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Log # TXX-08032

Ref. # 10CFR50.90

March 6, 2008

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
DOCKET NOS. 50-445 AND 50-446
SUPPLEMENT TO LICENSE AMENDMENT REQUEST (LAR) 07-003
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REQUEST ASSOCIATED WITH METHODOLOGY USED TO ESTABLISH CORE OPERATING LIMITS
(TAC NOS. MD5243 AND MD5244)

REFERENCES:
1. Letter logged TXX-07063 dated April 10, 2007 submitting License Amendment Request (LAR) 07-003 revision to Technical Specification 3.1, "REACTIVITY CONTROL SYSTEMS," 3.2, "POWER DISTRIBUTION LIMITS," 3.3, "INSTRUMENTATION," and 5.6.5b, "CORE OPERATING LIMITS REPORT (COLR)," from Mike Blevins to the NRC.
2. Letter logged TXX-07126 dated August 16, 2007 supplementing License Amendment Request (LAR) 07-003, from Mike Blevins to the NRC.
3. Letter dated February 4, 2008, from Balwant Singal of NRR to Mr. Blevins.
4. Letter logged TXX-08024 dated February 11, 2008 from Mike Blevins to the NRC submitting requested information supporting License Amendment Request (LAR) 07-003.

Dear Sir or Madam:

Per Reference 1 as supplemented by Reference 2, Luminant Generation Company LLC (Luminant Power) submitted proposed changes to the Comanche Peak Steam Electric Station, herein referred to as Comanche Peak Nuclear Power Plant (CPNPP), Unit 1 and Unit 2 Technical Specifications to allow the use of several Nuclear Regulatory Commission (NRC) approved accident analysis methodologies to be used to establish core operating limits. In Reference 3, the NRC requested additional information pertaining to Reference 1. Luminant Power initially responded to the request in Reference 4. However, Luminant Power would like to withdraw the letter logged TXX-08024, dated February 11, 2008 (Reference 4) and provide the information requested in Reference 3 in the attachment to this letter. In addition, Luminant Power will provide data regarding the completion of Technical Specification Surveillance Requirement (SR) 3.2.1.1 after the first six months of Unit 2 Cycle 11 operation.

A001
LRR

In accordance with 10CFR50.91(b), Luminant Power is providing the State of Texas with a copy of this proposed amendment.

This communication contains the following new licensing basis commitment regarding Comanche Peak Unit 2.

Commitment #	Description
3465995	Luminant Power will provide data regarding the measurements and results from Technical Specification Surveillance Requirement (SR) 3.2.1.1 following six months of Unit 2 Cycle 11 operation.

Should you have any questions, please contact Mr. J. D. Seawright at (254) 897-0140.

I state under penalty of perjury that the foregoing is true and correct.

Executed on March 6, 2008.

Sincerely,

Luminant Generation Company LLC

Mike Blevins

By: [signature]
Fred W. Madden
Director, Oversight & Regulatory Affairs

Attachment - Response to NRC Request for Additional Information on W(z)-Related Items #1 and #2

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, Comanche Peak

Alice Rogers
Environmental & Consumer Safety Section
Texas Department of State Health Services
1100 West 49th Street
Austin, Texas 78756-3189

Attachment to TXX-08032

Response to NRC Request for Additional Information on W(z)-Related Items #1 and #2

Response to NRC Request for Additional Information on W(z) Items #1 and #2

Question 1. Submit the Axial Offset (AO) Validity Criteria methodology and its technical basis for staff review and approval.

Response:

The use of the Westinghouse Axial Offset Validity Criteria Guidance was not discussed in the previous LARs and supporting RAI responses and will not be used at Comanche Peak Nuclear Power Plant (CPNPP) until the NRC questions associated with the generic guidance are resolved.

The Comanche Peak Technical Specification 3.2.1 and the associated BASES describe the surveillance technique used to assure the total heat flux hot channel factor remains within the limit values. The technique and supporting analytical inputs are described in WCAP-10216-P-A-R1A, "Relaxation of Constant Axial Offset Control F_Q Surveillance Technical Specification," which is listed in Comanche Peak Technical Specification 5.6.5b, Item 2. The application at Comanche Peak is compliant with conditions and limitations identified in the NRC's Safety Evaluation of this topical report.

