ATTACHMENT 2

TO P-90083

PROPOSED CHANGES

Specification LCO 4.4.1

Table 4.4-4 (Part 1)

INSTRUMENT OPERATING REQUIREMENTS FOR THE PLANT PROTECTIVE SYSTEM, ROD WITHDRAWAL PROHIBIT (RWP)

NO.	FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUE
1.	Startup Channel-Low Count Rate (u)	≥ 4.2 cps	≥ 3.2 cps
2a.	Linear Channel-Low Power RWP (Channels 3, 4 and 5)	≥ 5% Indicated Thermal Power (m)	≥ 5% Indicated Thermal Power
2b.	Linear Channel-Low Power RWP (Channels 6, 7 and 8)	≥ 5% Indicated Thermal Power (m)	≥ 5% Indicated Thermal Power
3a.	Linear Channel-High Power RWP (Channels 3, 4 and 5)	≤ 30% Indicated Thermal Power (n)	≤ 30% Indicated Thermal Power
3b.	Linear Channel-High Power RWP (Channels 6, 7 and 8)	≤ 30% Indicated Thermal Power (n)	≤ 30% Indicated Thermal Power

Notes for Tables 4.4-1 through 4.4-4 are on Pages 4.4-8 and 4.4-9

SPECIFICATION LCO 4.4.1

TABLE 4.4-4 (Part 2)

INSTRUMENT OPERATING REQUIREMENTS
FOR REACTOR PROTECTIVE SYSTEM, ROD WITHDRAWAL PROHIBIT (RWP)

NO.	FUNCTIONAL UNIT	MINIMUM OPERABLE CHANNELS	MINIMUM DEGREE OF REDUNDANCY	PERMISSIBLE BYPASS CONDITIONS
1.	Startup Channel - Low Count Rate (u)	2	1	Above 1.0E-03% Rated Power
2a.	Linear Channel - Low Power RWP (Channels 3, 4, and 5)	2	1	(g)
2b.	Linear Channel - Low Power RWP (Channels 6, 7, and 8)	2	1	(g)
3a.	Linear Channel - High Power RWP (Channels 3, 4, and 5)	2 (f)	1	None
3b.	Linear Channel - High Power RWP (Channels 6 7, and 8)	2 (f)	1	None

Notes for Tables 4.4-1 through 4.4-4 are on Pages 4.4-8 and 4.4-9

NOTES FOR TABLES 4.4-1 through 4.4-4 (continued)

(r) Separate instrumentation is provided on each circulator for this functional unit. Only the affected helium circulator shall be shut down within 12 hours if the indicated requirements are not met.

(s) Deleted.

(t) A primary coolant dew point moisture monitor shall not be considered operable unless the following conditions are met:

1)

Reactor Power Range	Minimum Sample Flow
Startup to 2%	1 scc/sec.
> 2% - 5%	5 scc/sec.
> 5% - 20%	15 scc/sec.
>20% - 35%	30 scc/sec.
>35% - 100%	50 scc/sec.

2) Minimum flow of item 1) is alarmed in the control room and the alarm is set in accordance with the power ranges specified.

3) Deleted

4) Fixed alarms of 1 scc/sec and 75 scc/sec are operable.

(u) With nine or less fueled regions remaining in the core, neutron sources may be installed near the Startup Channel detectors to maintain the minimum specified count rate. During this condition, the count rate seen by the detectors from these nearby sources shall not exceed 50 counts per second (cps).

Basis for Specification LCO 4.4.1 (Continued)

minimizing thermal cycling of plant and installed equipment.

Steam Leak Detection in the Turbine Building is required for equipment qualification of Safe Shutdown Cooling Systems. Thus, the limits and basis are the same as discussed in the basis for steam leak detection in the reactor building.

d. Rod Withdrawal Prohibit Inputs

The termination of control rod withdrawal to prevent further reactivity addition will occur with the following conditions:

Startup Channel - Low Count Rate

Start-up Channel - Low Count Rate is provided to prevent control rod pair withdrawal and reactor startup without adequate neutron flux indication. The trip level is selected to be above the background noise level.

