June 5, 2008

L-MT-08-042
10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Monticello Nuclear Generating Plant
Docket 50-263
Renewed Facility Operating License
License No. DPR-22

Monticello Extended Power Uprate (USNRC TAC MD8398):
Acceptance Review Supplemental Information Package 5

References:

1) NMC Letter to USNRC, "License Amendment Request: Extended Power Uprate," dated March 31, 2008

2) NMC Letter to USNRC, "Monticello Extended Power Uprate (USNRC TAC MD8398): Acceptance Review Supplement Regarding Radiological Analysis," dated May 20, 2008

3) NMC Letter to USNRC, "Monticello Extended Power Uprate (USNRC TAC MD8398): Acceptance Review Supplemental Information," dated May 28, 2008

4) NMC Letter to USNRC, "Monticello Extended Power Uprate (USNRC TAC MD8398): Acceptance Review Supplemental Information Package 3," dated May 30, 2008

5) NMC Letter to USNRC, "Monticello Extended Power Uprate (USNRC TAC MD8398): Acceptance Review Supplemental Information Package 4," dated June 3, 2008

Pursuant to 10 CFR 50.90, Nuclear Management Company, LLC (NMC), requested in Reference 1 approval of amendments to the Monticello Nuclear Generating Plant (MNGP) Renewed Operating License (OL) and Technical Specifications (TS) to increase the maximum power level authorized from 1775 megawatts thermal (MWt) to 1870 MWt, an approximate five percent increase in the current licensed thermal power (CLTP). The proposed request for Extended Power Uprate (EPU) represents an increase of approximately 12 percent above the Original Licensed Thermal Power (OLTP). The Monticello EPU application was supplemented on May 20, 2008, May 28, 2008, May 30, 2008, and June 3, 2008 by References 2, 3, 4 and 5.

In a teleconference held May 2, 2008, the NRC staff indicated that additional information would be necessary for the Electrical Engineering Branch (EEEB) to complete the acceptance review of the Monticello EPU license amendment request (LAR). The questions were formalized and emailed to NMC on May 15, 2008. On May 28, 2008, NMC submitted responses (Reference 3) to EEEB Questions 2, 3, and 4. Enclosure 1 of this letter contains the response to EEEB Question 1.

NMC has reviewed the No Significant Hazards Consideration and the Environmental Consideration submitted with Reference 1 relative to the enclosed supplemental information. NMC has determined that there are no changes required to either of these sections of Reference 1.

Commitment Summary

This letter makes no new commitments and does not change any existing commitments.

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

Executed on June 5, 2008.

Timothy J. O'Connor
Site Vice President, Monticello Nuclear Generating Plant
Nuclear Management Company, LLC

cc: Administrator, Region III, USNRC
Project Manager, Monticello, USNRC
Resident Inspector, Monticello, USNRC
Minnesota Department of Commerce

Enclosure

Enclosure 1 to L-MT-08-042

Electrical Engineering Branch
Question 1 and Response 1

4) EEEB – ELECTRICAL ENGINEERING BRANCH

NRC Question

1) In Section 2.3 of the LAR under the section titled 'Outside Containment', the licensee stated the following:

"The total integrated doses (normal plus accident) for EPU conditions were evaluated and determined not to adversely affect qualification of most of the EQ equipment located outside of containment. Equipment not qualified to the new environmental conditions at EPU will be reanalyzed, re-qualified, or replaced prior to implementation of EPU."

In order for the Electrical Engineering Branch (EEEB) to start its review, the full EQ analysis must be completed. This includes any reanalysis, re-qualification, or replacement of equipment. The licensee must also describe how the equipment was evaluated (e.g., calculations, assessments, etc.) and show how the equipment remains bounded (i.e., provide the original design parameters and the updated values including the supporting calculations).

NMC Response:

The responses to EEEB Questions 2, 3 and 4 were submitted in Monticello letter L-MT-08-039 on May 28, 2008. The following response is regarding EEEB Question 1.

Introduction

The following information provides more detail regarding the analyses that have been completed relative to the qualification of electrical equipment outside containment. As required, the analyses have addressed the radiation, pressure, temperature and flooding effects from operation at extended power uprate (EPU) conditions. This information describes how the equipment was evaluated and notes where further action, per the applicable regulatory criteria and the Monticello Environmental Qualification (EQ) Program, is necessary prior to implementation of EPU.

Normal Temperature Evaluation

An evaluation was completed to assess the impact EPU will have on the normal design temperatures of the Reactor Building. A calculation supports the normal area temperature data for the EQ Program. This calculation uses both survey data and calculated data as inputs. For the Drywell and the Steam Chase, a calculation provides a basis for the normal ambient temperatures. The EPU evaluation indicates no change in normal Drywell temperatures for EPU and a slight increase in normal Steam Chase temperature (less than one degree). This small temperature increase is bounded by the temperature value currently used in the EQ program for the steam chase. Normal plant area ambient temperature will continue to be assessed by the EQ program in lieu of using the maximum design temperature for assessing qualified lifetimes. As such, there is no impact of EPU conditions on normal plant temperature inputs to qualified life assessments.