As described in the Comanche Peak Technical Specification 3.2.1 and the associated BASES, the elevation-dependent total heat flux hot channel factor, $F_Q(z)$, as approximated by the terms $F_Q^C(z)$ and $F_Q^W(z)$, is periodically verified to be within the specified limits. The value of $F_Q^W(z)$ is derived by multiplying the value of $F_Q^C(z)$ (a steady-state value which includes uncertainties defined in the Technical Specification BASES) by a factor to account for potential increases in the measured value between surveillance intervals and by a factor, W(z), to account for potential transients. W(z) is defined as the ratio of the maximum transient F_Q-TR(z)*Power and the SS-F_Q(z)*Power. Standard Relaxed Axial Offsite Control (RAOC) analyses have demonstrated that the maximum transient $F_Q(z)$ (i.e., F_Q-TR(z)) is insensitive to the steady state power shape since, as part of the standard RAOC methodology, the maximum elevation-dependent values of $F_Q(z)$ from a large number of power shapes covering the full range of allowed axial flux differences are used. Conservative W(z) curves are generated using the approved methodology described in WCAP-10216-P-A-R1A and are based on assumed full power conditions and a predicted steady-state axial power distribution. Note that the effects of severe operating anomalies, such as Crud Induced Power Shift (CIPS), are addressed through recalculation of W(z)s using the approved methodology.

Relative to the definition of W(z), the following presentation may be beneficial in subsequent discussions. The definition of W(Z) may be presented as:

$$W(z) = \max \{ F_Q\text{-}TR(z) * P\} / \{SS\text{-} F_Q(z) * P\}$$

where the power component (P) will be discussed later.

Because of the large number of transient power shapes considered in its development, the maximum value of F_Q-TR(z) is insensitive to the assumed steady-state power distribution. The SS- $F_Q(z)$ may be further approximated with axial and radial components (P(z) and $F_{xy}(z)$). Recognize that for a given core design, the radial component is relatively constant while the axial component is variable.

Inherent in the Comanche Peak evaluation of the measured data from the performance of Technical Specification Surveillance Requirement 3.2.1.2 (or any other surveillance) is an assessment of the effects of any deviations between the plant operating state and the conditions assumed in the development of the limit values. These assessments include the potential effects of power level and axial offset. The evaluation of the acceptability of the potential effects of differences between the predicted and measured axial power distribution is based on a comparison with the margin between the total $F_Q(z)$, approximated as $F_Q^W(z)$, and the limit value specified in the Technical Specifications (F_Q-Limit(z)). A simple ratio of the predicted steady-state axial power shape (SS-P(z)), used in the development of the transient W(z) curves, and the measured axial power distribution (M-P(z)) is used to evaluate the effect of any differences in the axial power distribution. Here, M-P(z) is the measured core average axial power distribution at the conditions of the surveillance, obtained from a flux map or from the calibrated BEACON model. The $F_Q^W(z)$, which is $F_Q^C(z)$* W(z), is multiplied by this ratio. The result is used to confirm that the effects of the difference between the measured and predicted axial power distribution are within the available margins.

Presented in another manner:

Available $F_Q(z)$ margin = F_Q-Limit(z) - $F_Q^W(z)$ (Eqn. 1)

Effect of axial power distribution differences
= $F_Q^W(z)$ * (SS-P(z))/(M-P(z)) – $F_Q^W(z)$ (Eqn. 2)

If the value calculated in Equation 1 is greater than or equal to the value calculated in Equation 2, the conclusion of the evaluation is that the effects of the differences between the measured and predicted axial power distributions are within the available margins, and Technical Specification Surveillance Requirement 3.2.1.2 is satisfied.

If the value calculated in Equation 1 is less than the value calculated in Equation 2, the conclusion of the evaluation is that the effects of the differences between the measured and predicted axial power distributions are greater than the available margins, and Technical Specification Surveillance Requirement 3.2.1.2 is not satisfied. The appropriate Actions of Technical Specification would be taken.

