The F_Q SURVEILLANCE TECHNICAL SPECIFICATION

(Part B of NS-EPR-2649)

R. W. Miller

N. A. Pogorzelski

J. A. Vestovich

September 1982

WESTINGHOUSE ELECTRIC CORPORATION

Nuclear Energy Systems

P.O. Box 355

Pittsburgh, Pennsylvania 15230

Table of Contents

I. INTRODUCTION

Plant operation below the heat flux hot channel factor ($F_Q(z)$) limit assures that peak clad temperature above the 2200°F ECCS acceptance limits is not exceeded during a LOCA event. Currently, periodic plant surveillance on the height dependent radial peaking factor, $F_{xy}(z)$, is required as partial verification that operation will not cause the $F_Q(z)$ limit to be exceeded. In the F_Q Surveillance Technical Specifiction, $F_{xy}(z)$ surveillance has been replaced by $F_Q(z)$ surveillance. Monitoring $F_Q(z)$ and increasing the value for expected plant maneuvers provides a more convenient form of assuring plant operation below the F_Q (z) limit while retaining the intent of using a measured parameter to verify operation below Technical Specification limits.

II. REFORMULATION TO $F_Q(Z)$ SURVEILLANCE

$F_Q(z)$ surveillance is accomplished in the following manner. A full core flux map is taken under equilibrium conditions to determine $F_Q(z)$. This measured $F_Q(z)$ is increased by appropriate uncertainties to account for manufacturing tolerances and measurement uncertainty. The resulting $F_Q(z)$ including uncertainties is called $F_Q^M(z)$. Since $F_Q^M(z)$ was measured under equilibrium conditions, potential increases in $F_Q(z)$ that might arise from changes in the equilibrium power distribution caused by power level changes and control rod movement must also be accounted for. A W(z) function that represents the maximum likely increase in the equilibrium measured $F_Q(z)$ that might arise during power distribution transients will account for nonequilibrium operation.

$F_Q(z)$ surveillance is then accomplished by comparing the product of the measured $F_Q^M(z)$ and the analytically determined W(z) to the $F_Q(z)$ limit.

$$F_Q^M(z) \times W(z) \leq \frac{F_Q^{\text{limit}} \times K(z)}{P} \text{ for } P > 0.50$$

$$F_Q^M(z) \times W(z) \leq \frac{F_Q^{\text{limit}} \times K(z)}{0.5} \text{ for } P \leq 0.50$$

where K(z) is the normalized $F_Q(z)$ limit and P is the fraction of rated thermal power.

In a plant using CAOC operation, an Allowed Power Level (APL) can then be defined. APL represents the highest percentage of rated thermal power at which the plant can operate and still be assured that $F_Q(z)$ will be maintained below Technical Specifiction limits. APL is determined by taking the $F_Q(z)$ limit and dividing by the product of $F_Q^M(z)$ and W(z).

$$\text{APL} = \underset{\text{over } z}{\text{minimum}} \left(\frac{F_Q^{\text{limit}} \times K(z)}{F_Q^M(z) \times W(z)} \right) \times 100\%$$

While it is possible for the APL to be defined here as a number greater than 100%, other Technical specifications prevent plant operation above 100% of RATED THERMAL POWER. If APL is less than 100%, operation above APL is allowed to the extent that APDMS surveillance demonstrates or plant operation restrictions insure that the F_Q limit is met.

If the plant is using RAOC operation and $F_Q^M(z) \times W(z)$ exceeds its limit, the allowed ΔI-Power operating space must be reduced to insure operation below the F_Q limit. No allowance for widening the ΔI-Power space over that of Figure 3.2-1 if $F_Q^M(z) \times W(z)$ is below its limit is permited.