Normal Radiation Dose

The EPU evaluation for radiation levels generally indicates an increase of 13 percent for the Reactor Building dose and no change for most Turbine Building normal doses as the result of EPU (some areas of Turbine Building have dose rate increases). This evaluation provides survey data for most plant areas and identifies the applicable increase effect for each plant area outside the Drywell.

The current basis for normal radiation doses in the EQ program is provided by calculation. This calculation documents actual survey dose rate data for all of the Reactor Building and the Turbine Building. The tables below relate the normal radiation doses in the calculation for reactor and turbine building.

Reactor Building, Normal 60 Year Doses						
Current EQ Program Basis				**Projected 60 year Normal EPU Dose**		
RB Volume (Spec)	**Dose Rate mR/Hr**	**Survey date**	**Current 60 year Dose (Rad)**	**Dose rate (survey) mR/Hr**	**Predicted EPU Effect (see note)**	**EPU 60 yr Dose (Rad) (see note)**
1 (B.1.4)	200	01/18/03	1.39E+05	160	180.8	9.51E+04
2 (B.1.4)	200	01/18/03	1.39E+05	Not surv		
3 (B.1.4)	100	12/29/02	6.94E+04	50	56.5	2.97E+04
4 (B.1.4)	100	12/29/02	6.94E+04	Not surv		
5 (B.1.3)	1	08/18/02	6.94E+02	Not surv		
6 (B.1.2)	1000	12/21/02	6.94E+05	100	113	5.94E+04
7 (B.1.10)	1	06/26/00	6.94E+02	Not surv		
8 (B.1.2)	46	12/21/03	3.19E+04	3	3.39	1.78E+03
9 (B.1.6)	120	12/15/02	8.33E+04	50	56.5	2.97E+04
10 (B.1.6)	90	12/15/02	6.25E+04	30	33.9	1.78E+04
11 (B.1.6)	140	01/19/03	9.72E+04	60	67.8	3.57E+04
12 (B.1.6)	150	01/19/03	1.04E+05	30	33.9	1.78E+04
13 (B.1.8)	80	01/12/03	5.55E+04	20	22.6	1.19E+04
14 (B.1.9/11)	160	08/03/02	1.11E+05	60	67.8	3.57E+04
15 (B.1.9)	350	03/10/02	2.43E+05	50	56.5	2.97E+04
16 (B.1.7)	4000	07/01/98	2.78E+06	2000	2260	1.19E+06
17 (B.1.9)	4	12/29/02	2.78E+03	4	4.52	2.38E+03
18 (B.1.10)	400	01/21/03	2.78E+05	55	62.15	3.27E+04
19 (B.1.10/12)	42	12/29/02	2.92E+04	4	4.52	2.38E+03
20 (B.1.8)	80	01/18/03	5.55E+04	30	33.9	1.78E+04
21 (B.1.14)	100	02/08/03	6.94E+04	30	33.9	1.78E+04
22 (B.1.14)	80	12/15/02	5.55E+04	1	1.13	5.94E+02

Reactor Building, Normal 60 Year Doses						
Current EQ Program Basis				**Projected 60 year Normal EPU Dose**		
RB Volume (Spec)	**Dose Rate mR/Hr**	**Survey date**	**Current 60 year Dose (Rad)**	**Dose rate (survey) mR/Hr**	**Predicted EPU Effect (see note)**	**EPU 60 yr Dose (Rad) (see note)**
23 (B.1.14)	80	02/10/02	5.55E+04	1	1.13	5.94E+02
24	1	01/18/03	6.94E+02	Not surv		
25	1	12/15/02	6.94E+02	1	1.13	5.94E+02
26	18	01/18/03	1.25E+04	4	4.52	2.38E+03
27 (B.1.13/15)	260	08/12/02	1.81E+05	30	33.9	1.78E+04
28 (B.1.5)	40	01/04/02	2.78E+04	40	45.2	2.38E+04
29 (B.1.5)	20	01/04/02	1.39E+04	20	22.6	1.19E+04
30 (B.1.5)	800	01/04/02	5.55E+05	80	90.4	4.75E+04
31 (B.1.5)	2200	01/04/02	1.53E+06	2200	2486	1.31E+06
32 (B.1.5)	1600	01/04/02	1.11E+06	1600	1808	9.51E+05
33 (B.1.13)	680	08/12/02	4.72E+05	3	3.39	1.78E+03
34 (B.1.18)	40	12/15/02	2.78E+04	6	6.78	3.57E+03
35 (B.1.17)	5	12/15/02	3.47E+03	4	4.52	2.38E+03
36 (B.1.21)	1	08/26/02	6.94E+02	1	1.13	5.94E+02
37 (B.1.21)	1	08/26/02	6.94E+02	1	1.13	5.94E+02
38 (B.1.21)	1	08/26/02	6.94E+02	1	1.13	5.94E+02
39 (B.1.21)	1	08/26/02	6.94E+02	1	1.13	5.94E+02
40 (B.1.16)	2	08/26/02	1.39E+03	1	1.13	5.94E+02
41 (B.1.16)	2	01/18/03	1.39E+03	1	1.13	5.94E+02
42 (B.1.16)	20	12/15/02	1.39E+04	1	1.13	5.94E+02
43 (B.1.19)	700	12/27/02	4.86E+05	500	565	2.97E+05
44 (B.1.20)	200	12/27/02	1.39E+05	5	5.65	2.97E+03
45 (B.1.19)	2	12/27/02	1.39E+03	2	2.26	1.19E+03
46 (B.1.19)	200	12/27/02	1.39E+05	6	6.78	3.57E+03
47 (B.1.19)	1	12/27/02	6.94E+02	Not surv		
48	36	02/06/03	2.50E+04	7	7.91	4.16E+03

