ATTACHMENT A

Proposed Technical Specification Changes

Proposed Technical Specification Modifications

Item Number	Technical Specification	Description of Change	Reason for Change
1.	3.1.1.1.2 p. 3/4 1-2a	Change from "1. 490^{o}F $\leq T_{avg} \leq$ 515^{o}F Shutdown Margin $\geq$ 6% $\Delta k/k$ for T_{avg} = 515^{o}F" to "1. 490^{o}F $\leq T_{avg}$ Shutdown Margin $\geq$ 6% $\Delta k/k$ for T_{avg} = 516^{o}F."	To be consistent with assumptions of revised steam line break analysis supporting increase in temperature limit in Table 3.2-1.
2.	4.2.1.2 b p. 3/4 2-2	Delete "b. Effect of inserting the control rod group from its position at the time of measurement to its insertion limit, F_I as shown in Figure 3.2-2. The rod insertion limit is shown in Figure 3.1-2."	The revised LOCA analysis already accounts for the worst-perturbed power distributions, thus this adjustment to the measured LHGR becomes unnecessary.
3.	4.2.1.2 h p. 3/4 2-3	Change "h. Core average linear heat generation rate at full power, 4.417 kw/ft." to "g. Core average linear heat generation rate at full power."	The specific value presumes a certain fuel assembly configuration. Minor modifications are sometimes necessary at refueling to remove damaged fuel rods, which could change this value. In order to avoid the necessity for last minute Technical Specification change, the value should be removed.
		Insert "The Factors d, e and f ... the individual parameters."	The factors cited are independent from each other, and thus can be combined statistically using the square-root-of-the-sum-of-the-squares method.
4.	Figure 3.2-1 p. 3/4 2-4	Replace current peak LHGR curve with the enclosed new curve.	LOCA limits have been recalculated as described in Section 9 of the Core XVIII Core Performance Analysis Report, Attachment B.

Item Number	Technical Specification	Description of Change	Reason for Change
5.	Figure 3.2-2 p. 3/4 2-5	Delete.	Same as Item 2.
6.	Figure 3.2-3 p. 3/4 2-6	Replace current xenon redistribution curve with the enclosed new curve.	The new curve reflects the basis for establishing the worst axial power shapes for determining peak LHGR limits from the LOCA analysis, as discussed in Section 5.1 of the Core XVIII CPAR, Attachment B.
7.	Figure 3.2-4 p. 3/4 2-7	Replace current reduced load multiplier with the enclosed new curve.	The exposure range is expanded to accommodate the expected cycle length.
8.	3.2.4 a p. 3/4 2-12	Change from "Main Coolant System Inlet Temperature" to "Highest Operating Loop Cold Leg Temperature."	To be consistent with core safety limit temperature specification wording in Section 2.1.1.
9.	Table 3.2-1 p. 3/4 2-13	Change from "Main Coolant System Inlet Temperature $\leq 515^{\circ}F \leq 515^{\circ}F$" to "Operating Loop Cold Leg Temperature $\leq 520^{\circ}F$."	A $5^{\circ}F$ increase is provided in order to accommodate possible future increases in operating main coolant system temperature. The increase was factored into the licensing analysis and was found to have negligible impact on the results.
		Delete limits for "3 Loops in Operation."	Three-loop operation is not allowed at Yankee at this time.

Item Number	Technical Specification	Description of Change	Reason for Change
10.	Table 3.3-3 p. 3/4 3-14	Change trip setpoints in 1.a. 1) and 1.b. 1) from "1700 psig" to "1650 psig."	In order to avoid inadvertent SI actuations on reactor trips. This change has been factored into the Core XVIII LOCA and steam line break analysis and has negligible impact on the results of the analysis (Sections 7 and 9 of Attachment B).
11.	3.9.1 p. 3/4 9-1	Change wording from "... 0.93 or less, which includes a 2% k/k conservative allowance for uncertainties." to "... 0.93 calculated or less."	Making wording consistent with analysis basis.
12.	Bases 3/4.1.1 p. B3/4 1-1	Delete "$\geq$ 6%Δk/k at T_{avg} = 515°F" and "$\geq$ 5%Δk/k at T_{avg} = 330°F."	Eliminates redundancy since values are specified in 3.1.1.1.2. Reduces potential for future errors and confusion if one set of numbers get changed without the other.
13.	Bases 3/4.2.1 p. B3/4 2-1	Insert "This multiplier ... axial power distribution."	Explains basis for the xenon-induced power redistribution.