III. REVISIONS TO THE TECHNICAL SPECIFICATIONS

A. Surveillance Requirements - Section 4.2.2.2

During normal operation $F_Q(z)$ is shown to be within its limit by comparing the result of a measured $F_Q(z)$ multiplied by a W(z) transient function to the $F_Q(z)$ limit. Periodically a full core flux map is taken under equilibrium conditions to determine a measured $F_Q(z)$. This $F_Q(z)$ is then increased by 3% to account for manufacturing tolerances and further increased by 5% to account for measurement uncertainties. The resulting equilibrium measured $F_Q(z)$ including uncertainties is called $F_Q^M(z)$. To verify operation below the Tech Spec $F_Q(z)$ limit, $F_Q^M(z)$ must be shown to be less than or equal to the $F_Q(z)$ limit divided by the W(z) transient function

$$F_Q^M(z) \leq \frac{F_Q^{limit} \times K(z)}{P \times W(z)} \quad \text{for } P > 0.5$$

$$F_Q^M(z) \leq \frac{F_Q^{limit} \times K(z)}{W(z) \times 0.5} \quad \text{for } P \geq 0.5$$

where K(z) is the normalized $F_Q(z)$ limit, P is the fraction of rated thermal power and everything else is as defined previously. $F_Q(z)$ surveillance must be performed when power has been increased by 10% of rated thermal power over the thermal power that $F_Q^M(z)$ was last determined or at least once every 31 effective full power days, whichever occurs first. When verifying that $F_Q^M(z)$ is within its limits, the top and bottom 15% of the core are excluded from consideration due to the difficulty in making a precise measurement for this region and the low probability that this region would be more limiting than the central 70% of the active core.

B. Surveillance Requirements - Section 4.2.2.2.e

Because $F_Q(z)$ surveillance is only required every 31 effective full power days, the Technical Specification takes into account the possibility that $F_Q(z)$ may increase between surveillances. Typically, because of natural feedback effects, $F_Q(z)$ decreases with increasing core burnup. Locations of peak power output in the core are also locations of peak fuel depletion rate in the core. However, cores using large numbers of burnable poison rods or non-standard fuel management techniques may show some small increase in $F_Q(z)$ with core burnup. The Technical Specification requires that when performing $F_Q(z)$ surveillance the resulting $F_Q(z)$ value must be compared to $F_Q(z)$ determined from the previous flux map. If the margin to the $F_Q(z)$ limit has decreased since the previous determination of $F_Q(z)$ then additional action must be taken. The Technical Specification allows two options. If the margin to the $F_Q(z)$ limit has decreased since the previous map, then either the new $F_Q(z)$ must be increased by an additional 2% to account for further increases in $F_Q(z)$ before the next surveillance, or surveillance must be performed every seven full power days. Analysis of both flux maps and predicted $F_Q(z)$ values indicate that $F_Q(z)$ will not increase by more than 1% per month. 2% was chosen as a conservative bound for the maximum possible decrease in margin to the $F_Q(z)$ limit between monthly flux maps that might be encountered during plant operation. The additional 2% penalty or more frequent mapping requirements can be discontinued when two successive flux maps indicate that the margin to the $F_Q(z)$ limit is no longer decreasing.

An example of the modifications to 3/4.2.2 required to incorporate F_Q surveillance for RAOC operation is Section 1 of the attachment.

C. PEAKING FACTOR LIMIT REPORT-SECTION 6.9.1.14

The W(z) function is a plant and cycle dependent function. The W(z) function for a given cycle will be formally reported to the utility and the NRC in the Peaking Factor Limit Report. The Peaking Factor Limit

Report will be supplied at least 60 days prior to cycle initial criticality or 60 days prior to the date the values would become effective unless otherwise exempted by the NRC. Section 2 of the attachment is the changes to the Reporting Requirements section (6.9) of the Technical Specifications requiring a Peaking Factor Limit Report. Section 3 is a sample report for RAOC operation.