Note: EPU 60-year basis dose was determined by increasing the shown dose rate by 13 percent taken over the number of hours over 60 years (365.25 days/year used to account for leap years). No equivalent 60 year dose was determined for areas where the EPU evaluation did not provide dose rate values. As illustrated above, the projected 60-year normal dose due to EPU is bounded by the specified doses used in the current EQ Program for the Reactor Building.

Turbine Building, Normal 60 Year Doses						
Current EQ Program Basis Normal Dose				**Projected 60 year Normal EPU Dose**		
TB Volume	**mR/Hr**	**Survey Date**	**Current 60 year Dose (Rad)**	**Dose Rate survey (mRem/hr)**	**EPU Effect**	**EPU 60 yr Dose (Rad)**
1 (B.1.24)	1	12/18/02	6.94E+02	1	No change	5.26E+02
2 (B.1.24)	1	12/18/02	6.94E+02	1	1130% Increase	5.94E+03
3 (B.1.24)	1	12/18/02	6.94E+02	1	1130% Increase	5.94E+03
4 (B.1.24)	1	12/18/02	6.94E+02	1	No change	5.26E+02
5 (B.1.24)	8	12/18/02	5.55E+03	1 - 2	No change	1.05E+03
6 (B.1.24)	1	12/18/02	6.94E+02	1	No change	5.26E+02
7 (B.1.24)	1	12/18/02	6.94E+02	1	No change	5.26E+02
8 (B.1.24)	1	12/18/02	6.94E+02	1	No change	5.26E+02
9 (B.1.24)	1	12/18/02	6.94E+02	1	No change	5.26E+02
10 (B.1.24)	2	12/18/02	1.39E+03	1 1 - 5	No change	2.63E+03
11 (B.1.24)	200	01/29/03	1.39E+05	1 - 10 30	No change	1.58E+04
12 (B.1.24)	120	05/01/02	8.33E+04	5 - 30	No change	1.58E+04
13 (B.1.24)	2400	02/07/02	1.67E+06	2 - 1500	25 – 33% Increase	1.05E+06
14 (B.1.24)	4000	07/01/98	2.78E+06	5 - 1800	Up to 1130% Increase	1.07E+07
15 (B.1.24)	8	12/18/02	5.55E+03	1	No change	5.26E+02
16 (B.1.24)	8	12/18/02	5.55E+03	1	No change	5.26E+02
17 (B.1.24)	8	12/18/02	5.55E+03	1	No change	5.26E+02
18 (B.1.24)	8	12/18/02	5.55E+03	1	No change	5.26E+02
19 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
20 (B.1.23)	46	11/13/02	3.19E+04	Not surveyed	No change	
21 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02

Turbine Building, Normal 60 Year Doses						
Current EQ Program Basis Normal Dose				**Projected 60 year Normal EPU Dose**		
TB Volume	**mR/Hr**	**Survey Date**	**Current 60 year Dose (Rad)**	**Dose Rate survey (mRem/hr)**	**EPU Effect**	**EPU 60 yr Dose (Rad)**
22 (B.1.23)	12	11/13/02	8.33E+03	1	No change	5.26E+02
23 (B.1.23)	1	12/18/02	6.94E+02	1-2	No change	1.05E+03
24 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
25 (B.1.23)	2	12/04/02	1.39E+03	1	1130% Increase	5.94E+03
26 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
27 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
28 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
29 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
30 (B.1.23)	8	02/06/02	5.55E+03	1	No change	5.26E+02
31 (B.1.23)	1	02/06/02	6.94E+02	1	No change	5.26E+02
32 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
33 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
34 (B.1.23)	1	03/28/02	6.94E+02	1	No change	5.26E+02
35 (B.1.23)	1	03/28/02	6.94E+02	1	No change	5.26E+02
36 (B.1.23)	1	03/28/02	6.94E+02	1	No change	5.26E+02
37 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
38 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
39 (B.1.23)	1	12/18/02	6.94E+02	1	No change	5.26E+02
40 (B.1.23)	60	12/18/02	4.17E+04	1 – 2	No change	1.05E+03
41 (B.1.22)	80	05/08/00	5.55E+04	1 – 3	No change	1.58E+03
42 (B.1.22)	3000	05/08/00	2.08E+06	1 – 1000 10 - 3000	2 – 9% Increase	1.72E+06

Turbine Building, Normal 60 Year Doses						
Current EQ Program Basis Normal Dose				**Projected 60 year Normal EPU Dose**		
TB Volume	**mR/Hr**	**Survey Date**	**Current 60 year Dose (Rad)**	**Dose Rate survey (mRem/hr)**	**EPU Effect**	**EPU 60 yr Dose (Rad)**
43 (B.1.23)	1	12/18/02	6.94E+02	Not surveyed	No change	
44 (B.1.22)	3000	05/08/00	2.08E+06	1 – 1000 10 - 3000	2 – 9% Increase	1.72E+06

Note: EPU 60-year basis dose was determined by increasing the highest shown dose rate by the EPU Effect value and then multiplying by the number of hours over 60 years (365.25 days/year used to account for leap years). No equivalent 60 year dose was determined for areas where the EPU evaluation did not provide dose rate values.