Item Number	Technical Specification	Description of Change	Reason for Change
14.	Bases 3/4.2.1 p. B3/4 2-2	Insert "Factors d, e and f ... peak LHGR values."	The factors cited are independent from each other, and thus can be combined statistically using the square-root-of-the-sum-of-the-squares method. This approach will provide a sufficiently conservative upper bound value for the LHGR for comparison to the LOCA limit.
15.	Bases 3/4.2.2 p. B3/4 2-2	Change from "ethalpy" to "enthalpy."	Correct misspelled word.
16.	Bases 3/4.2.3 p. 3/4 2-3	In first paragraph, delete "The specified limit ... less readily available."	Consistency with current specifications.
17.	Bases 3/4.2.4 p. 3/4 2-3	Delete "519°F."	Eliminate redundancy.
18.	Bases 3/4.2.4 p. 3/4 2-4	Add "for Exxon fuel" and change "... minimum DNBR in excess of 2.05. Thus, 36.6% margin ..." to "... minimum DNBR in access of 1.82. Thus, 27.8% margin ..."	Minor change in analysis results to be consistent with Core XVIII analysis.

Item Number	Technical Specification	Description of Change	Reason for Change
19.	5.3.1 p. 5-1	Change wording from "... similar in physical design to Core XVI Exxon fuel ..." to "... similar in physical design to current fuel ..."	Eliminate unnecessary reference to specific cycle and specific vendor, eliminating need for trivial changes, but without eliminating need to identify significant fuel design changes.

Summary of Technical Specification Changes

Delete the Following Pages	Insert the Following Pages
3/4 1-2a	3/4 1-2a
3/4 2-2	3/4 2-2
3/4 2-3	3/4 2-3
3/4 2-4	3/4 2-4
3/4 2-5	3/4 2-5
3/4 2-6	3/4 2-6
3/4 2-7	3/4 2-7
3/4 2-12	3/4 2-12
3/4 2-13	3/4 2-13
3/4 3-14	3/4 3-14
3/4 9-1	3/4 9-1
B3/4 1-1	B3/4 1-1
B3/4 2-1	B3/4 2-1
B3/4 2-2	B3/4 2-2
B3/4 2-3	B3/4 2-3
B3/4 2-4	B3/4 2-4
5-1	5-1

LIMITING CONDITION FOR OPERATION

3.1.1.1.2 The shutdown margin requirement is as follows:

1. $490^{o}F \leq T_{avg}$ Shutdown Margin $\geq$ 6%Δk/k for T_{avg} = $516^{o}F$
2. $330^{o}F \leq T_{avg} < 490^{o}F$ Shutdown Margin $\geq$ 5%Δk/k for T_{avg} = $330^{o}F$

APPLICABILITY: MODE 3*

ACTION:

With the SHUTDOWN MARGIN less than required, immediately initiate and continue boration at $\geq$ 26 gpm of 2200 ppm boron concentration or equivalent until the required SHUTDOWN MARGIN is restored.

SURVEILLANCE REQUIREMENTS

4.1.1.2.1 The SHUTDOWN MARGIN shall be determined to be greater than or equal to that required:

a. When in Mode 3, at least once per 24 hours by consideration of the following factors:

   1. Main Coolant System boron concentration,
   2. Control rod position,
   3. Main Coolant System average temperature,
   4. Fuel burnup based on gross thermal energy generation,
   5. Xenon concentration, and
   6. Samarium concentration.

4.1.1.1.2.2 During a reactor startup in which core reactivity or control positions for criticality are not established, a plot of inverse multiplication rate (or count rate) versus reactivity shall be made.

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*See Special Test Exception 3.10.1.

SURVEILLANCE REQUIREMENTS (Continued)

4.2.1.2 The below factors shall be included in the calculation of peak full power LHGR:

a. Heat flux power peaking factor, F_q^N, measured using incore instrumentation at a power $\geq$ 10%.

b. The multiplier for xenon redistribution is a function of core lifetime as given in Figure 3.2-3. In addition, if Control Rod Group C is inserted below 80 inches, allowable power may not be regained until power has been at a reduced level defined below for at least twenty-four hours with Control Rod Group C between 80 and 90 inches.

Reduced power = Allowable fraction of full power times multiplier given in Figure 3.2-4.

