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A WISCONSIN ENERGY COMPANY

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10CFR50, Appendix A, GDC 4

Document Control Desk
U.S. NUCLEAR REGULATORY COMMISSION
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Ladies/Gentlemen:

DOCKETS 50-266 AND 50-301
DYNAMIC EFFECTS DESIGN BASIS REVIEW REQUEST
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

By letter dated December 2, 1999, Wisconsin Electric Power Company (WE) submitted analyses demonstrating the acceptability of applying leak-before-break methodology to exclude the dynamic effects associated with the postulated rupture of certain piping systems, including portions of the residual heat removal system, pressurizer surge line and accumulator injection piping. The analyses were submitted pursuant to the requirements of 10CFR50, Appendix A, General Design Criterion (GDC) 4, "Environmental and dynamic effects design basis."

As discussed in a conference call with NRC staff on April 28, 2000, and as requested in the staff's request for additional information dated June 7, 2000, the attached information is provided in support of the staff's review. We have also provided information related to the proprietary aspects of the related WCAPs that was discussed with the staff during the April 28, 2000, conference call.

We believe the information is responsive to your request. If you require any additional information or have further questions, please contact us.

Sincerely,

A. J. Cayia

A. J. Cayia
Manager
Site Services & Assessment

Attachments

cc: NRC Resident Inspector
NRC Regional Administrator
NRC Project Manager
Public Service Commission of Wisconsin

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DOCKETS 50-266 AND 50-301
DYNAMIC EFFECTS DESIGN BASIS REVIEW REQUEST
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

The following information is provided in response to the Nuclear Regulatory Commission (NRC) staff's request for additional information dated June 7, 2000, related to Wisconsin Electric's review request dated December 2, 1999. The purpose of the requested review was for the NRC staff to evaluate the acceptability of applying leak-before-break methodology to exclude the dynamic effects associated with the postulated rupture of certain piping systems, including portions of the residual heat removal system, pressurizer surge line and accumulator injection piping.

Responses to the NRC staff's questions were prepared by Westinghouse Electric Company (reference Westinghouse letter dated July 5, 2000) and reviewed by Wisconsin Electric personnel. Each question is restated below with Wisconsin Electric's response following.

Section I: Regarding WCAP-15107 on Accumulator Injection Line Piping LBB

(1) Clarify the information in Table 3-5. It appears that there are two entries for Type 316 stainless steel at 600°F. What does each entry signify:

Response:

Two entries for Type 316 stainless steel @ 600 °F are provided, one for the minimum value and other for the maximum value. These values are based on the tests performed by Westinghouse and the values are taken from WCAP-9558 Revision 2.

(2) Confirm that the analyses in WCAP-15107 bound all nodal locations identified in Figures 3-1 through 3-4.

Response:

We confirm that that the analyses in WCAP-15107 bound all of the nodal locations identified in Figures 3-1 thru 3-4.

(3) In Section 4.1, equation 4-2, the torsional loads (M_x) have been left out of the moment summation. The LBB procedural guidance in NUREG-1061, Volume 3 (see Section 5.4) requires that these loads be conservatively included in the moment summation. It may be that these loads are insignificant in comparison to the other loads on the piping. If so, note that this is the case and give some bounding value of M_x that would adequately cover all of the nodal locations in this piping system.

Response:

Due to the complexity of the piping layout, torsional moment at a given location may or may not be insignificant in comparison to the other load component at the same location on this piping system. We have combined torsion with bending moments at all the locations and found that the highest combined faulted moment (M) occurs at Node 380. Therefore, loads (including torsion) at Node 380 are provided below. It can be noted that Node 380 is also one of the highest stressed locations for which LBB analyses were performed.

Loads at the location with the highest combined faulted moment (M)

		Normal		Faulted	
Node	Location	Axial Force (lb)	Moment (M) (in-lbs)	Axial Force (lb)	Moment (M) (in-lbs)
380	Unit 1 Tank B	104875	678603	153189	763369

Information Related To Proprietary Aspects:

Tables 5-1, 5-2 and 7-1 in a non-proprietary and Table 5-3 in a proprietary form are provided below. Flaw size, J_{IC} and J applied values in Table 5-3 are kept as proprietary, information within the proprietary bracket is not shown below and they are the same as given in WCAP-15107.