A numerical example is shown in Tables 1, 2, and 3. Table 1 represents the steady-state axial power shape. Tables 2 and 3 represent axial power shapes with axial offsets that differ by approximately -3% and +3% from the steady-state shape. A comparison of the axial power shapes is shown in Figure 1. These shapes (and the corresponding $F_Q(z)$ values) were generated with a 3-D nodal code using values under development to support Unit 2 Cycle 11 operation. The ratio of predicted and measured power shapes effectively corrects the surveilled F_Q values for the effects of power shape differences as demonstrated by the adjusted F_Q margin values in the accompanying tables. In an actual surveillance, this correction will permit the F_Q margin effects of measured $F_{xy}(z)$ values to be accurately assessed.

In keeping with standard practice, the W(z) curves will be generated assuming that the surveillance of $F_Q^W(z)$ is performed at full power. Following refueling, $F_Q^W(z)$ must be verified to be within its limit prior to exceeding 75% RTP. Also, $F_Q^W(z)$must be verified to be within its limits after exceeding, by ≥20% RTP, the thermal power at which a surveillance was last performed and every 31 EFPD thereafter. The F_Q limit is given by:

$F_Q(z) \leq [F_Q^{RTP} / P] * K(z)$ for $P > 0.5$ (Eqn. 3)

$F_Q(z) \leq [F_Q^{RTP} / 0.5] * K(z)$ for $P \leq 0.5$ (Eqn. 4)

If a surveillance of $F_Q^W(z)$ relative to the above limit must be performed at part power conditions, then Equations 1 and 2 will be used as described earlier, where the F_Q-Limit(z) term is given by the above expressions (Equations 3 and 4). In this case, however, $F_Q^W(z)$ in Equations 1 and 2 will be calculated as follows:

$F_Q^W(z) = F_Q^C(z) * [W(z) / P]$ for $P > 0.5$ (Eqn. 5)

$F_Q^W(z) = F_Q^C(z) * [W(z) / 0.5]$ for $P \leq 0.5$ (Eqn. 6)

where the W(z) values are the values generated assuming a full power surveillance (i.e., P=1.0). Dividing the W(z) values by P in Equation 5 and 0.5 in Equation 6 ensures that the $F_Q^W(z)$ terms are increased commensurate with the increase in the F_Q limit. Effectively, the P and 0.5 terms scale the measured $F_Q^W(z)$ in the same manner that the F_Q limit is scaled to ensure that transient F_Q margin will be properly assessed and not overestimated. Use of these terms is consistent with intent of the definition of the W(z) function presented in WCAP-10216-P-A, Revision 1A, which includes a 1/P term to scale $F_Q^W(z)$ in the same manner that the F_Q limit is scaled.

Alternatively, the BEACON Power Distribution Monitoring System may be used to perform the power distribution surveillance function. When the surveillance is performed, the BEACON "measured" power distribution is updated to full power, steady state conditions and used to determine the "measured" maximum transient $F_Q(z)$ x Power. To do this, the full power "measured" steady state $F_Q(z)$ from the BEACON core model is multiplied by the W(z) curve and the result, $F_Q^W(z)$, is compared to the $F_Q(z)$ limit. Thus, the full power W(z) curves are appropriate since the transient $F_Q(z)$ measurement is always based on full power conditions. Differences between the "measured" steady state power shape and the predicted steady state power shape will be addressed as described above (see Equations 1 and 2).

Question 2. Explain how CPSES, Units 1 and 2, will implement the burnup dependency of the W(z) functions, where W(z) represents the largest expected increase in Fq (the heat flux hot channel factor) from allowed plant operation.

Response:

The W(z) factors are generated using the approved methods of WCAP-10216-P-A, Revision 1A. Typically, W(z)s are provided at four different burnups to cover the entire operating cycle. A spline fit of the W(z)s versus burnup at each elevation is then used to provide appropriate W(z)s at the burnup of interest.