Exceptions:

1. If the rods are inserted below 80 inches and power does not go below the reduced power calculated above, hold at the lowest attained power level for at least twenty-four hours with Control Rod Group C between 80 and 90 inches before returning to allowable power.

2. If the rods are inserted below 80 inches and zero power is held for more than forty-eight hours, no reduced power level need be held on the way to the allowable fraction of full power.

c. Shortened stack height factor, 1.009.

d. Measurement uncertainty:*

1. 1.05, when at least 17 incore detection system neutron detector thimbles are OPERABLE, or

2. 1.068, when less than 17 incore detection system neutron detector thimbles are OPERABLE.

SURVEILLANCE REQUIREMENTS (Continued)

e. Power level uncertainty*, 1.03.

f. Heat flux engineering factor*, F_q^E, 1.04.

g. Core average linear heat generation rate at full power.

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*The Factors d, e and f will be combined statistically as the "root-sum-square" of the individual parameters.

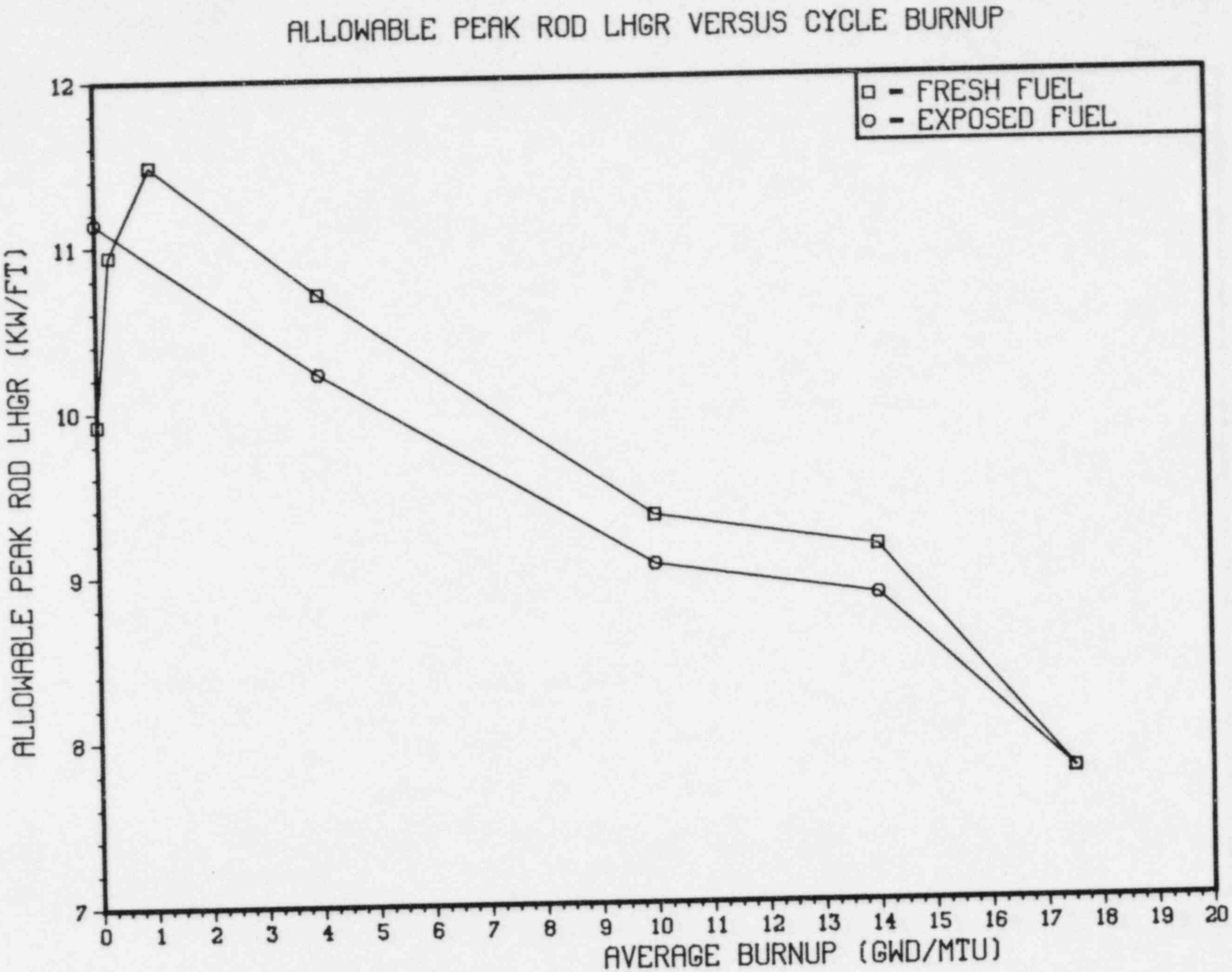
ALLOWABLE PEAK ROD LHGR VERSUS CYCLE BURNUP
□ - FRESH FUEL
○ - EXPOSED FUEL
ALLOWABLE PEAK ROD LHGR (KW/FT)
AVERAGE BURNUP (GWD/MTU)
7
8
9
10
11
12
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure 3.2-1