Based on the above, it is observed that the projected 60 year normal doses in Turbine Building Volumes 2, 3, 10, 14, 23, and 25 will increase from the current specified EQ Program data. These volumes, with the exception of 14, remain below the radiation harsh classification threshold as defined by the EQ program.

Accident Radiation Doses

The EPU evaluation of the impacts of radiation on equipment qualification and the supporting vendor calculation performed by Alion provides the bases for EPU impacts on the EQ program from post-LOCA accident doses. The resulting EPU doses and the indicated increases by location are shown below.

LOCATION	% EPU Dose Increase	EPU 180-day TID, (Rads)
Drywell	2.5	5.44E+07
HPCI Room - Elevation 896'	7.3	2.73E+06
RCIC Room - Elevation 896'	7.5	1.82E+06
RHR Rooms - Elevation 896'	4.3	2.72E+07
RWCU Pump Room - Elevation 962'	7.8	2.52E+06
Torus Compartment - Elevation 896'	3.5	1.19E+07
Main Steam Chase - Elevation 935'	7.3	2.73E+06
LPCI Valve Injection Room - Elevation 935'	7.8	2.52E+06
Reactor Building - Elevation 935' E	7.8	2.52E+06
Reactor Building - Elevation 935' W	7.8	2.52E+06
Reactor Building - Elevation 935' SE	7.8	2.52E+06
Reactor Building - Elevation 935' SW	7.8	2.52E+06
Reactor Building - Elevation 962' S	7.8	2.52E+06
Reactor Building - Elevation 962' E	7.8	2.52E+06
Reactor Building - Elevation 962' NW	7.8	2.52E+06

Reactor Building - Elevation 985' N	7.9	1.29E+04
Reactor Building - Elevation 985' SW	7.9	1.29E+04
Reactor Building - Elevation 985' SE	7.9	1.29E+04
Reactor Building - Elevation 1001' N	7.9	1.29E+04
Reactor Building - Elevation 1001' S	7.9	1.29E+04
Standby Gas Treatment Room - Elevation 985'	8.3	2.03E+08
Turbine Building Operating Deck - Elevation 951'	0.0	<1.00E+04
Turbine Building Condenser Room - Elevations 907', 911' & 931'	0.0	<1.00E+04
Cond Phase Separator Room	3.7	1.19E+07
Waste Collector Tank Room	7.7	3.87E+06

The accident doses developed in the subject EPU evaluation are supported by vendor calculation (ALION). The vendor calculation develops scaling factors on the original plant dose calculations developed in response to the Three Mile Island action plan. For the Reactor Building and Drywell, the EPU effective accident dose increase was shown to range from 2.5 to 8.3 percent with the 180-day integrated accident dose shown above.

For the Turbine Building, the calculation indicates that there were no original plant dose calculations developed for general areas of the Turbine Building. For comparison, the calculation indicates 1-hour dose rates of less than 500 mRem/hour for vital access areas of the Administrative Building that experience shine from the Reactor Building. For conservatism, the accident dose was always listed as being <1.0E+04 Rad.

Accordingly, the revised combined 60-year normal doses and the 180-day accident doses under EPU have the potential to impact the qualification of EQ components in the Reactor Building. Using the methods prescribed in the individual EQ calculation files for operating time and distance factors, the revised normal and accident doses were evaluated and compared to the qualified dose as indicated below (for conservatism, the normal dose was increased by +13 percent). For the equipment located in the Drywell, Beta dose was also considered. The Beta dose specified in the Monticello EQ Program is taken from the DOR Guidelines (Division of Operating Reactors – “Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors”) as an unshielded 200 Mrad dose, which was developed from a 4,100 MWth reactor. Therefore, considerable margin is included in the Beta dose as it applies to Monticello.