When the reactor is being defueled, a point will be reached when the remaining fueled regions and neutron sources will produce an insufficient number of neutrons to maintain the minimum specified Startup Channel count rate. Neutron sources may be placed near the Startup Channel detectors to aid in maintaining the minimum specified count rate when nine fueled regions or less remain in the core. The count rate seen by the detectors from these nearby sources shall not exceed 50 cps. This will assure that an unexpected reactor criticality will be indicated on the Startup Channel instrumentation and will not be masked by the direct neutrons from these sources.

Linear Channel - Low Power RWP

Linear Channel (5% Power) directs the reactor operator's attention to either a downscale failure of a power range channel or improper positioning of the Interlock Sequence Switch. (FSAR Sections 7.1.2.2 and 7.1.2.8)

Linear Channel - High Power RWP

Linear Channel (30% Power) is provided to prevent control rod pair withdrawal if reactor power exceeds the Interlock Sequence Switch limit for the "Low Power" position. (FSAR Sections 7.1.2.2 and 7.1.2.8)

TABLE 5.4-4

MINIMUM FREQUENCIES FOR CHECKS, CALIBRATIONS, AND TESTING OF ROD WITHDRAWAL PROHIBIT SYSTEM

Channel Description	Function	Frequency(1)	Method
1. Start-up Channel	a. Check	D	a. Comparison of two separate channel indicators.
	b. Test	P	b. Apply test signal to verify all trips and alarms.
	c. Calibrate	R	c. The internal test signal shall be checked and calibrated to assure that its output is in accordance with the design requirements. This shall be done after completing the external test signal procedure by checking the output indication when turning the internal test signal switch.
	d. Check	X	d. Check that the count rate seen by the Startup Channel detectors from nearby installed sources does not exceed 50 counts per second.

TABLE 5.4-4

MINIMUM FREQUENCIES FOR CHECKS, CALIBRATIONS, AND TESTING OF ROD WITHDRAWAL PROHIBIT SYSTEM (Cont'd)

Channel Description	Function	Frequency(1)	Method
2. Linear Channel	a. Check	D	a. Comparison of 6 separate level indicators.
	b. Test	M	b. Apply test signal to verify trips and alarms.
	c. Calibrate	D	c. Channel adjusted to agree with heat balance calculation.
	d. Calibrate	R	d. Apply test signals to adjust trips and indications.
3. Wide Range Power Channel	a. Check	D	a. Comparison of three separate indicators.
	b. Test	P	b. Apply test signals to verify trips and alarms.
	c. Calibration	M	c. Channel adjusted to agree with heat balance calculation.
	d. Calibration	R	d. Apply test signals to adjust trips and indications.
4. Multiple Rod Pair Withdrawal	a. Test	P	a. Attempt two rod pair withdrawal.
	b. Check	R	b. Simulate current through sensor to verify trip and alarms.

NOTE 1: D - Daily when in use
M - Monthly
R - Once per refueling cycle
P - Prior to each start-up if not done previous week
X - Whenever neutron sources are installed or repositioned near the Startup Channel detectors.

boron loading equivalent to about 350 ppm of homogeneous natural boron to replace the negative reactivity of the control rods.

The essentially right circular cylindrical geometry of the core that is modeled in the GAUGE code will be retained during defueling. The outer ring of fuel elements (Regions 20-37) will be replaced with defueling elements first. The next most outer ring of fuel elements (Regions 8-19) will be replaced second. The central regions of fuel elements (Regions 2-7 and 1) will be replaced last.

The top layer reflectors (metal plenum elements) may be replaced with reflectors not containing boronated graphite in selected regions during defueling, to decrease shielding of the Startup Channel detectors from multiplied neutrons originating in the core. Neutron sources (Cf-252) will also be added in the top layer of fuel of selected core regions to maintain a Startup Channel neutron count rate above the specified minimum.

With nine fueled regions or less remaining in the core, neutron sources may also be placed in tubes near the Startup Channel detectors or in the detectors' wells. The strength and positioning relative to the detectors of these neutron sources shall be chosen to maintain the minimum specified count rate, while not exceeding 50 counts per second (counts seen by the detectors from these sources) per LCO 4.4.1, Table 4.4-4.