FIGURE 3.2-2

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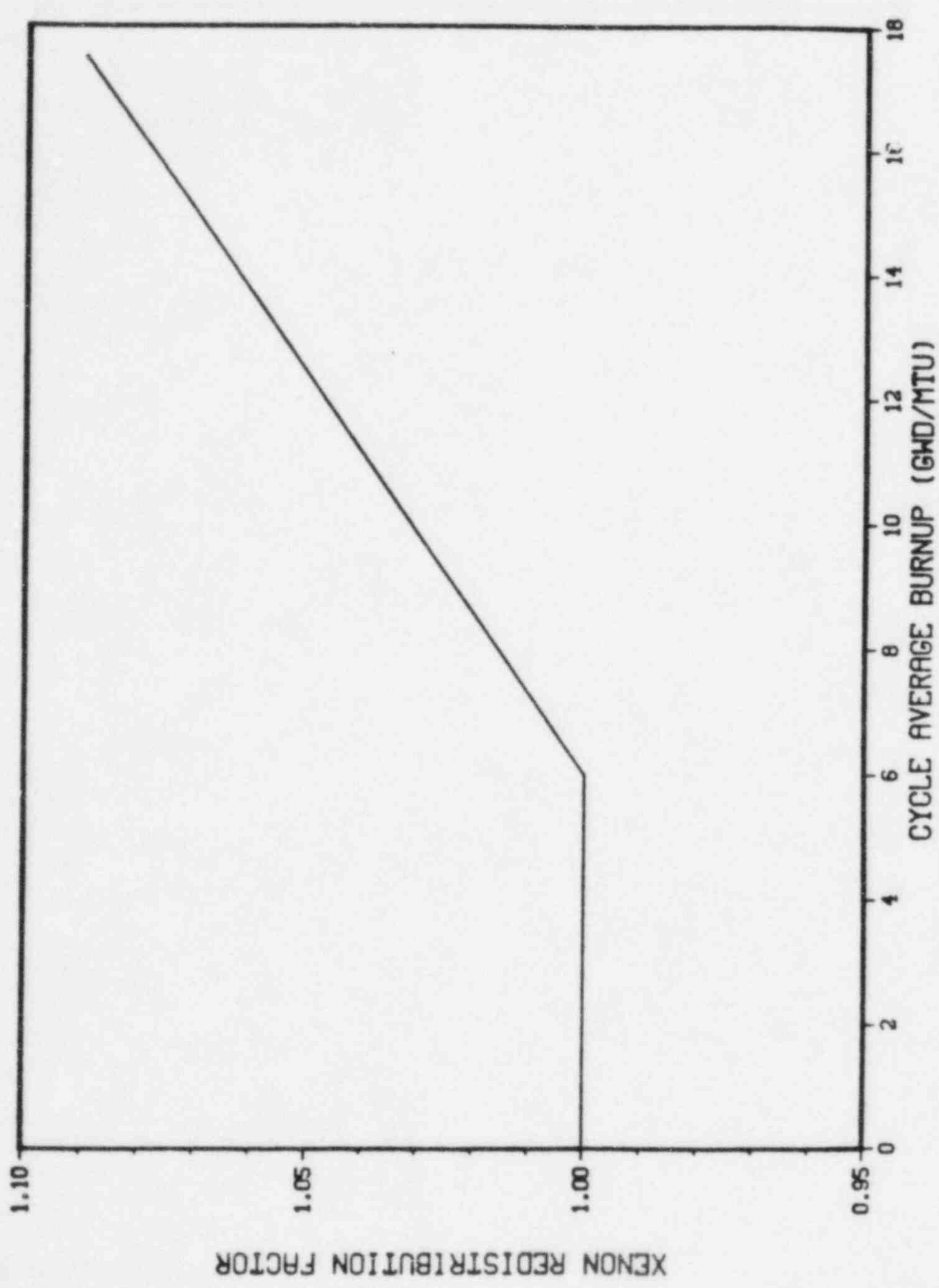