Table 5-1 Leakage Flaw Size

Node	Temperature (°F)	Crack Length (in) (for 10 gpm leakage)
380	547	3.80
340	547	4.35
310	105	4.50
165	105	10.20
5	105	5.60
225	105	7.40

Table 5-2 Summary of Critical Flaw Size

Node	Temperature (°F)	Critical Flaw Size (in.)
380	547	11.94
340	547	12.92
310	105	14.23
165	105	19.05
5	105	15.12
225	105	17.50

Table 5-3 Stability Result for Node 165 Based on J-Integral Evaluation

Node Point	Flaw Size (in.)	J_{IC} (in-lb/in^2)	J Applied (in-lb/in^2)
165	[		]^{a,c,e}

Table 7-1 Leakage Flaw Sizes, Critical Flaw Sizes and Margins

Node Point	Critical Flaw Sizes (in)	Leakage Flaw Sizes (in)	Margins
380	11.94	3.80	3.1
340	12.92	4.35	3.0
310	14.23	4.50	3.2
165	20.40	10.20	>2.0[1]
5	15.12	5.60	2.7
225	17.50	7.40	2.4

[1] Based on J-integral approach.

Section II: Regarding WCAP-15105 on RHR System Piping LBB

(1) In Section 4.1, equation 4-2, the torsional loads (M_x) have been left out of the moment summation. The LBB procedural guidance in NUREG-1061, Volume 3 (see Section 5.4) requires that these loads be conservatively included in the moment summation. IT may be that these loads are insignificant in comparison to the other loads on the piping. If so, note that this is the case and give some bounding value of M_x that would adequately cover all of the nodal locations in this piping system.

Response:

Due to the complexity of the piping layout, torsional moment at a given location may or may not be insignificant in comparison to the other load component at the same location on this piping system. We have combined torsion with bending moments at all the locations and found that the .0highest combined faulted moment (M) occurs at Node 135 with no stratification and at Node 65 with stratification. Therefore, loads (including torsion) at Node 135 and Node 65 at which highest faulted moment (M) occurs are provided below.

Loads at the location with the highest combined faulted moment (M)

		Normal (no thermal stratification)		Faulted (no thermal stratification)	
Node	Location	Axial Force (lb)	Moment (M) (in-lb)	Axial Force (lb)	Moment (M) (in-lb)
135	Unit 2	117922	691843	122149	838369

		Normal (with thermal stratification)		Faulted (with thermal stratification)	
Node	Location	Axial Force (lb)	Moment (M) (in-lb)	Axial Force (lb)	Moment (M) (in-lb)
65	Unit 2	116456	1264142	134899	1328351

(2) Confirm that the analyses in the WCAP bound all nodal locations identified in Figures 3-1 and 3-2 and that the LBB approval is intended to apply to all of the depicted piping.

Response:

We confirm that the analyses in the WCAP bound all of the nodal locations identified in Figures 3-1 and 3-2 and that the LBB approval is intended to apply to all of the depicted piping.

(3) For Tables 4-1 and 4-2, provide the normal (used to determine the leakage flaw size) and faulted (used to determine the critical flaw size) loading conditions (with and without the inclusion of the thermal stratification stresses) for each nodal location in Figures 4-1 and 4-2. It is understood that for some nodal locations, thermal stratification stresses may not apply. Therefore, only having Table 4-1 entry for those locations would be sufficient. If it is not practical to include the loads for every nodal location, provide the appropriate loads for the 10 highest stress locations. Confirm that the information for the node with the highest ratio of:

(the loads determining the critical flaw size)-to-(the loads determining the leakage flaw size)

is included in the 10 highest stressed locations.

Response:

Loads at the 10 highest stressed locations without stratification and loads at the 10 highest stressed locations with stratification are provided below. Also, the location(s) with highest ratio of (the loads determining the critical flaw size)-to-(the loads determining the leakage flaw size) are at Nodes 470 and 20.