D. Axial Power Distribution - Section 3.2.6 (CAOC Plants Only)

In conjunction with the measurement of $F_Q^M(z)$, an Allowed Power Level (APL) is determined. APL is defined as the ratio of the $F_Q(z)$ limit to the product of $F_Q^M(z)$ and W(z).

$$APL = \underset{\text{over } z}{\text{minimum}} \left(\frac{F_Q^{\text{Limit}} \times K(z)}{F_Q^M(z) \times W(z)} \right) \times 100\%$$

The top and the bottom 15% of the core are also excluded from the calculations of APL. Operation at power levels above APL requires the use of the APDMS or operational restrictions (such as Base Load Operation) on the plant.

IV. METHODOLOGY FOR $F_Q(Z)$ AND W(Z) ANALYSIS

A. W(z) Methodology

The W(z) factor represents the largest expected increase in an equilibrium $F_Q(z)$ that can result from changes in ΔI and power level which are allowed in plant operation.

W(z) is defined as:

$$W(z) = \frac{(F_Q(z) \times P)^{\text{maximum, simulated transient}}}{(F_Q(z) \times P)^{\text{equilibrium}}}$$

Changes in the core power distribution caused by control rod insertion, power level changes, axial xenon transients, and radial xenon transients are all included in W(z). In some reload cores, operating flexibility can be maximized by making the W(z) function burnup dependent.

For a plant incorporating CAOC operation, the W(z) function is determined by analyzing a full range of power shapes occurring from simulation of typical load follow operation. Plant maneuvers covering the full range of power levels, core burnups, and operator control strategies are simulated while maintaining the appropriate ΔI band. The specific cases analyzed are those used in the standard Westinghouse $F_Q(z)$ analysis[1,2]. Alternatively, other standard F_Q analyses[3,4] could be employed to compute W(z).

For a plant with a RAOC Technical Specification, W(z) is determined based on the transient $F_Q(z)$ resulting from the normal operation analysis of the final ΔI-Power operating space. The methodology for determining the ΔI-Power operating space is discussed in "Relaxation of Constant Axial Offset Control" (Part A of NS-EPR-2649).

---

(1) "F_Q Envelope Calculations", C.E. Eicheldinqer letter NS-CE-687; 6/27/74 (Prop.)

(2) F.M. Bordelon, et. al. "Westinghouse Reload Safety Methodology", WCAP-9272. March 1978. (Prop.)

(3) Letter from C. Eicheldinger (Westinghouse), NS-CE-1749 to John F. Stolz (NRC); April 6,, 1978 (Proprietary).

(4) Letter from T.M. Anderson (Westinghouse), NS-TMA-2198, to K. Kniel (NRC); January 31, 1980 (Proprietary).

B. Radial Xenon Methodology

The insertion or withdrawal of control rods while changing power level can cause radial xenon redistribution as well as axial xenon redistribution. Since $F_Q(z)$ increases caused by radial xenon redistribution cannot be modeled in the axial model used to evaluate F_Q, this factor must be taken into account with separate calculations. $F_Q(z)$ increases due to radial xenon transients are explicitly included in W(z) through a height dependent radial xenon factor, Xe(z). Three-dimensional calculations are used to evaluate increases in elevation dependent radial peaking factors in a conservative manner by inducing a radial xenon oscillation. An equilibrium xenon case is perturbed by reducing power level and inserting control rods deeply enough to force the axial flux difference to the most negative allowed valve. The xenon distribution is allowed to change for sereral hours in this configuration, then the control rods are withdrawn and power is increased. The resulting xenon transient is followed in short time steps. The maximum value of F_{xy} at each elevation occuring during the transient is used to determine

Xe(z), where

$$Xe(z) = \frac{F_{xy}(z,t)^{\text{maximum, transient}}}{F_{xy}(z)^{\text{equilibrium}}}$$

The final form of Xe(z) is determined by conservatively bounding the results of the transient calculation.