Figure 3.2-3

Multiplier for Xenon Redistribution as a Function of Exposure

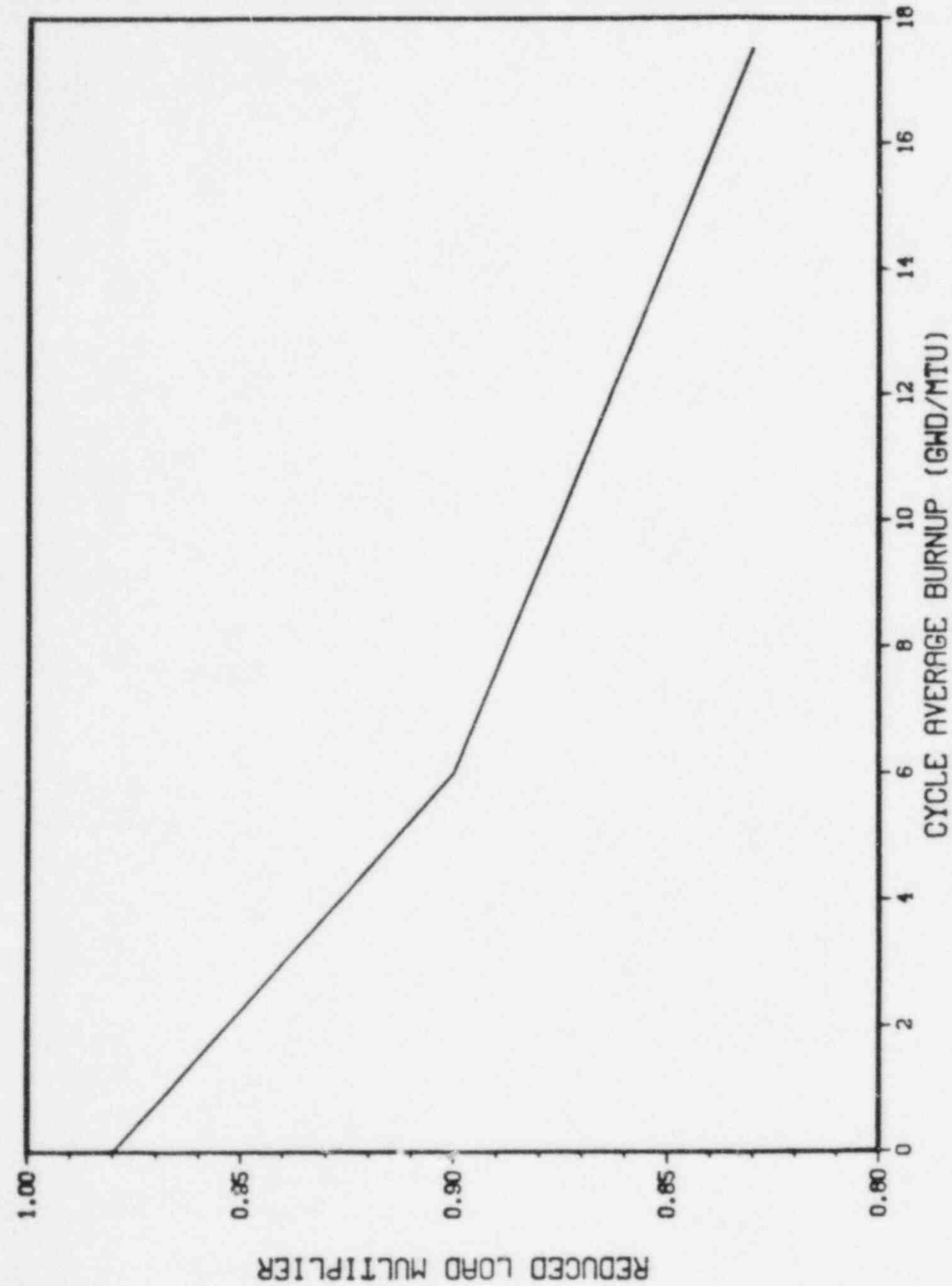

Figure 3.2-4

Multiplier for Reduced Power as a Function of Exposure

DNB PARAMETERS

LIMITING CONDITION FOR OPERATION

3.2.4 The following DNB related parameters shall be maintained within the limits shown on Table 3.2-1

a. Highest Operating Loop Cold Leg Temperature

b. Main Coolant System Pressure

c. Main Coolant System Total Flow Rate

APPLICABILITY: MODE 1

ACTION:

With any of the above parameters exceeding its limit, restore the parameter to within its limit within 2 hours or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 4 hours.