Table 1: Predicted steady-state axial power distribution with an axial offset of -1.75%

CASE

AO+0	Predicted =>			Measured =>					$F_Q^{RTP}(Z)$ Limit				Adjusted
	AO+0	AO+0	AO+0	AO+0	AO+0					$F_Q(Z)$	$P(Z)_{ratio}$	Axial Pwr Dist. Effects	$F_Q(Z)$
Node	$P^{SS}(Z)$	$F_Q^{SS}(Z)$	W(Z)	$P^M(Z)$	$F_Q^M(Z)$	$F_Q^C(Z)$	$F_Q^W(Z)$	K(Z)	[F_Q^{RTP} * K(Z)]	Margin	[$P^{ss}(Z) / P^M(Z)$]	[$F_Q^W(Z) * P(Z)_{ratio}$] - $F_Q^W(Z)$]	Margin
24	0.309	0.424	1.000	0.309	0.424	0.459	0.459	0.928	2.320	1.861	1.000	0.000	1.861
23	0.707	0.973	1.399	0.707	0.973	1.052	1.472	0.934	2.335	0.863	1.000	0.000	0.863
22	0.897	1.210	1.377	0.897	1.210	1.309	1.802	0.941	2.353	0.550	1.000	0.000	0.550
21	1.009	1.374	1.324	1.009	1.374	1.486	1.968	0.947	2.368	0.399	1.000	0.000	0.399
20	1.072	1.469	1.273	1.072	1.469	1.589	2.023	0.953	2.383	0.360	1.000	0.000	0.360
19	1.105	1.516	1.228	1.105	1.516	1.640	2.014	0.959	2.398	0.384	1.000	0.000	0.384
18	1.119	1.540	1.205	1.119	1.540	1.666	2.007	0.966	2.415	0.408	1.000	0.000	0.408
17	1.110	1.540	1.193	1.110	1.540	1.666	1.987	0.972	2.430	0.443	1.000	0.000	0.443
16	1.111	1.546	1.186	1.111	1.546	1.672	1.983	0.978	2.445	0.462	1.000	0.000	0.462
15	1.113	1.554	1.180	1.113	1.554	1.681	1.984	0.984	2.460	0.476	1.000	0.000	0.476
14	1.116	1.562	1.171	1.116	1.562	1.689	1.979	0.991	2.478	0.499	1.000	0.000	0.499
13	1.121	1.573	1.144	1.121	1.573	1.701	1.947	0.997	2.493	0.546	1.000	0.000	0.546
12	1.126	1.585	1.135	1.126	1.585	1.714	1.945	1.000	2.500	0.555	1.000	0.000	0.555
11	1.133	1.599	1.130	1.133	1.599	1.729	1.953	1.000	2.500	0.547	1.000	0.000	0.547
10	1.140	1.613	1.125	1.140	1.613	1.744	1.962	1.000	2.500	0.538	1.000	0.000	0.538
9	1.146	1.627	1.111	1.146	1.627	1.760	1.956	1.000	2.500	0.544	1.000	0.000	0.544
8	1.151	1.639	1.112	1.151	1.639	1.773	1.971	1.000	2.500	0.529	1.000	0.000	0.529
7	1.152	1.642	1.120	1.152	1.642	1.776	1.989	1.000	2.500	0.511	1.000	0.000	0.511
6	1.144	1.632	1.129	1.144	1.632	1.765	1.993	1.000	2.500	0.507	1.000	0.000	0.507
5	1.119	1.596	1.167	1.119	1.596	1.726	2.014	1.000	2.500	0.486	1.000	0.000	0.486
4	1.065	1.510	1.195	1.065	1.510	1.633	1.951	1.000	2.500	0.549	1.000	0.000	0.549
3	0.958	1.347	1.234	0.958	1.347	1.457	1.798	1.000	2.500	0.702	1.000	0.000	0.702
2	0.763	1.085	1.250	0.763	1.085	1.173	1.466	1.000	2.500	1.034	1.000	0.000	1.034
1	0.312	0.433	1.000	0.312	0.433	0.468	0.468	1.000	2.500	2.032	1.000	0.000	2.032

Note that for convenience, the FQ(Z) burnup dependent penalty factor (i.e., >= 1.02) has been excluded in this example.