	Normal (with no thermal stratification)			Faulted (with no thermal stratification)		
Node	Bending Moment (in-lb)	Axial Force (lb)	Total Stress (psi)	Bending Moment (in-lb)	Axial Force (lb)	Total Stress (psi)
Unit 1						
105	305653	131721	9593	524970	133109	13117
115	391923	123818	10675	456117	127834	11836
130	299641	123554	9203	453863	127900	11803
40	348847	122317	9938	437202	130696	11640
470*	35290	37590	1915	425510	40797	8212
Unit 2						
40	365617	122208	10200	451820	130935	11880
105	305691	131910	9600	474899	133313	12331
115	425905	123174	11190	537295	128504	13146
120	536165	123174	12936	644117	128506	14839
130	386938	123692	10591	530756	127913	13021
135	498024	117922	11128	645418	122149	13420

	Normal (with thermal stratification)			Faulted (with thermal stratification)		
Node	Bending Moment (in-lb)	Axial Force (lb)	Total Stress (psi)	Bending Moment (in-lb)	Axial Force (lb)	Total Stress (psi)
Unit 1						
40	911207	128134	19056	1002986	129299	20552
50	1071263	116646	21177	1153562	135080	23146
65	1220608	116646	23543	1280562	134784	25147
75	1128305	123556	22330	1209521	129132	23818

Unit 2						
20*	106634	123226	6134	365773	131813	10549
40	962429	127784	19855	1053796	128919	21343
50	1117134	116456	21897	1199381	135208	23876
65	1249414	116456	23992	1306684	134899	25565
75	1149721	123945	22683	1220456	128618	23972
115	624925	117664	14144	732664	134014	16440
120	651073	117664	14558	756791	134016	16822

* Location with the highest ratio of (the loads determining the critical flaw size)-to-(the loads determining the leakage flaw size)

Information Related To Proprietary Aspects:

Tables 5-1, 5-2 and 7-1 in a non-proprietary form are provided below.

Table 5-1 Leakage Flaw Size

Node	Temperature (^{o}F)	Crack Length (in) (for 10 gpm leakage)
40	598	4.68
120	105	4.00
620	105	6.35
65	290	2.32

Table 5-2 Summary of Critical Flaw Size

Node	Temperature (^{o}F)	Crack Flaw Size (in.)
40	598	13.98
120	105	13.89
620	105	16.18
65	290	9.98

Table 7-1 Leakage Flaw Sizes, Critical Flaw Sizes and Margins			
Node Point	Critical Flaw Sizes (in)	Leakage Flaw Sizes (in)	Margins
40[1]	13.98	4.68	2.98
120[1]	13.89	4.00	3.47
620[2]	16.18	6.35	2.55
65[1]	9.98	2.32	4.30

[1] Unit 2
[2] Unit 1

<u>Section III: Regarding WCAP-15065 on Surge Line Piping LBB</u>

(1) In Section 4.1, equation 4-2, the torsional loads (M_x) have been left out of the moment summation. The LBB procedural guidance in NUREG-1061, Volume 3 (see Section 5.4) requires that these loads be conservatively included in the moment summation. IT may be that these loads are insignificant in comparison to the other loads on the piping. If so, note that this is the case and give some bounding value of M_x that would adequately cover all of the nodal locations in this piping system.

<u>Response:</u>

Due to the complexity of the piping layout, torsional moment at a given location may or may not be insignificant in comparison to the other load component at the same location on this piping system. We have combined torsion with bending moments at all the locations and found that the highest combined faulted moment (M) occurs at Node 1030. Therefore, loads (including torsion) at Node 1030 at which highest faulted moment (M) occurs are provided below. It can be noted that Node 1030 is also one of the highest stressed locations for which LBB analyses were performed.