Equipment Title	EPU Normal Dose (rad)	EPU Accident Gamma TID (rad)	Beta Dose (rad)	Total EPU TID (rad)	Qual. Dose (rad)	Note
Allen Bradley Terminal Boards	7.84E+02	4.33E+06		4.33E+06	2.51E+08	
ASCO Solenoid Valves (Normally Energized) Group 1	1.57E+05	2.83E+07		2.84E+07	2.00E+08	
ASCO Solenoid Valves (Normally Energized) Group 2	9.41E+04	1.25E+07		1.25E+07	2.00E+08	
ASCO Solenoid Valves (Normally Energized) Group 3	1.79E+07	5.44E+07	2.00E+07	9.23E+07	2.00E+08	
ASCO Solenoid Valves (Normally Energized) Group 4	3.14E+05	2.53E+06		2.85E+06	2.00E+08	
ASCO Solenoid Valves (Normally De-energized) Group 1	1.79E+07	5.44E+07	Shielded	7.23E+07	2.00E+08	
ASCO Solenoid Valves (Normally De-energized) Group 2	1.18E+05	1.25E+07		1.26E+07	2.00E+08	
ASCO Pressure Switches	1.18E+05	1.25E+07		1.26E+07	1.93E+07	
ASCO Temperature Switches	7.84E+02	1.08E+07		1.08E+07	1.50E+07	
Automatic Valve Solenoid Valves	2.79E+06	5.00E+06	Shielded	7.79E+06	7.79E+06	Note
Barksdale Pressure Switch	1.57E+05	6.50E+06		6.66E+06	1.00E+07	
Barton Pressure Switches RHR	1.57E+05	5.42E+05		6.99E+05	3.00E+06	
Barton Pressure Switches, Non-RHR	1.30E+05	2.53E+06		2.66E+06	3.00E+06	
Barton Pressure Switches 580A-0, 580A-1	3.14E+05	2.53E+06		2.85E+06	1.00E+07	
E.F. Johnson Banana Plug	3.14E+06	HELB only		3.14E+06	4.70E+06	
G.E. Cable (Butyl type)	1.57E+05	2.83E+07		2.84E+07	4.00E+07	
G.E. Cable SIS & SI-58109 Control	1.79E+07	5.44E+07	2.00E+07	9.23E+07	2.00E+08	Note
G.E. Cable SI-58081 Control	7.84E+03	2.17E+07		2.17E+07	2.44E+07	
General Electric Motors	1.57E+05	2.72E+07		2.74E+07	3.00E+07	Note

Equipment Title	EPU Normal Dose (rad)	EPU Accident Gamma TID (rad)	Beta Dose (rad)	Total EPU TID (rad)	Qual. Dose (rad)	Note
General Electric Containment Penetrations	1.79E+07	5.44E+07	Shielded	7.23E+07	1.00E+08	
General Electric Terminal Blocks	7.84E+02	2.03E+08		2.03E+08	2.20E+08	Note
General Electric MCCs	3.60E+05			3.60E+05	1.00E+06	
Hevi-Duty Electric Transformer	7.84E+02	4.71E+06		2.00E+06	2.00E+06	Note
General Electric Fan Motors	7.84E+02	1.08E+06		1.08E+06	1.00E+06	Note
Limitorque Motor Operators (DOR) (MO-2397)	1.79E+07	5.44E+07	2.00E+06	7.43E+07	2.00E+08	
Limitorque Motor Operators (DOR) (MO-2107)	3.14E+06	2.75E+06		5.89E+06	2.00E+07	
Limitorque Motor Operators (50.49)	1.79E+07	5.44E+07	2.00E+07	9.23E+07	2.00E+08	
Limitorque Motor Operators (50.49)	3.14E+06	2.75E+06		5.89E+06	1.00E+07	
Limitorque Motor Operators (50.49)	1.18E+05	1.25E+07		1.26E+07	2.00E+07	
Limitorque Motor Operators (50.49)	1.79E+07	5.44E+07	2.00E+07	9.23E+07	2.27E+08	
Limitorque Motor Operators (50.49)(MO-4229 & MO-4230)	1.18E+05	1.25E+07		1.26E+07	2.00E+07	
Magnetrol Level Switches	1.18E+05	1.25E+07		1.26E+07	2.20E+08	
McDonnell & Miller Flow Switches	7.84E+02	5.40E+06		5.40E+06	5.00E+06	Note
MicroSwitch Limit Switches	7.84E+02	1.07E+07		1.07E+07	1.00E+07	Note
Namco Limit Switches (50.49)	1.79E+07	5.44E+07	Shielded	7.23E+07	2.04E+08	
Namco Quick Disconnects EC210	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.04E+08	
Raychem NEIS Seals	1.18E+05	1.25E+07		1.26E+07	5.00E+07	
Raychem Low Voltage Splices	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.25E+08	
Robertshaw Level Switch	3.14E+05	3.25E+05		6.39E+05	2.00E+06	
Rockbestos Coax Cable	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.00E+08	