A.1. MODIFICATIONS TO 3/4.2.2
HEAT FLUX HOT CHANNEL FACTOR LIMITS

POWER DISTRIBUTION LIMITS

HEAT FLUX HOT CHANNEL FACTOR-FQ(Z)

LIMITING CONDITION FOR OPERATION

3.2.2 $F_Q(z)$ shall be limited by the following relationships:

$$F_Q(z) \leq \left[\frac{F_Q^{Limit}}{P}\right] [K(Z)] \text{ for } P > 0.5$$

$$F_Q(z) \leq \left[\frac{F_Q^{Limit}}{0.5}\right] [K(Z)] \text{ for } P \leq 0.5$$

where $P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$

and K(z) is the function obtained from Figure 3.2-2 for a given core height location.

APPLICABILITY: MODE 1

ACTION:

With $F_Q(z)$ exceeding its limit:

1. Reduce THERMAL POWER at least 1 percent for each 1 percent $F_Q(z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower ΔT Trip Setpoints (value of K_4) have been reduced at least 1 percent (in ΔT span) for each 1 percent $F_Q(z)$ exceeds the limit.

b. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; THERMAL POWER may then be increased provided $F_Q(z)$ is demonstrated through incore mapping to be within its limit.

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 $F_Q(z)$ shall be evaluated to determine if $F_Q(z)$ is within its limit by:

a. Using the moveable incore detectors to obtain a power distribution map at any THERMAL POWER greater than 5 percent of RATED THERMAL POWER.

b. Increasing the measured $F_Q(z)$ component of the power distribution map by 3 percent to account for manufacturing tolerances and further increasing the value by 5 percent to account for measurement uncertainties.

c. Satisfying the following relationship:

$$F_Q^M(z) \leq \frac{F_Q^{Limit} \times K(z)}{P \times W(z)} \text{ for } P > 0.5$$

$$F_Q^M(z) \leq \frac{F^{Limit} \times K(z)}{W(z) \times 0.5} \text{ for } P \leq 0.5$$

where $F_Q^M(z)$ is the measured $F_Q(z)$ increased by the allowances for manufacturing tolerances and measurement uncertainty, F_Q^{limit} is the F_Q limit, K(z) is given in Figure 3.2-2, P is the relative THERMAL POWER, and W(z) is the cycle dependent function that accounts for power distribution transients encountered during normal operation. This function is given in the Peaking Factor Limit Report as per Specification 6.9.1.14.

d. Measuring $F_Q^M(z)$ according to the following schedule:

1. Upon achieving equilibrium conditions after exceeding by 10 percent or more of RATED THERMAL POWER, the THERMAL POWER at which $F_Q(z)$ was last determined,* or

2. At least once per 31 effective full power days, whichever occurs first.

*During power escalation at the beginning of each cycle, power level may be increased until a power level for extended operation has been achieved and a power distribution map obtained.

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS (Cont)

e. With measurements indicating

$$\underset{\text{over } z}{\text{maximum}} \left(\frac{F_Q^M(z)}{K(z)} \right)$$

has increased since the previous determination of $F_Q{}^M(z)$ either of the following actions shall be taken:

1. $F_Q{}^M(z)$ shall be increased by 2 percent over that specified in 4.2.2.2.c, or

2. $F_Q{}^M(z)$ shall be measured at least once per 7 effective full power days until 2 successive maps indicate that

$$\underset{\text{over } z}{\text{maximum}} \left(\frac{F_Q^M(z)}{K(z)} \right) \text{is not increasing.}$$

f. With the relationships specified in 4.2.2.2.c above not being satisfied:

1. Calculate the percent $F_Q(z)$ exceeds its limit by the following expression:

$$\left\{ \left(\underset{\text{over } z}{\text{maximum}} \left[\frac{F_Q{}^M(z) \times W(z)}{\frac{F_Q{}^{limit}}{P} \times K(z)} \right] \right) -1 \right\} \times 100 \quad \text{for } P \geq 0.5$$

$$\left\{ \left(\underset{\text{over } z}{\text{maximum}} \left[\frac{F_Q{}^M(z) \times W(z)}{\frac{F_Q{}^{limit}}{0.5} \times K(z)} \right] \right) -1 \right\} \times 100 \quad \text{for } P < 0.5$$