Table 2: Predicted steady-state axial power distribution with an axial offset of +1.71%

CASE

AO+3 Node	**Predicted =>** AO+0 $P^{SS}(Z)$	AO+0 $F_Q^{SS}(Z)$	AO+0 $W(Z)$	**Measured =>** AO+3 $P^M(Z)$	AO+3 $F_Q^M(Z)$	$F_Q^C(Z)$	$F_Q^W(Z)$	$K(Z)$	$F_Q^{RTP}(Z)$ Limit $[F_Q^{RTP} * K(Z)]$	$F_Q(Z)$ Margin	$P(Z)_{ratio}$ $[P^{ss}(Z) / P^M(Z)]$	Axial Pwr Dist. Effects $[F_Q^W(Z) * P(Z)_{ratio}] - F_Q^W(Z)$	Adjusted $F_Q(Z)$ Margin
24	0.309	0.424	1.000	0.317	0.433	0.468	0.468	0.928	2.320	1.852	0.975	-0.012	1.864
23	0.707	0.973	1.399	0.748	1.028	1.112	1.556	0.934	2.335	0.779	0.945	-0.085	0.865
22	0.897	1.210	1.377	0.957	1.291	1.396	1.923	0.941	2.353	0.430	0.937	-0.121	0.550
21	1.009	1.374	1.324	1.075	1.464	1.583	2.097	0.947	2.368	0.271	0.939	-0.129	0.399
20	1.072	1.469	1.273	1.137	1.558	1.685	2.145	0.953	2.383	0.237	0.943	-0.123	0.360
19	1.105	1.516	1.228	1.165	1.600	1.730	2.125	0.959	2.398	0.272	0.948	-0.109	0.382
18	1.119	1.540	1.205	1.170	1.612	1.743	2.101	0.966	2.415	0.314	0.956	-0.092	0.405
17	1.110	1.540	1.193	1.149	1.595	1.725	2.058	0.972	2.430	0.372	0.966	-0.070	0.442
16	1.111	1.546	1.186	1.137	1.583	1.712	2.030	0.978	2.445	0.415	0.977	-0.046	0.461
15	1.113	1.554	1.180	1.125	1.572	1.700	2.006	0.984	2.460	0.454	0.989	-0.021	0.475
14	1.116	1.562	1.171	1.116	1.564	1.691	1.981	0.991	2.478	0.496	1.000	0.000	0.496
13	1.121	1.573	1.144	1.110	1.559	1.686	1.930	0.997	2.493	0.563	1.010	0.019	0.544
12	1.126	1.585	1.135	1.107	1.559	1.686	1.913	1.000	2.500	0.587	1.017	0.033	0.554
11	1.133	1.599	1.130	1.107	1.564	1.691	1.911	1.000	2.500	0.589	1.023	0.045	0.544
10	1.140	1.613	1.125	1.109	1.572	1.700	1.912	1.000	2.500	0.588	1.028	0.053	0.535
9	1.146	1.627	1.111	1.112	1.579	1.708	1.898	1.000	2.500	0.602	1.031	0.058	0.544
8	1.151	1.639	1.112	1.114	1.586	1.715	1.907	1.000	2.500	0.593	1.033	0.063	0.530
7	1.152	1.642	1.120	1.112	1.585	1.714	1.920	1.000	2.500	0.580	1.036	0.069	0.511
6	1.144	1.632	1.129	1.101	1.572	1.700	1.920	1.000	2.500	0.580	1.039	0.075	0.505
5	1.119	1.596	1.167	1.076	1.534	1.659	1.936	1.000	2.500	0.564	1.040	0.077	0.487
4	1.065	1.510	1.195	1.024	1.453	1.571	1.877	1.000	2.500	0.623	1.040	0.075	0.548
3	0.958	1.347	1.234	0.920	1.294	1.399	1.727	1.000	2.500	0.773	1.041	0.071	0.702
2	0.763	1.085	1.250	0.726	1.034	1.118	1.397	1.000	2.500	1.103	1.051	0.071	1.031
1	0.312	0.433	1.000	0.287	0.397	0.429	0.429	1.000	2.500	2.071	1.087	0.037	2.033

Note that for convenience, the FQ(Z) burnup dependent penalty factor (i.e., >= 1.02) has been excluded in this example.