Equipment Title	EPU Normal Dose (rad)	EPU Accident Gamma TID (rad)	Beta Dose (rad)	Total EPU TID (rad)	Qual. Dose (rad)	Note
Rosemount Pressure Transmitter	1.18E+05	1.25E+07		1.26E+07	4.40E+07	
Rosemount 1153 Series B	1.57E+05	2.83E+07		2.84E+07	2.62E+07	Note
Rosemount Conduit Seals	1.18E+05	1.25E+07		1.26E+07	1.11E+08	
Rotork "A" Range Actuators (DOR)	1.57E+05	1.62E+06		1.78E+06	4.00E+06	
Rotork Valve Operators (50.49)	1.57E+05	2.83E+07		2.84E+07	1.84E+08	
Static O-ring	5.33E+05	5.74E+06		6.27E+06	8.00E+06	
Yarway Level	3.14E+05	3.40E+05		6.54E+05	1.00E+06	
Samuel Moore Instrument Cable	7.84E+02	1.08E+08		1.08E+08	2.00E+08	
Valcor Solenoid Valves	1.10E+05	1.25E+07		1.26E+07	5.90E+07	
DG O'Brien Electrical Penetrations	1.79E+07	5.44E+07	Shielded	7.23E+07	2.20E+08	
DG O'Brien Electrical Penetrations (Plugs)	1.79E+07	5.44E+07	1.25E+07	8.48E+07	1.25E+08	
Reliance Motors	1.57E+05	2.83E+07		2.84E+07	2.00E+08	
Tavis Flow Transmitter	7.84E+02	1.08E+06		1.08E+06	1.40E+06	
ITT Grinnel/Conoflow Transducer	7.84E+02	5.42E+06		5.42E+06	1.00E+07	
Consolidated Control Relays	3.14E+05	7.58E+04		3.90E+05	5.00E+05	
General Atomic Radiation Detector	1.79E+07	5.44E+07	2.00E+08	2.72E+08	Not Rad Sensitive	
Kerite Cable/Termination	1.57E+05	2.83E+07		2.84E+07	2.20E+08	
Westinghouse Starter and Transformer	1.25E+05	2.53E+06		2.66E+06	5.00E+06	
GOULD CONTACTOR/ DISCONNECT	7.84E+02	4.33E+06		4.33E+06	1.00E+07	
Eaton Thermocouple Extension Cable	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.00E+08	
Brand Rex 600V Instrument Cable (Dywell)	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.00E+08	
Brand Rex 600V Instrument Cable (RB)	7.84E+03	1.08E+08		1.08E+08	2.00E+08	
Boston Control Cable	7.84E+03	1.08E+08		1.08E+08	2.00E+08	

Equipment Title	EPU Normal Dose (rad)	EPU Accident Gamma TID (rad)	Beta Dose (rad)	Total EPU TID (rad)	Qual. Dose (rad)	Note
CONAX Electrical Connector Seal	1.79E+07	5.44E+07	2.25E+07	9.48E+07	2.25E+08	
CONAX RTDs	1.18E+05	1.25E+07		1.26E+07	2.27E+08	
Patel Conduit Seals (Drywell)	1.79E+07	5.44E+07	2.00E+07	9.23E+07	2.00E+08	
Patel Conduit Seals (Contact SBGT Filters)	7.84E+03	1.08E+08		1.08E+08	2.00E+08	
Patel Conformal Coating (outside Drywell)	1.18E+05	1.25E+07		1.26E+07	2.00E+07	
Patel Conformal Coating (Drywell)	1.79E+07	5.44E+07	2.00E+08	2.72E+08	3.06E+08	
EGS Grayboot Electrical Connectors	1.79E+07	5.44E+07	2.00E+07	9.23E+07	2.08E+08	
EGS Quick Disconnect	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.00E+08	
Raychem/Swagelok Conduit Seals	1.57E+05	2.83E+07		2.84E+07	5.00E+07	
Weed Thermocouples	1.79E+07	5.44E+07	2.00E+08	2.72E+08	3.06E+08	
Rome Cable Type SIS	3.60E+04	3.25E+05		3.61E+05	5.00E+08	
Eaton Cutler-Hammer Relays	5.33E+05	5.29E+05		1.06E+06	1.43E+06	
PEI/FENWAL Temperature Switch	1.18E+05	1.25E+07		1.26E+07	5.00E+07	
ITT-Royal PVC Cable	5.33E+05	2.53E+06		3.07E+06	1.00E+07	
Okonite Control Cable	3.14E+05	2.53E+06		2.85E+06	1.00E+07	
Triangle Triolene Control Cable	3.14E+05	7.58E+04		3.90E+05	3.90E+05	
MNGP-A Cable	1.57E+05	2.83E+07		2.84E+07	5.00E+07	
MNGP-B Cable	1.57E+05	2.83E+07		2.84E+07	4.10E+07	
Amphenol Connectors	5.33E+05	3.79E+06		4.32E+06	6.00E+06	
Pyco Temperature Elements	3.14E+04	2.53E+06		2.57E+06	2.20E+08	
SOR Pressure Switches	5.33E+05	2.53E+06		3.07E+06	3.30E+07	
General Electric Terminal Blocks	5.33E+05	2.17E+06		2.70E+06	2.20E+08	
Patel P-1 Thread Sealant	1.79E+07	5.44E+07	2.00E+08	2.72E+08	1.50E+09	
Rockbestos Firewall SR Cable	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.00E+08	