Basis for Specification DF 6.1

The above specifications form the general design bases and criteria for the overall design features of the reactor core which were used to evaluate its general performance. Further details concerning these design features are given in Section III of the FSAR, the Safety Analysis Report for Fort St. Vrain Reload 1 Test Elements FTE-1 through FTE-8, General Atomic Document GLP-5494, June 30, 1977, and the Safety Analysis Report For Reactor Defueling, General Atomics Document GA-C19694.

SPECIFICATION SR 4.1.4 (Continued)

c. The CORE AVERAGE TEMPERATURE is equal to 80 degrees F, and

d. Full decay of Xe-135, full buildup of Sm-149, and Pa-233 decay as a function of time after shutdown.

| C. When in REFUELING*:

1. Prior to control rod pair withdrawal, if all control rod pairs are not fully inserted into fueled regions prior to withdrawal action, and

2. Prior to the removal of the control rod pair in a region to be refueled or repaired.

3. In assessing the SHUTDOWN MARGIN the following conditions shall be assumed:

a. The highest worth control rod pair capable of being withdrawn is fully withdrawn,

b. Control rod pairs being withdrawn for refueling/repair, SHUTDOWN MARGIN assessment, or OPERABILITY test purposes, are fully withdrawn,

c. All other OPERABLE control rod pairs are fully inserted into fueled regions and incapable of being withdrawn,

d. Inoperable control rod pairs are in their known position or fully withdrawn,

e. For planned CORE ALTERATIONS, the core shall be in its most reactive configuration,

| * Exception: SHUTDOWN MARGIN assessment may be discontinued when
| nine fueled regions or less remain in the core.

BASIS FOR SPECIFICATION LCO 3.1.4/SR 4.1.4 (Continued)

The ACTION statement of LCO 3.1.6, Control Rod Pair Position Requirements-Shutdown, requires completion of the assessment of the SHUTDOWN MARGIN within 12 hours.

Within the first 24 hours after shutdown, the SHUTDOWN MARGIN is significantly larger than specified due to higher core temperatures and the presence of Xe-135 and Pa-233. A 12 hour delay will not compromise the validity of this specification.

Assessment of the SHUTDOWN MARGIN prior to any control rod pair withdrawal, if all control rod pairs are not fully inserted, prior to withdrawal to achieve criticality, and prior to removal of a control rod pair for refueling/repair, ensures that the requirements of this specification will be met during these ACTIONS.

During defueling, SHUTDOWN MARGIN assessment is required until nine or less fueled regions remain in the core. At that time, SHUTDOWN MARGIN assessments are no longer required since a calculated k(eff) not exceeding 0.95 is achieved. This calculation assumes that all control rod pairs are fully withdrawn, the remaining fueled regions are configured in their most reactive condition, a CORE AVERAGE TEMPERATURE equal to 80 degrees F, full decay of Xe-135, full build up of Sm-149, and full decay of Pa-233. These assumptions are more conservative than those of SR 4.1.4.C and result in a more reactive hypothetical core condition. Assuming the conditions of SR 4.1.4.C and the full decay of Pa-233, the highest actual calculated k(eff) (with nine or less fueled regions remaining) is not projected to exceed 0.81. This situation occurs with seven fueled regions remaining, while two control rod pairs are removed for defueling. (Reference the Safety Analysis transmitted to the NRC in PSC letter P-90083.)

SPECIFICATION LCO 3.1.6 (Continued)

2. Within 12 hours either:

   a. Insert any control rod pair capable of being inserted into fueled regions and verify the SHUTDOWN MARGIN requirements of LCO 3.1.4 are met, or

   b. Actuate sufficient reserve shutdown material into fueled regions to achieve the specified SHUTDOWN MARGIN.

SURVEILLANCE REQUIREMENTS

4.1.6 A. Control rod pair positions for all control rod pairs capable of being withdrawn shall be monitored for compliance with LCO 3.1.6.A above, once every 12 hours.