SURVEILLANCE REQUIREMENTS

4.2.4.1 Each of the parameters of Table 3.2-1 shall be verified to be within their limits at least once per 12 hours.

4.2.4.2 The Main Coolant System total flow rate shall be determined to be within its limit by measurement at least once per 18 months.

TABLE 3.2-1

DNB Parameters

Parameter	LIMITS 4 Loops in Operation
Operating Loop Cold Leg Temperature	$\leq$ 520°F
Main Coolant System Pressure	$\geq$ 1950 psig*
Main Coolant System Total Flow Rate	$\geq 38.3 \times 10^6$ lb/hr

*Limit not applicable during either a THERMAL POWER ramp increase in excess of 5% RATED THERMAL POWER per minute or a THERMAL POWER step increase in excess of 10% RATED THERMAL POWER.

TABLE 3.3-3

Engineered Safeguards System Instrumentation Trip Setpoints

Functional Unit	Trip Setpoint
1. SAFETY INJECTION	
a. Actuation Channel #1	
1) RPS Low Main Coolant - Loop 1 Pressure Channel	≥ 1650 psig
2) High Containment Pressure Sensor	≤ 5 psig
3) Manual Initiation	Not Applicable
b. Actuation Channel #2	
1) RPS Low Main Coolant - Loop 2 Pressure Channel	≥ 1650 psig
2) High Containment Pressure Sensor	≤ 5 psig
3) Manual Initiation	Not Applicable
2. CONTAINMENT ISOLATION	
a. Manual Initiation	Not Applicable
b. Actuation Channel A	
1) High Containment Pressure Sensor	≤ 5 psig
2) Safety Injection	(All Safety Injection Setpoints)
c. Actuation Channel B	
1) High Containment Pressure Sensor	≤ 5 psig
2) Safety Injection	(All Safety Injection Setpoints)
3. MAIN STEAM ISOLATION	
a. Low Steam Line Pressure	≥ 200 psig
b. Automatic Trip Logic	Not Applicable
c. Manual Initiation	Not Applicable
d. High Containment Pressure Trip-Containment Isolation	≤ 5 psig

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head unbolted or removed, the boron concentration of all filled portions of the Main Coolant System and the shield tank cavity shall be maintained uniform and sufficient to ensure a k_{eff} of 0.93 calculated or less.

APPLICABILITY: MODE 6*

ACTION:

a. With the boron concentration requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at $\geq$ 26 gpm of 2200 ppm boron concentration or its equivalent until K_{eff} is reduced to $\leq$ 0.93.

b. With a significant unexpected increase in the count rate on any channel, or an unexpected increase in the count rate by a factor of two after addition of a new fuel assembly or removal of a control rod, suspend CORE ALTERATIONS until the situation is reviewed by plant technical supervisory personnel.

c. The provisions of Specification 3.0.3 are not applicable.

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*The reactor shall be maintained in MODE 6 when the reactor vessel head is unbolted or removed with fuel in the vessel.

3/4.1 REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.1 BORATION CONTROL

3/4.1.1.1 and 3/4.1.1.2 SHUTDOWN MARGIN

A sufficient SHUTDOWN MARGIN ensures that 1) the reactor can be made subcritical from all operating conditions, 2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits, and 3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

SHUTDOWN MARGIN requirements are a function of the plant operating status. For critical conditions, minimum shutdown margins are limited by the Power Dependent Insertion Limits (PDIL) as given in Figure 3.1-2. For 490°F $\leq T_{avg}$, the requirement for a SHUTDOWN MARGIN is established by postulated steam line break considerations with ECCS and NRVs available and covers the requirements to preclude inadvertent criticality. For $330 \leq T_{avg} < 490°F$, the requirement for a SHUTDOWN MARGIN is sufficient to preclude inadvertent criticality and covers the requirements of steam line breaks with automatic initiation of ECCS and NRVs blocked. With $T_{avg} < 330°F$, the reactivity transients resulting from a steam line break cooldown are minimal. 5%$\Delta k/k$ SHUTDOWN MARGIN (with all rods inserted) provides adequate protection to preclude criticality for all postulated accidents with the reactor vessel head in place.