Equipment Title	EPU Normal Dose (rad)	EPU Accident Gamma TID (rad)	Beta Dose (rad)	Total EPU TID (rad)	Qual. Dose (rad)	Note
Rockbestos Firewall III/SIS Cable	1.79E+07	5.44E+07	1.00E+08	1.72E+08	2.00E+08	
Rockbestos Firewall EP Cable	1.57E+05	2.83E+07		2.84E+07	1.30E+08	
Valcor MSIV Solenoid Valves	3.14E+04	8.66E+04		1.18E+05	5.00E+07	
Core Spray & RHR High Voltage Termination	1.57E+05	2.83E+07		2.84E+07	5.77E+07	
Dow Corning 3-6548 Silicone RTV Foam	3.60E+04	HELB only		3.60E+04	1.36E+06	
Loctite PST 580 Thread Sealant	1.79E+07	5.44E+07	Shielded	7.23E+07	7.37E+07	Note
Scotch 130C and 69 Electrical Tape	7.84E+03	1.08E+08		1.08E+08	1.83E+08	
Fisher E/P Transducer	1.57E+05	4.33E+06		4.49E+06	6.00E+06	
Cutler-Hammer Motor Starter/Control Transformer	1.24E+05	2.52E+06		2.65E+06	2.80E+06	Note
ASCO Scram Solenoid Pilot Valves	7.85E+04	HELB only		7.85E+04	8.55E+04	

Note: Additional supporting qualification analysis to be performed and documented in EQ qualification file and/or equipment to be replaced/modified prior to EPU implementation.

EPU HELB Evaluation

HELB is discussed in PUSAR Section 2.2.1. Under the EPU evaluation for HELB, several high energy break or critical crack scenarios were considered for the Reactor Building. These included feedwater, reactor water cleanup, and control rod drive breaks and cracks in various areas. The EPU evaluation for HELBs, in combination with supporting calculations, provides the bases for temperatures, pressures and flood levels used for evaluation of HELBs in the Reactor and Turbine Buildings. The safe-shutdown equipment located in any Turbine Building locations made harsh (i.e. the peak HELB temperature greater than 140°F) as a result of EPU are being determined and evaluated.

From the evaluation for Reactor Building EPU event cases, the following peak conditions are obtained as compared to the current EQ Program Basis values for the respective Reactor Building Volume:

Current EQ Program Basis Data				EPU Data			
RB Volume	**Temp (°F)**	**Press (psia)**	**Liquid (ft)**	**Temp (°F)**	**Press (psia)**	**Liquid (ft)**	**Comment**
1	142.97	14.86	0.05	114.2	14.81	0.4	Note
2	142.97	14.85	0.01	115.2	14.8	0	
3	143.8	14.98	0.05	115.7	14.83	0.4	Note
4	144.4	14.97	0	135.6	14.82	0	
5	256	15.15	0.05	121.3	14.81	0.5	Note
6	263.6	15.63	3.95	157.2	14.8	0.6	
7	240.4	15.19	4.38	184.5	14.84	0.8	
8	<140	14.99	0	140.7	14.8	0.6	Note
9	187.6	15.59	0.01	127.4	14.79	0.5	Note
10	159.9	15.59	0	127.2	14.79	0.5	Note
11	158.7	15.59	0	127.3	14.79	0.5	Note
12	193	15.59	0.01	127.6	14.79	0.5	Note
13	127.3	14.88	0.24	166.2	14.8	0	Note
14	153.3	14.83	0.27	174.7	14.8	0	Note
15	209.6	15.3	0.05	180.2	14.8	0	
16	311.3	21.16	6.68	213.1	15.22	8.8	Note
17	222.4	15.14	0	130.6	14.79	0	
18	208.1	15.11	0.68	209.7	14.83	0	Note
19	175.9	15.13	0.53	209.3	14.83	0.1	Note
20	112.5	15.14	0	179.4	14.8	0.1	Note
21	112.2	14.87	0	108	14.79	0	
22	170.4	14.84	0	184	14.79	0	Note
23	143.7	14.87	0	164	14.79	0	Note
24	104	14.7	0	104.4	14.7	0	
25	145.8	14.85	0	183.5	14.79	0	Note
26	109.1	14.89	0	104.4	14.7	0	
27	203.6	14.99	0.01	211.7	14.83	0	Note
28	216.7	15.85	0.38	213.3	15.03	1.6	Note
29	214.6	15.85	0.3	213.5	15.4	1.7	Note
30	220.5	17.2	0.27	218.2	16.52	1.4	Note
31	188.3	17.19	0.27	213	16.52	1.4	Note
32	164.1	15.85	0.19	219.8	17.09	1.7	Note
33	128.3	14.99	0	211.7	14.83	0	Note
34	168.3	14.83	0.005	191.4	14.79	0	Note
35	207.8	14.84	0.02	199.2	14.79	0	
36	142.4	14.88	0	141.6	14.79	0	
37	112.8	14.88	0	143.9	14.8	0	Note

Current EQ Program Basis Data				EPU Data			
RB Volume	**Temp (°F)**	**Press (psia)**	**Liquid (ft)**	**Temp (°F)**	**Press (psia)**	**Liquid (ft)**	**Comment**
38	100	14.7	0	100.3	14.7	0	
39	215.3	14.87	0.01	112.2	14.8	0	
40	126.2	14.84	0	127.7	14.8	0	
41	106.9	14.88	0	104.4	14.7	0	
42	204.7	14.85	0.01	198.8	14.79	0	
43	128.3	14.83	0.01	122.2	14.78	0	
44	160.8	14.82	0.01	138.1	14.78	0	
45	169.7	14.85	0.01	198.6	14.78	0	Note
46	219.2	14.86	0.02	106.2	14.77	0	
47	101.5	14.84	0	187.8	14.78	0	Note
48	131.1	14.8	0.01	137.3	14.76	0	

Note: Additional supporting qualification analysis to be performed and documented in EQ qualification file and/or equipment to be replaced/modified prior to EPU implementation.

