c) CPC Addressable constants and their allowed ranges (i.e., upper and lower bounds) are identified in the Technical Specifications (d) values of Addressable Constants outside the allowed range are not to be entered without approval of the Plant Safety Committee (see proposed T.S. 2.2.2) (e) An independent verification shall be conducted to confirm that Addressable Constant Modifications have been made as approved by the Plant Safety Committee or the Engineering Staff (whichever is applicable) (f) Modifications to the CPC Addressable Constants based on information obtained through the Plant Computer Data Links shall not be made without approval of the Plant Safety Committee.

see propose change to T. Table 4.3-1

see propose T.S. 6.8.1.g

PART III - OTHER ISSUES

Q-1. Your letter of August 29, 1980 requested an extension from 12 to 24 hours for setting the pressurizer code safety valves during Mode 3. The following information is needed to enable our review.

a) Was the subject testing performed as part of the ANO-2 ASME Code Section XI inservice testing and inspection program?

b) How many tests have been conducted on these valves to date and what was the time required to do each of these tests?

c) How does AP&L Co's., experience with the testing of these valves compare to general industry practice?

d) During the testing are both valves rendered inoperable at the same time?