B. Following each reactor shutdown, each control rod pair shall be verified to be at the fully inserted position by:

1. The rod-in position indication, or

2. The use of an independent control rod pair position verification method (e.g., watt-meter test).

Control rod pairs known to be fully inserted prior to the shutdown may be excluded from the above verifications.

C. Prior to the removal of more than one control rod drive assembly, the SHUTDOWN MARGIN shall be explicitly calculated per the assumptions specified in SR 4.1.4, unless the exception to SR 4.1.4.C is in effect.

SPECIFICATION SR 4.1.6 (Continued)

D. Upon full withdrawal of control rod pairs selected for removal, and prior to disabling their scram capabilities, the SHUTDOWN MARGIN shall be assessed by*:

1. Withdrawing one or more additional control rod pairs with a calculated worth greater than or equal to 0.01 delta k, plus any calculated positive worth due to the temperature difference between the actual refueling temperature and 80 degrees F,

2. Verifying subcriticality, and

3. Then reinserting the additional control rod pairs.

---

* Assessing the SHUTDOWN MARGIN is not required if the exception to SR 4.1.4.C is in effect.

BASIS FOR SPECIFICATION LCO 3.1.6/SR 4.1.6

This specification ensures that a sufficient number of control rod pairs are fully inserted into fueled regions to keep the reactor in a shutdown condition (SHUTDOWN MARGIN greater than or equal to 0.01 delta k) in SHUTDOWN and REFUELING.

Prior to refueling a region, the control rod pair in that region and the control rod pair in the region next in sequence to be refueled will be withdrawn. Additional predesignated control rod pairs will also be withdrawn and subcriticality will be verified. The calculated minimum reactivity worth of the additional predesignated control rod pairs is 0.01 delta k plus the reactivity difference between the new and spent fuel in the region to be refueled, plus the temperature defect between the refueling temperature and 80 degrees F. After subcriticality has been verified, the predesignated control rod pairs will be fully reinserted. Withdrawal of the predesignated control rod pairs ensures a SHUTDOWN MARGIN of greater than or equal to 0.01 delta k at 80 degrees F with new fuel loaded into the refueled region. This procedure shall be followed until nine fueled regions or less remain in the core and the exception to SR 4.1.4.C is in effect.

Making all of the fully inserted control rod pairs incapable of being withdrawn ensures that an un-analyzed core configuration which might result in criticality will not exist. In general, this is accomplished by placing the reactor mode switch in the "off" position or disabling the electrical supply to the motors. However, for any specific control rod pair where analysis indicates inadvertent withdrawal would result in criticality, this control rod pair is made incapable of withdrawal by physically disconnecting its drive so that its withdrawal is an incredible event for the purposes of analysis. This may be accomplished by lifting the power leads or other means that involve more than just an administratively controlled clearance.

ATTACHMENT 3

TO P-90083

NO SIGNIFICANT
HAZARDS CONSIDERATION
ANALYSIS

NO SIGNIFICANT HAZARDS CONSIDERATION ANALYSIS

I. EVALUATION OF CHANGES

Changes to Reactivity Control Section SR's 4.1.4, 4.1.6, and their Bases delete all requirements to perform shutdown margin assessments during defueling after nine fueled regions or less remain in the core. The purpose of shutdown margin assessment during refueling conditions (including defueling) is to confirm that a shutdown margin of at least 0.01 delta k will exist assuming the core average temperature equals 80 degrees Fahrenheit, full decay of Xe-135, full buildup of Sm-149, Pa-233 decay as a function of time after shutdown, the highest worth control rod pair capable of being withdrawn is fully withdrawn, control rod pairs needing to be withdrawn are fully withdrawn, and the most reactive configuration for planned core alterations. K(eff) has been calculated to equal 0.95 when nine fueled regions remain in the core, assuming all control rods are fully withdrawn, Pa-233 is fully decayed, and the other conditions of SR 4.1.4.C are satisfied. However, during the remainder of the defueling process, a maximum of two control rod pairs will be removed from fueled regions at any one time in preparation for defueling those regions. This results in a calculated k(eff) below 0.81. At these low values of k(eff), shutdown margin assessment to demonstrate the core is subcritical by at least 0.01 delta k is not meaningful or necessary. The probability of an inadvertent criticality is not increased by elimination of shutdown margin assessment when nine fueled regions or less remain in the core.