Loads at the location with the highest combined faulted moment (M)

Node	Case	Axial Force (lbs)	Moment M (in-lbs)
1030	A	143318	651350
1030	B	143167	709490
1030	C	28375	1231810
1030	D	144496	778290
1030	E	144345	875800
1030	F	28765	1325560
1030	G	29943	1462660

(2) For Table 4-4, provide the case A through G loading conditions for each nodal location in Figure 4-1. It is understood that for some nodal locations, not all of the loading cases may apply. If it is not practical to include the loads for every nodal location, provide the appropriate loads for the three highest stressed locations. Confirm that the information for the node with the highest ratio of :

(the loads determined for Case F)-to-(the loads determined for Case B)

is included in the three highest stressed locations.

Response:

Loads at the three highest stressed locations are provided below. Node 1040 is the location at which highest ratio of (the loads determined for Case F)-to-(the loads determined for Case B) occurs. It can be noted that the stratification delta T for Case F used in this analysis is same as that used for Case G, which is conservative. The actual stratification delta T for Case F is less than maximum delta T used for Case G.

Summary of LBB Loads and Stresses for the three highest stressed locations				
Node	Case	Axial Force (lbs)	Bending Moment (in-lbs)	Total Stress (psi)
1030	A	143318	211420	8519
1030	B	143167	378750	11164
1030	C	28375	1175690	19647
1030	D	144496	416090	11800
1030	E	144345	596150	14650
1030	F	28765	1272830	21200
1030	G	29943	1404250	23324
1040	A	143056	110840	6920
1040	B	142905	179590	8000
1040	C	28117	1038470	17460
1040	D	144198	245120	9080
1040	E	144047	363930	10960
1040	F	28528	1126110	18870
1040	G	29670	1247560	20830
1150	A	152611	727280	17030
1150	B	152584	751580	17410
1150	C	34823	1212260	20460
1150	D	152997	764560	17630
1150	E	152970	818070	18480
1150	F	34823	1212260	20460
1150	G	35209	1281090	21560

Information Related To Proprietary Aspects:

Tables 4-2, 4-3, 5-1, 5-2 and 7-1 were requested in a non-proprietary form. Westinghouse prefers not to make all the information in Tables 4-2 and 4-3 as non-proprietary. As agreed with

Mr. Matthew A. Mitchell of the NRC (in a telephone conversation) non-proprietary information for Case F in Table 4-2 and Case A/F, Case B/F in Table 4-3 is shown below. Remaining information in Tables 4-2 and 4-3 of WCAP-15065 remains the same. Leakage flaw sizes, critical flaw sizes in Tables 5-1, 5-2 and 7-1 are shown below as non-proprietary. Information within the proprietary bracket not shown in the following Tables remains the same as those shown in WCAP-15065.

Table 4-2 Normal and Faulted Loading Cases for Leak-Before-Break Evaluations	
CASE F	This is a forced cooldown case [ ]a,c,e with stratification [ ]a,c,e

Table 4-3 Associated Load Cases for Analyses	
A/F	This depicts a postulated forced cooldown resulting from experiencing a detectable leak [ ]a,c,e
B/F	This depicts a postulated forced cooldown resulting from experiencing a detectable leak [ ]a,c,e

Table 5-1 Leakage Flaw Size			
Node Point	Load Case	Temperature (°F)	Crack Length (in.) (for 10 gpm leakage)
1030	A	653	5.25
	B	[ ] a,c,e	4.35
	C	[ ] a,c,e	3.65

Table 5-2 Summary of Critical Flaw Size			
Node Point	Load Case	Temperature (°F)	Crack Flaw Size (in)
1030	D	653	13.89
	E	[ ] a,c,e	12.87
	F	[ ] a,c,e	11.93
	G	[ ] a,c,e	11.22

Table 7-1 Leakage Flaw Sizes, Critical Flaw Sizes and Margins				
Node	Load Case	Critical Flaw Size (in)	Leakage Flaw Size (in)	Margin
1030	A/D	13.89	5.25	2.6
	A/F	11.93	5.25	2.3
	B/E	12.87	4.35	2.9
	B/F	11.93	4.35	2.7
	C/G[1]	11.22	3.65	3.1
	B/G[1]	11.22	4.35	2.6

1. These are judged to be low probability events