2. Either of the following actions shall be taken:

   a. Place the core in an equilibrium condition where the limit in 4.2.2.2.c is satisfied. Power level may then be increased provided the AFD limits of Figure 3.2-1 are reduced 1% AFD for each percent $F_Q(z)$ exceeded its limit, or

   b. Comply with the requirements of Specification 3.2.2 for $F_Q(z)$ exceeding its limit by the percent calculated above

g. The limits specified in 4.2.2.2.c, 4.2.2.2.e, and 4.2.2.2.f above are not applicable in the following core plane regions:

1. Lower core region 0 to 15 percent inclusive.

2. Upper core region 85 to 100 percent inclusive.

4.2.2.3 When $F_Q(z)$ is measured for reasons other than meeting the requirements of Specification 4.2.2.2 an overall measured $F_Q(z)$ shall be obtained from a power distribution map and increased by 3 percent to account for manufacturing tolerances and further increased by 5 percent to account for measurement uncertainty.

3/4.2 POWER DISTRIBUTION LIMITS

BASES

The specifications of this section provide assurance of fuel integrity during Condition I (Normal Operation) and II (Incidents of Moderate Frequency) events by: (a) maintaining the calculated DNBR in the core at or above design 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. In addition, limiting the peak linear power density 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°F is not exceeded.

The definitions of certain hot channel and peaking factors as used in these specifications are as follows:

$F_Q(z)$ Heat flux Hot Channel Factor, is defined as the maximum local heat flux on the surface of a fuel rod at core elevation Z divided by the average fuel rod heat flux, allowing for manufacturing tolerances on fuel pellets and rods.

$F^N_{\Delta H}$ Nuclear Enthalpy Rise Hot Channel Factor is defined as the ratio of the integral of linear power along the rod with the highest integrated power to the average rod power.

3/4.2.1 AXIAL FLUX DIFFERENCE (AFD)

The limits on AXIAL FLUX DIFFERENCE assure that the $F_Q(z)$ upper bound envelope of F_Q^{limit} times the normalized axial peaking factor is not exceeded during either normal operation or in the event of xenon redistribution following power changes.

Provisions for monitoring the AFD on an automatic basis are derived from the plant process computer through the AFD Monitor Alarm. The computer determines the one minute average of each of the OPERABLE excore detector outputs and provides an alarm message immediately if the AFD for at least 2 of 4 or 2 of 3 OPERABLE excore channels are outside the allowed ΔI-Power operating space and the THERMAL POWER is greater than 50 percent of RATED THERMAL POWER.

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

The limits on heat flux hot channel factor, RCS flowrate, and nuclear enthalpy rise hot channel factor 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.

POWER DISTRIBUTION LIMITS

BASES (Cont)

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

a. Control rods in a single group move together with no individual rod insertion differing by more than $\pm$ 13 steps from the group demand position.

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

c. The control rod insertion limits of Specifications 3.1.3.5 and 3.1.3.6 are maintained.

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

$F^N_{\Delta H}$ will be maintained within its limits provided conditions a. through d. above are maintained. As noted on Figures 3.2-3 and 3.2-4, RCS flow and $F^N_{\Delta H}$ may be "traded off" against one another to ensure that the calculated DNBR will not be below the design DNBR value. The relaxation of $F^N_{\Delta H}$ as a function of THERMAL POWER allows changes in the radial power shape for all permissible rod insertion limits.

When RCS flow rate and $F^N_{\Delta H}$ are measured, no additional allowances are necessary prior to comparison with the limits of Figures 3.2-3 and 3.2-4. Measurement errors of 3.5 percent for RCS total flow rate and 4 percent for $F^N_{\Delta H}$ have been allowed for in determination of the design DNBR value.