As defueling progresses on the last nine fueled regions in the core, a point will be reached when the remaining fueled regions and neutron sources will produce an insufficient number of neutrons to maintain the minimum specified Startup Channel count rate of LCO 4.4.1. Changes to Reactor Core Design Features, DF 6.1, and LCO 4.4.1 allow neutron sources to be installed near the Startup Channel detectors after nine fueled regions or less remain in the core. This will enable a count rate indication above background noise levels to be maintained on the Startup Channel instrumentation per the requirements of LCO 4.4.1. This aids in assuring Startup Channel operability. The maximum count rate seen by the Startup Channel detectors from these sources is limited to 50 counts per second. This ensures that an unexpected reactor criticality will be indicated on the Startup Channel instrumentation and will not be masked by the direct neutrons from the nearby sources.

The Startup Channel Check added to SR 5.4.1, Table 5.4-4 verifies that the count rate seen by the detectors from the nearby sources (when installed) does not exceed 50 cps. This surveillance shall be performed upon source installation and any time the sources are repositioned. It is not anticipated that the Startup Channel detectors would see an increased count rate from these sources once they are positioned since radioactive sources decay over time. However, should the sources unexpectedly reposition themselves nearer to the detectors, plant operators would see an increased count rate on the Startup Channel instrumentation. Administrative procedures exist that evaluate changes in core reactivity during defueling, and provide immediate and corrective actions for unexpected indications of increased reactivity.

Changes made to the DF 6.1 discussion on replacing the top layer reflector elements are for clarification only, and do not involve any technical changes.

II. CONCLUSION

Based on the above evaluation, it is concluded that operation of Fort St. Vrain in accordance with the proposed changes will not involve a significant increase in the probability or consequences of an accident previously evaluated, create the possibility of a new or different kind of accident from any accident previously evaluated, or involve a significant reduction in a margin of safety. Therefore, this change will not increase any risk to the health and safety of the public nor does it involve any significant hazards.

ATTACHMENT 4

TO P-90083

SAFETY ANALYSIS

Safety Analysis

1.0 Introduction

Fort St. Vrain (FSV) was permanently shutdown on August 18, 1989. By letter dated December 1, 1989, the NRC issued Amendment No. 74 to the Facility Operating License, which authorized loading of defueling elements into the core and permitted PSC to proceed with defueling. (See Figure 1 for the defueling sequence.) Currently, PSC has removed fuel from 12 core regions, and replaced fuel blocks in those regions with defueling elements.

The changes to the Technical Specifications proposed by this submittal address performance of shutdown margin (SDM) assessments and the capability to maintain the minimum count rate required by the FSV Technical Specifications on the Startup Channel nuclear instrumentation in the latter phase of defueling.

The proposed Technical Specification changes will permit elimination of shutdown margin assessments with nine or less regions of fuel remaining in the core. This point in the defueling sequence was selected because it is no longer possible to achieve criticality, assuming all control rods are withdrawn.

With respect to the Startup Channel count rate, the Technical Specifications require that both Startup Channels be operable and a rod withdrawal prohibit occur should the count rate on either channel decrease below 4.2 cps. However, the proposed change would permit the Startup Channel count rate to be maintained above 4.2 cps by the addition of neutron sources located near the Startup Channel detectors. The use of these nearby sources would only be permitted when nine fueled regions or less remain in the core.

2.0 Analysis

2.1 Shutdown Margin During Defueling

The proposed amendment to Technical Specifications SR 4.1.4 and SR 4.1.6 eliminates the requirement for shutdown margin assessments once nine fueled regions or less remain in the core. At this time, k(eff) is calculated to not exceed 0.95 assuming all control rods in the core are fully withdrawn, Pa-233 is fully decayed, and the other conditions of SR 4.1.4.C are satisfied. The 0.01 delta k shutdown margin assessments are not meaningful and are considered to be unnecessary to confirm shutdown margin. Prior to reaching this point, SR 4.1.4 and SR 4.1.6 will continue to require that shutdown margin assessments be performed to confirm that a shutdown margin of at least 0.01 delta k is maintained.