To eliminate possible errors in the calculations of the initial reactivity of the core and the reactivity depletion rate, the predicted relation between fuel burnup and the boron concentration, necessary to maintain adequate control characteristics, must be adjusted (normalized) to accurately reflect actual core conditions. Normally, when fuel power is reached after each refueling, and with the control rod groups in the desired positions, the boron concentration is measured and the predicted steady-state curve is adjusted to this point. As power operation proceeds, the measured boron concentration is compared with the predicted concentration and the slope of the curve relating burnup and reactivity is compared with that predicted. This process of normalization should be completed after about 10% of the total core burnup. Thereafter, actual boron concentration can be compared with prediction and the reactivity status of the core can be continuously evaluated, and any deviation would be thoroughly investigated and evaluated.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

The specifications of this section provide assurance of fuel integrity during Conditions I (Normal Operation) and II (Incidents of Moderate Frequency) events by: (a) maintaining the minimum DNBR in the core $\geq$ 1.30 during normal operation and in short term transients, and (b) limiting the fission gas release, fuel pellet temperature and cladding mechanical properties to within assumed design criteria.

3/4.2.1 PEAK LINEAR HEAT GENERATION RATE

Limiting the peak Linear Heat Generation Rate (LHGR) during Condition I events provides assurance that the initial conditions assumed for the LOCA analyses are met and the ECCS acceptance criteria limit of 2200^{o}F is not exceeded.

When operating at constant power, all rods out, with equilibrium xenon, power peaking in the Yankee Rowe core decreases monotonically as a function of cycle burnup. This has been verified by both calculation and measurement on Yankee cores and is in accord with the expected behavior in a core that does not contain burnable poison. The all-rods-out power peaking measured prior to exceeding 75% of RATED THERMAL POWER after each fuel loading thus provides an upper bound on all-rods-out power peaking for the remainder of that cycle. Thereafter the measured power peaking shall be checked every 1000 equivalent full power hours and the latest measured value shall be used in the computation. The only effects which can increase peaking beyond this value would be control rod insertion and xenon transients and these are accounted for in calculating peak LHGR.

The core is stable with respect to xenon, and any xenon transients which may be excited are rapidly damped.

The xenon multiplier in Figure 3.2-3 was selected to conservatively account for transients which can result from control rod motion at full power.

The multiplier is defined as the ratio of the maximum value of F_Z due to xenon induced top peaked power redistribution and the F_Z of the nominal operating axial shape. This is consistent with the methodology used to derive the LHGR limits, which were generated based on the worst top-peaked axial power distribution. The minimum value of the multiplier is unity.

The limits on power level and control rod position following control rod insertion were selected to prevent exceeding the maximum allowable linear heat generation rate limits in Figure 3.2-1 within the first few hours following return to power after the insertion. With Yankee's highly damped core, the 24 hour hold allows sufficient time for the initial xenon maldistribution to accommodate itself to the new power distribution. The restriction on control rod location during these 24 hours assures that the return to allowable fraction of full power will not cause additional redistribution due to rod motion.

After 48 hours at zero power, the average xenon concentration has decayed to about 20% of the full power concentration. Since the xenon concentrations are so low, an increase in power directly to maximum allowable power creates transient peaking well below the value imposed by the xenon redistribution multiplier. Thus, any increase in power peaking due to this operation is below the value accounted for in the calculation of the LHGR.

These conclusions are based on plant tests and on calculations performed with the SIMULATE three dimensional nodal code used in the analysis of Core XI (reference cycle) described in Proposed Change No. 115, dated March 29, 1974.

The Factors d, e and f in Specification 4.2.1.2 will be combined statistically as the "root-sum-square" of the individual parameters. This method for combining parameter uncertainties is valid due to the independence of the parameters involved. Factor d accounts for uncertainty in the power distribution measurement with the movable incore instrumentation system. Factor e accounts for uncertainty in the calorimetric measurement for determining core power level. Factor f accounts for uncertainty in engineering and fabrication tolerances of the fuel. Together these factors, when combined statistically, yield an uncertainty of 8.5% for less than 17 operating incore thimbles and 7.1% for greater than 17 operating thimbles. This factor and Factors a, b, c and g will be combined multiplicatively to obtain peak LHGR values.