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

The hot channel factor $F_Q{}^M(z)$ is measured periodically and increased by a cycle and height dependent power factor, W(z), to provide assurance that the limit on the hot channel factor, $F_Q(z)$, is met. W(z) accounts for the effects of normal operation transients and was determined from expected power control maneuvers over the full range of burnup conditions in the core. The W(z) function for normal operation is provided in the Peaking Factor Limit Report per Specification 6.9.1.14.

POWER DISTRIBUTION LIMITS

BASES (Cont)

3/4.2.4 QUADRANT POWER TILT RATIO

The quadrant power tilt ratio limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during startup testing and periodically during power operation.

The two hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned rod. In the event such action does not correct the tilt, the margin for uncertainty of F_Q is reinstated by reducing the power by 3 percent from RATED THERMAL POWER for each percent of tilt in excess of 1.0.

3/4.2.5 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 intial FSAR assumptions and have been analytically demonstrated adequate to maintain a minimum DNBR of 1.3 throughout each analyzed transient.

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.

THIS FIGURE DELETED

Figure B 3/4 2-1 TYPICAL INDICATED AXIAL FLUX DIFFERENCE VERSUS THERMAL POWER

A.2. ADDITIONS TO 6.0

ADMINISTRATIVE CONTROLS

PEAKING FACTOR LIMIT REPORT

6.9.1.14 The W(z) function for normal operation shall be provided to the Director, Nuclear Reactor Regulations, Attention Chief of the Core Performance Branch, U. S. Nuclear Regulatory Commission, Washington, D.C. 20555 at least 60 days prior to cycle initial criticality. In the event that these values would be submitted at some other time during core life, it will be submitted 60 days prior to the date the values would become effective unless otherwise exempted by the Commission.

Any information needed to support W(z) will be by request from the NRC and need not be included in this report.

A.3. SAMPLE PEAKING FACTOR LIMIT REPORT

APPENDIX A

PEAKING FACTOR LIMIT REPORT

This Peaking Factor Limit Report is provided in accordance with Paragraph 6.9.1.14 of the Plant A Technical Specifications.

The Cycle N W(z) function for RAOC operation is shown in Figure 1. W(z) was calculated using the method described in Reference 1.

This W(z) function is used to confirm that the heat flux hot channel factor, $F_Q(z)$, will be limited to the Technical Specifications values of:

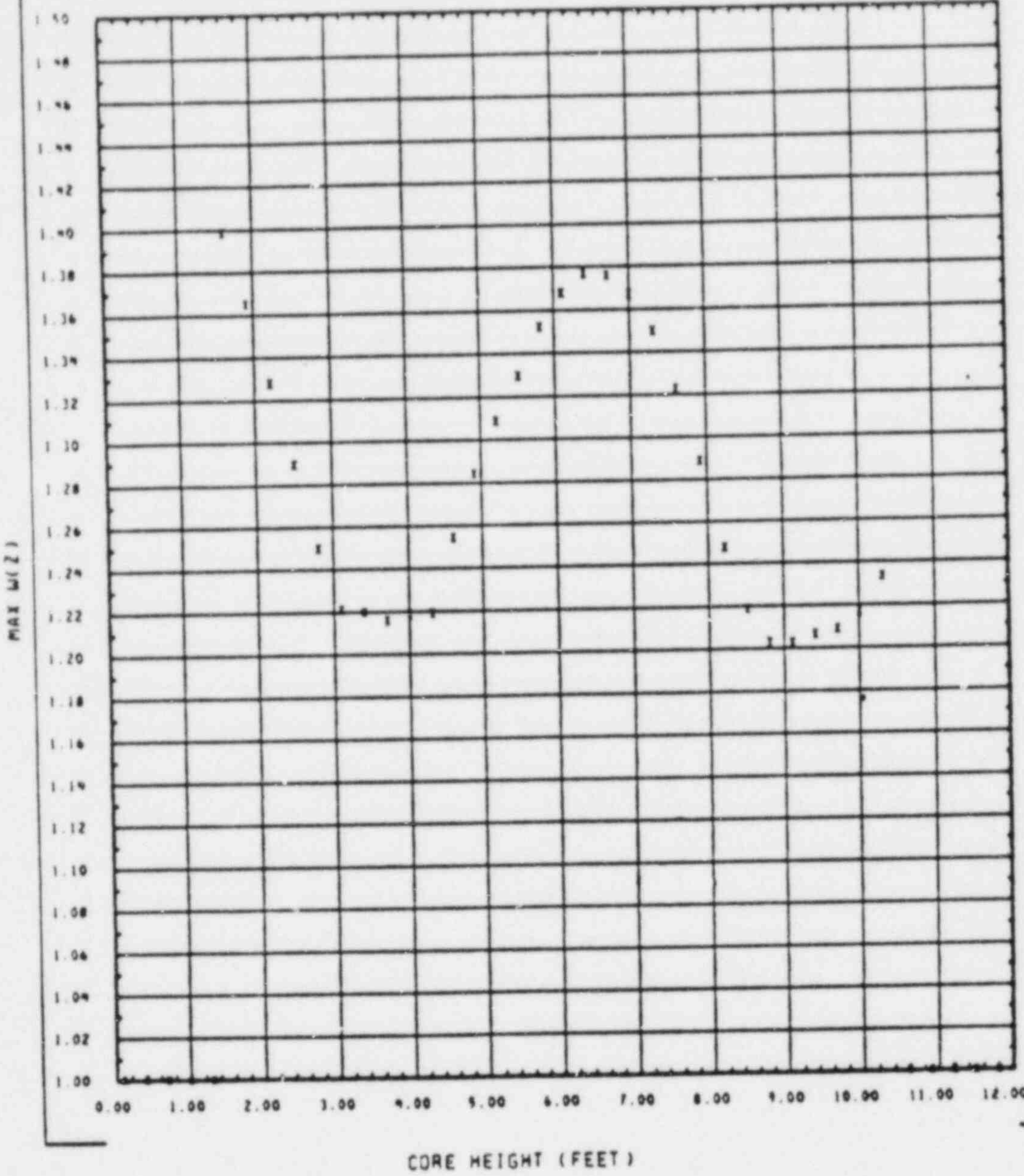
$$F_Q(z) \leq \frac{F_Q^{Limit}}{P} [K(z)] \text{ for } P > 0.5 \text{ and}$$

$$F_Q(z) \leq \frac{F_Q^{Limit}}{0.5} [K(z)] \text{ for } P \leq 0.5$$

This W(z) function, when applied to a power distribution measured under equilibrium conditions, demonstrate that the initial conditions assumed in the LOCA are met, along with the ECCS acceptance criteria of 10CFR50.46.

(1) NS-EPR-2649, Letter from E.P. Rahe (Westinghouse) to C.H. Burlinger (NRC), August 31, 1982

+(a,c)



HEIGHT (FEET)	MAX W(Z)	+(a,c)
.15	1.000	*
.45	1.000	*
.75	1.000	*
1.05	1.000	*
1.35	1.000	*
1.65	1.399	
1.95	1.365	
2.25	1.328	
2.55	1.289	
2.85	1.250	
3.15	1.221	
3.45	1.220	
3.75	1.216	
4.05	1.219	
4.35	1.219	
4.65	1.254	
4.95	1.284	
5.25	1.309	
5.55	1.329	
5.85	1.352	
6.15	1.368	
6.45	1.376	
6.75	1.376	
7.05	1.367	
7.35	1.350	
7.65	1.323	
7.95	1.289	
8.25	1.248	
8.55	1.219	
8.85	1.203	
9.15	1.203	
9.45	1.206	
9.75	1.209	
10.05	1.217	
10.35	1.233	
10.65	1.000	*
10.95	1.000	*
11.25	1.000	*
11.55	1.000	*
11.85	1.000	*

* Top and bottom 15% excluded as per Technical Specification 4.2.2.2.g

FIGURE 1

TYPICAL WESTINGHOUSE RELOAD CORE

RAOC W(Z)