PSC has adopted k(eff) of less than or equal to 0.95 as the reference for shutdown cores and spent fuel storage facilities. A k(eff) of 0.95 is discussed in various NRC regulatory documents, including NRC Bulletin No. 89-03, Standard Review Plan (NUREG 0800) Section 9.1.2, and Regulatory Guide 1.13 (Appendix A). ANS Standard 57.2/N210-1976 (Section 5.1.12) also discusses k(eff) of 0.95.

Table 1 presents the results of shutdown margin analyses, performed using the GAUGE code, through the remaining 25 regions of the defueling sequence (12 regions of fuel have been removed from the outer ring of the core and placed in FSV's fuel storage wells). Table 1 also identifies the calculated k(eff) which will exist with the shutdown margin assessment rod pair(s) fully withdrawn. PSC has confirmed that inadvertent withdrawal of the maximum worth rod pair, instead of the rod(s) designated for shutdown margin assessments, will never result in a k(eff) greater than 0.99. The shutdown margin calculations were performed based on the actual "as-burned" core, with credit taken for the lumped poison pins in the defueling elements. Full decay of Xe-135 and Pa-233, and full buildup of Sm-149 was also assumed, with the core assumed to be at 80 degrees F. All control rods were assumed to be fully inserted, with the exception of those withdrawn in preparation for defueling, or for shutdown margin assessment, as specified in Table 1. In all cases the shutdown margin is shown to be in excess of 0.01 delta k, as required by Technical Specification LCO 3.1.4.

Table 2 presents the calculated k(eff) with eleven fueled regions or less remaining in the core, with either all control rods fully withdrawn or with two rod pairs out (the defueling configuration), and core temperature assumed to be 80 degrees F. It is noted that, when nine regions of fuel remain in the core, and all rods are assumed to be withdrawn, calculated k(eff) is 0.9500. After shutdown margin assessments cease, the highest predicted defueling configuration k(eff) is 0.8075. This follows removal of 30 fueled regions (7 regions of fuel remaining) with two rod pairs withdrawn to facilitate defueling the next two regions in the sequence. Thus, it is clear that FSV will have a very substantial shutdown margin beyond that point at which shutdown margin assessment ceases.

GAUGE Code Adequacy

The code used by PSC for all shutdown margin calculations is the GAUGE code. This model has been used extensively for core monitoring, core design, critical rod height predictions, and for analyzing core reactivity changes. It has also been used extensively in the calculation of shutdown margins. Critical rod height predictions with GAUGE are frequently compared to the actual critical rod height where typical discrepancies are about +/- .003 delta k. The Technical Specifications require that critical rod heights be predicted within +/- 0.01 delta k. In addition, GAUGE has been used to predict control rod bank worths and has always met the Technical Specification requirements concerning the measured versus predicted values. Since the defueling sequence assures that the core will be maintained essentially in a right circular cylinder geometry, PSC has no evidence that the uncertainty associated with the shutdown margin computation would be significantly different than the uncertainty of 0.012 delta k as described in Section 3.5.7.4 of the FSAR for subsequent cycles as defueling progresses.

2.2 Neutron Sources and Reactivity Monitoring

Core reactivity during defueling is being monitored by means of the count rate on the redundant (two) Startup Channels per Technical Specification LCO 4.7.5. Table 4.4-4 of LCO 4.4.1 identifies the trip setpoint for a rod withdrawal prohibit (RWP) on low Startup Channel count rate as equal to or greater than 4.2 cps. The purpose of this particular rod withdrawal prohibit is to prevent control rod pair withdrawal and reactor startup without adequate neutron flux indication. The trip level is above the background noise level of the channels. Analysis by PSC indicates that a neutron count rate greater than 4.2 cps will be maintained with greater than nine fueled regions remaining.