Table 3: Predicted steady-state axial power distribution with an axial offset of -5.18%

CASE

AO-3	**Predicted =>**			**Measured =>**					$F_Q^{RTP}(Z)$				Adjusted
	AO+0	AO+0	AO+0	AO-3	AO-3				Limit	$F_Q(Z)$	$P(Z)_{ratio}$	Axial Pwr Dist. Effects	$F_Q(Z)$
Node	$P^{SS}(Z)$	$F_Q^{SS}(Z)$	$W(Z)$	$P^M(Z)$	$F_Q^M(Z)$	$F_Q^C(Z)$	$F_Q^W(Z)$	$K(Z)$	$[F_Q^{RTP} * K(Z)]$	Margin	$[P^{SS}(Z) / P^M(Z)]$	$[F_Q^W(Z) * P(Z)_{ratio}] - F_Q^W(Z)]$	Margin
24	0.309	0.424	1.000	0.286	0.392	0.424	0.424	0.928	2.320	1.896	1.080	0.034	1.862
23	0.707	0.973	1.399	0.677	0.931	1.007	1.409	0.934	2.335	0.926	1.044	0.062	0.864
22	0.897	1.210	1.377	0.868	1.171	1.266	1.744	0.941	2.353	0.608	1.033	0.058	0.550
21	1.009	1.374	1.324	0.977	1.331	1.439	1.906	0.947	2.368	0.461	1.033	0.062	0.399
20	1.072	1.469	1.273	1.037	1.420	1.536	1.955	0.953	2.383	0.427	1.034	0.066	0.361
19	1.105	1.516	1.228	1.067	1.465	1.584	1.946	0.959	2.398	0.451	1.036	0.069	0.382
18	1.119	1.540	1.205	1.079	1.485	1.606	1.936	0.966	2.415	0.479	1.037	0.072	0.408
17	1.110	1.540	1.193	1.069	1.482	1.603	1.912	0.972	2.430	0.518	1.038	0.073	0.444
16	1.111	1.546	1.186	1.070	1.488	1.609	1.909	0.978	2.445	0.536	1.038	0.073	0.463
15	1.113	1.554	1.180	1.074	1.497	1.619	1.911	0.984	2.460	0.549	1.036	0.069	0.480
14	1.116	1.562	1.171	1.081	1.512	1.635	1.915	0.991	2.478	0.562	1.032	0.062	0.500
13	1.121	1.573	1.144	1.092	1.532	1.657	1.896	0.997	2.493	0.596	1.027	0.050	0.546
12	1.126	1.585	1.135	1.108	1.557	1.684	1.911	1.000	2.500	0.589	1.016	0.031	0.558
11	1.133	1.599	1.130	1.127	1.590	1.720	1.942	1.000	2.500	0.558	1.005	0.010	0.547
10	1.140	1.613	1.125	1.148	1.625	1.757	1.976	1.000	2.500	0.524	0.993	-0.014	0.538
9	1.146	1.627	1.111	1.170	1.659	1.794	1.994	1.000	2.500	0.506	0.979	-0.041	0.547
8	1.151	1.639	1.112	1.188	1.690	1.828	2.032	1.000	2.500	0.468	0.969	-0.063	0.531
7	1.152	1.642	1.120	1.201	1.711	1.850	2.073	1.000	2.500	0.427	0.959	-0.085	0.512
6	1.144	1.632	1.129	1.202	1.715	1.855	2.094	1.000	2.500	0.406	0.952	-0.101	0.507
5	1.119	1.596	1.167	1.185	1.689	1.827	2.132	1.000	2.500	0.368	0.944	-0.119	0.487
4	1.065	1.510	1.195	1.135	1.609	1.740	2.079	1.000	2.500	0.421	0.938	-0.128	0.549
3	0.958	1.347	1.234	1.024	1.441	1.558	1.923	1.000	2.500	0.577	0.936	-0.124	0.701
2	0.763	1.085	1.250	0.812	1.155	1.249	1.561	1.000	2.500	0.939	0.940	-0.094	1.033
1	0.312	0.433	1.000	0.322	0.446	0.482	0.482	1.000	2.500	2.018	0.969	-0.015	2.033

Note that for convenience, the FQ(Z) burnup dependent penalty factor (i.e., >= 1.02) has been excluded in this example.