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

The limits on heat flux and enthalpy hot channel factors ensure that 1) the design limits on peak local power density and minimum DNBR are not exceeded and 2) in the event of a LOCA the peak fuel clad temperature will not exceed the 2200°F ECCS acceptance criteria limit.

Each of these hot channel factors are measurable but will normally only be determined periodically as specified in Specification 4.2.2.1 and 4.2.3.1. This periodic surveillance is sufficient to insure that the hot channel factor limits are maintained provided:

BASES (Continued)

a. Control rods in a single group move together with no individual rod insertion differing by more than ± 8 inches from any other rod in the group.

b. Control rod groups are sequenced with overlapping groups as described in Specification 3.1.3.5.

c. The control rod insertion limits of Specification 3.1.3.5 is maintained.

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

When an F_q measurement is taken, experimental error, engineering tolerance and fuel densification must be allowed for. 5% is the appropriate allowance for a full core map taken with the incore detector flux mapping system, 4% is the appropriate allowance for engineering tolerance and 3% is the appropriate allowance for fuel densification.

When $F^N_{\Delta H}$ is measured, experimental error must be allowed for and 5% is the appropriate allowance for a full core map taken with the incore detection system.

3/4.2.4 DNB PARAMETERS

The limits on the DNB related parameters assure that each of the parameters are maintained within the normal steady state envelope of operation assumed in the transient and accident analyses. The limits are consistent with the accident analysis assumptions and have been analytically demonstrated adequately to maintain a minimum DNBR of 1.30 throughout each analyzed transient. The Main Coolant System inlet temperature assumed in the analysis is conservatively 4°F in excess of the limit to allow for uncertainty in plant measurement. The Main Coolant System pressure assumed in the analysis is 1925 psig, conservatively 25 psig less than the limit to allow for uncertainty in plant measurement. The assumed operating deadband of ± 50 psig is applied to the nominal 2000 psig limit, yielding a minimum operation limit of 1950 psig.

The 12 hour periodic surveillance of these parameters through instrument readout is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation. The 18 month periodic measurement of the Main Coolant System total flow rate is adequate to detect flow degradation and ensure correlation of the flow indication channels with measured flow such that the indicated percent flow will provide sufficient verification of flow rate on a 12 hour basis.

A 34% DNBR credit is needed to offset the full-closure rod bow penalty for the Exxon fuel in Yankee Rowe. The full-closure penalty was previously approved (D. Ross and D. Eisenhut memorandum of December 12, 1976) for Yankee Rowe since a gap closure model was not available. Generic credits (D. Edward's letter to NRC dated February 9, 1977) equivalent to 13.2% DNBR margin were approved for Yankee Rowe. The limiting transient for Yankee Rowe with respect to DNB is the 1 of 4 pump loss of flow. Based on design conditions, this event results in a minimum DNBR in excess of 1.82. Thus, 27.8% margin to a DNBR of 1.3 exists for this limiting event, which is applied to the remaining 20.8% margin required by the rod-bow penalty.

5.0 DESIGN FEATURES

5.1 SITE

EXCLUSION AREA

5.1.1 The exclusion area shall be as shown in Figure 5.1-1.

LOW POPULATION ZONE

5.1.2 The low population zone shall be as shown in Figure 5.1-2.

SITE BOUNDARY FOR GASEOUS EFFLUENTS

5.1.3 The site boundary for gaseous effluents shall be shown in Figure 5.1-3.

SITE BOUNDARY FOR LIQUID EFFLUENTS

5.1.4 The site boundary for liquid effluents shall be shown in Figure 5.1-4.

5.2 CONTAINMENT

CONFIGURATION

5.2.1 The Reactor Containment Building is a steel spherical shall having the following design features:

a. Nominal inside diameter = 125 feet.

b. Minimum thickness of steel shell = 7/8 inches.

c. Net free volume = 860,000 cubic feet.

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The reactor containment is designed and shall be maintained for a maximum internal pressure of 34.5 psig and a temperature of 249°F.

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 76 fuel assemblies with each fuel assembly containing up to 231 fuel rods clad with Zircaloy-4. Each fuel rod shall have a nominal active fuel length of 91 inches. Each fuel assembly shall contain a maximum total weight of 234 kilograms uranium. Reload fuel is similar in physical design to current fuel and has a nominal enrichment of 3.7 weight percent U-235.

ATTACHMENT B

Yankee Core XVIII Performance Analysis Report