As defueling continues past nine fueled regions remaining, a point will be reached when the remaining fueled regions and neutron sources will produce an insufficient number of neutrons to maintain the minimum specified Startup Channel count rate. (See Figure 1 for the location of the Startup Channel detectors and in-core sources.) The minimum specified count rate will then be maintained by installing small neutron sources near the Startup Channel detectors. The Startup Channels will be maintained operable per the requirements of LCO 4.7.5.

Strength and location of any nearby neutron sources will be selected to provide a count rate at each detector of greater than 4.2 cps (not to exceed 50 cps) to confirm Startup Channel operability. The nearby sources must not mask any criticality accident. During past reactor startups, the Startup Channels typically indicate approximately 2,000 cps when the reactor attains criticality. Testing was conducted in 1974 to determine the capability of the Startup Channels to detect criticality in localized areas of the core. These tests were documented in RT-310, a special test performed during zero power testing, and showed that both Startup Channels were capable of detecting criticalities resulting from localized reactivity additions (withdrawal of rod pairs from 3 adjacent regions). The recorded count rates were between 150 cps and 750 cps on both Startup Channels just prior to criticality. This testing provides assurance that the operators will be warned prior to any criticality accident, even with small neutron sources located near the detectors which produce up to and including 50 cps.

3.0 Conclusion

PSC is proposing to eliminate the requirement for shutdown margin assessments when nine fueled regions or less remain in the core.

PSC will maintain both Startup Channels in an operable condition to the end of defueling so that they are confirmed to be capable of detecting an inadvertent criticality. Using in-core neutron sources, it may not be possible to maintain a count rate above the minimum required (4.2 cps). The proposed Technical Specification changes would permit use of neutron sources located near the Startup Channel detectors to maintain the required count rate to the end of defueling. Testing has demonstrated that localized criticality produced count rates well above 100 cps at both detectors. Therefore, the Startup Channels would register criticality and serve to warn the operators even with these nearby sources indicating a direct neutron count rate of up to and including 50 cps. Use of these nearby neutron sources would only be allowed after defueling has progressed to a point where nine fueled regions or less remain. Attaining criticality with nine fueled regions or less remaining is not considered to be credible.

Table 1

Shutdown Margins During Remainder of Defueling Sequence, From 25 Fueled Regions Remaining

NO. OF FUELED REGIONS	2 ROD * PAIRS OUT	2 ROD PAIRS OUT k(eff)	SDM ASESS. ROD	SDM ASESS. k(eff)
25	30+37	.8798	4	.9268
24	37+24	.8717	4	.9267
23	24+31	.8730	4	.9268
22	31+23	.8677	4	.9240
21	23+32	.8621	4	.9236
20	32+13	.8929	4	.9497
19	13+19	.8936	4	.9498
18	19+12	.8564	4	.8979
17	12+18	.8432	4	.8957
16	18+11	.8530	4	.8926
15	11+17	.8531	4	.8927
14	17+8	.8240	4	.8460
13	8+14	.8135	4	.8423
12	14+9	.8175	4	.8452
11	9+15	.8239	4	.8468
10	15+10	.8170	4	.8368
9	10+16	.7703	---	---
8	16+2	.7848	---	---
7	2+5	.8075	---	---
6	5+7	.7869	---	---
5	7+4	.7563	---	---
4	4+1	.7852	---	---
3	1+6	.6472	---	---
2	6+3	.6526	---	---
1	3	.6526	---	---
0	---	---	---	---

* Next 2 regions to be defueled in sequence.