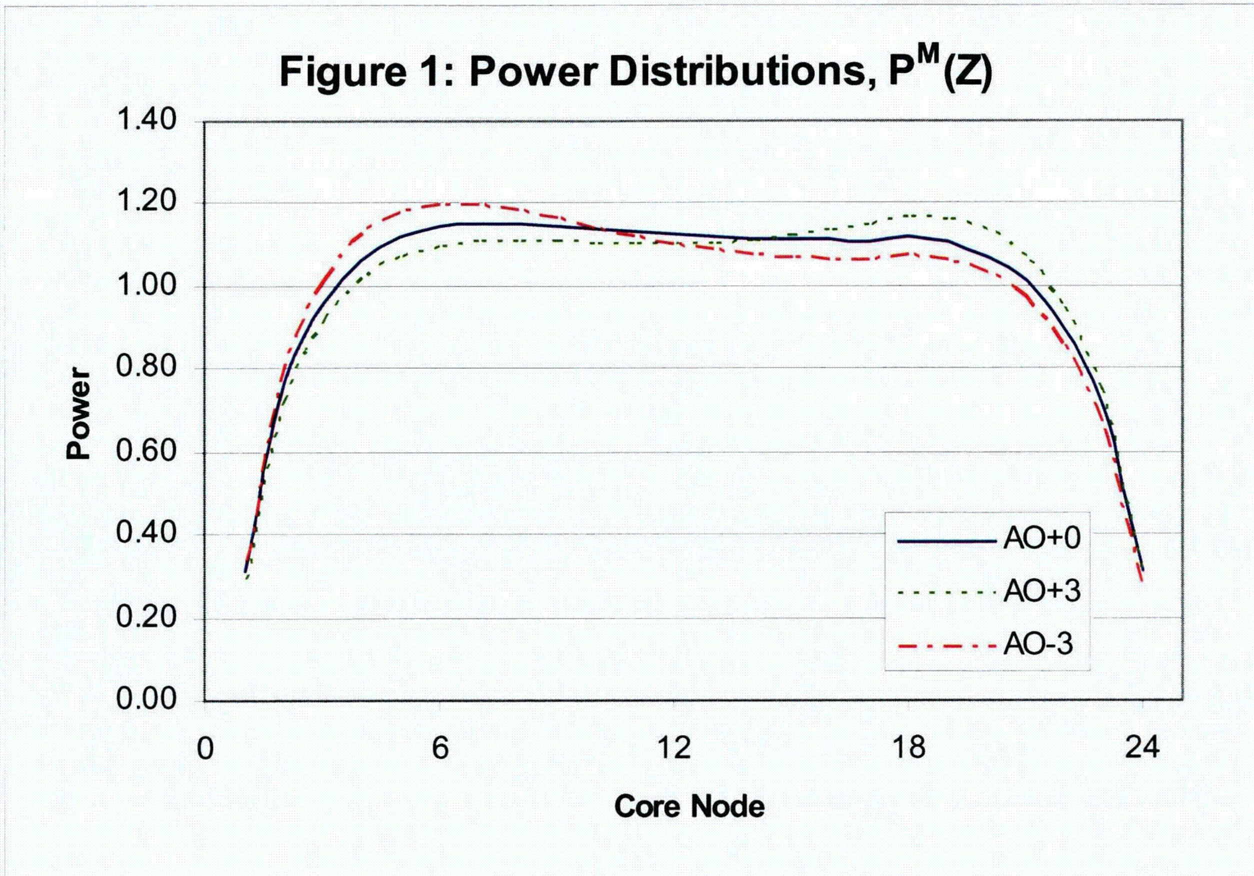
Figure 1: Power Distributions, P^M(Z)
Power
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
6
12
18
24
Core Node
AO+0
AO+3
AO-3