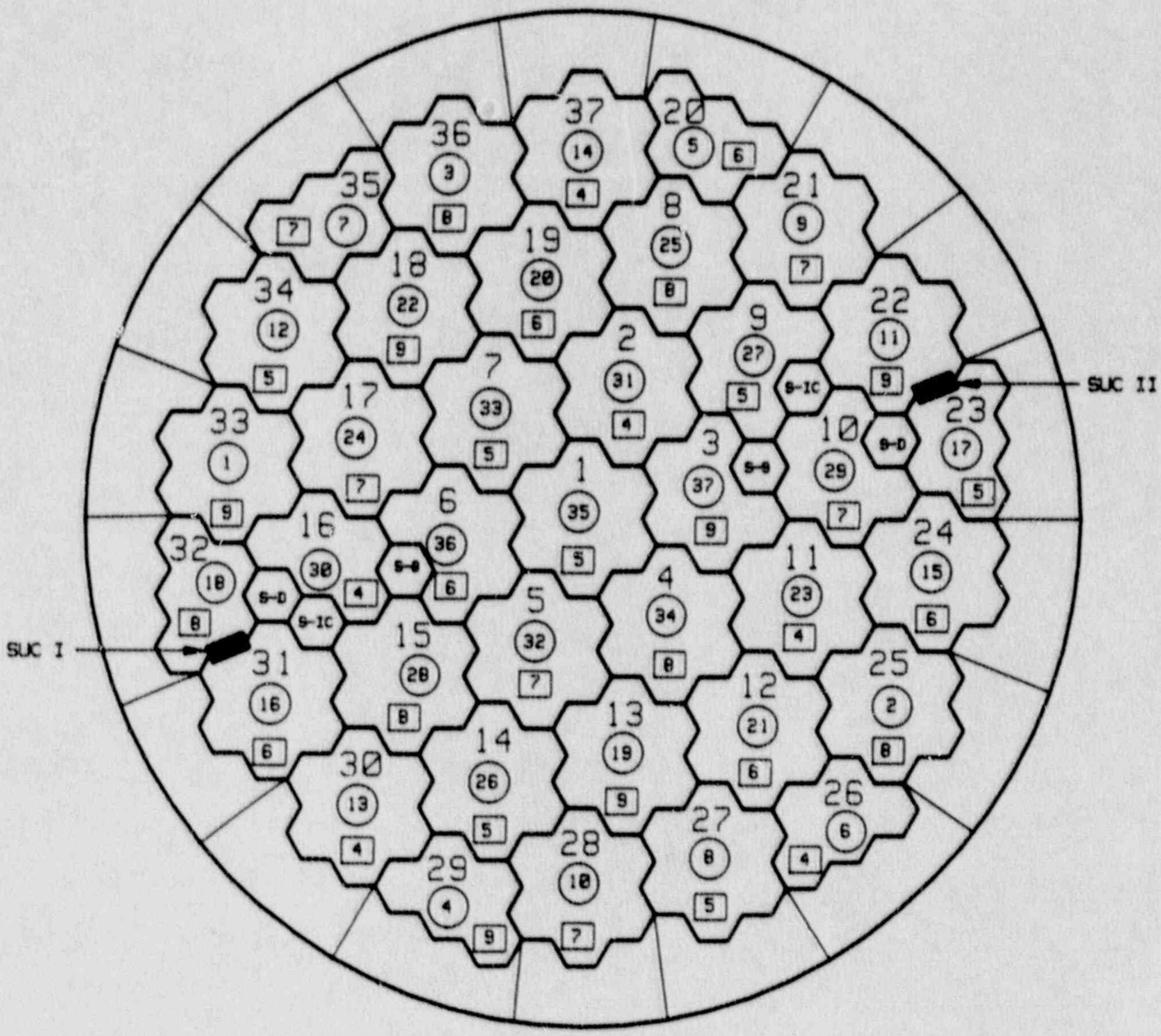
Table 2

Calculated k(eff) - Assuming Most Reactive Core Conditions

NO. OF FUELED REGIONS	ALL CONTROL RODS OUT	DEFUELING CONFIGURATION (TWO ROD PAIRS OUT)
11	.9840	.8239
10	.9672	.8170
9	.9500	.7703
8	.9451	.7848
7	.9442	.8075
6	---	.7869
5	---	.7563

Fig. 1

DEFUELING SEQUENCE STRATEGY
(SEQUENCE NO. 8)



SPIRAL DEFUEL
(FROM OUTSIDE TO CENTER)

LEGEND

REGION NUMBER 30

SEQUENCE NUMBER 37

SEGMENT NUMBER 4

SOURCE ELEMENT S-

INITIAL CORE -IC

SEGMENT -8 or -9

DEFUELING -D