EPU HELB Temperature Review

From the table above, it is observed that the peak EPU liquid break HELB temperatures for Reactor Building Volumes 13, 14, 18, 19, 20, 22, 23, 24, 25, 27, 31, 32, 33, 34, 37, 38, 40, 45, 47, and 48 exceed the currently specified peak HELB temperature provided by the current EQ Program basis data. The peak EPU (or pre-EPU) HELB temperature in Reactor Building Volumes 24, 38, 40, and 48 are less than the harsh/mild threshold temperature of 140°F, so these areas remain “mild”. Based on EQ end device location and required performance, the impact of EPU HELB conditions focuses on Reactor Building Volumes 13, 14, 18, 19, 20, 22, 27, 31, 32, 33, and 34.

Equipment Title	**RB Volumes**	**Qualified Temp. (°F)**	**EPU Peak Temp (°F)**	**Note**
ASCO Solenoid Valves (Normally Energized)	18, 19	346	209.7	
ASCO Solenoid Valves (Normally De-energized)	31	346	213	
ASCO Pressure Switches	14, 19, 31	210	213	Note
Barksdale Pressure Switch	14, 18, 22, 33	212	211.7	
Barton Pressure Switches	14, 19	212	209.3	
Barton Pressure Switches 580A-0, 580A-1	14, 18	200	209.7	Note
G.E. Cable (butyl rubber SI-58007/58136)	13, 14, 18, 19, 20, 22, 27, 33, 34	340	211.7	

Enclosure 1

Equipment Title	RB Volumes	Qualified Temp. (°F)	EPU Peak Temp (°F)	Note
GE Cable (PE type SI-58081)	13, 14, 18, 19, 20, 22, 27, 33, 34	236	211.7	
GE Cable (XLPE type, SI-57275/58109)	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	340	219.8	
General Electric Containment Penetrations	14, 18	340	209.7	
General Electric Terminal Blocks	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	340	219.8	
Limitorque MOVs (50.49, class RH, AC motor)	13, 19, 20, 22, 31	340	213	
Limitorque MOVs (50.49, class RH, DC motor)	13, 32	340	219.8	
Limitorque Fibrite Switches	13, 19, 20, 22, 31, 32	420	219.8	
Namco Limit Switches (EA740 w/o EC210)	31	352	213	
Namco Limit Switches (EA180 w/o EC210)	18, 19, 31	361	213	
Raychem NEIS Seals	18, 19, 31	366	213	
Raychem WCSF-N Splices	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	350	219.8	
Robertshaw Level Switch (DOR)	18	220	209.7	
Rockbestos Coax Cable	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	346	219.8	
Rosemount 1153 Series A Transmitter (DOR)	33, 34	340	211.7	
Rosemount 1153 Series B	14, 18, 19, 22, 27, 33, 34	318	211.7	
Rosemount Conduit Seals	14, 18, 22, 27, 33	420	211.7	
Rotork Valve Operators (50.49)	14, 31, 33	385	213	
Static O-ring (DOR)	22, 33	212	211.7	
Yarway Level (DOR)	14, 18	250	209.7	

Equipment Title	RB Volumes	Qualified Temp. (°F)	EPU Peak Temp (°F)	Note
Samuel Moore Instrument Cable	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	340	219.8	
Valcor Solenoid Valves	18, 19	365	209.7	
DG O'Brien Electrical Penetrations	14, 19	320	209.3	
DG O'Brien Electrical Penetrations (Plugs)	14, 19	345	209.3	
Reliance Motors	14, 19	464	209.3	
Consolidated Control Relays	18	223.1	209.7	
Westinghouse Starter and Transformer	14, 19	260	209.3	
Eaton Thermocouple Extension Cable	14	375	174.7	
Brand Rex 600V Instrument Cable	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	385	219.8	
Boston Control Cable	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	340	219.8	
Patel Conduit Seals	18	354	209.7	
EGS Grayboot Electrical Connectors	31	450	213	
EGS Quick Disconnect	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	435	219.8	
Raychem/Swagelok Conduit Seals	14, 18, 19, 22, 33, 34	340	211.7	
Eaton Cutler-Hammer Relays	22, 33, 34	232	211.7	
ITT-Royal PVC Cable (DOR)	14, 18, 19, 22, 33	211	211.7	Note
Okonite Control Cable	14, 18, 19, 22	211	209.7	
Triangle Triolene Control Cable (DOR)	18, 19	211	209.7	
MNGP-A Cable (DOR)	13, 14, 18, 19, 20, 22, 27, 33, 34	230	211.7	
MNGP-B Cable (DOR)	14, 19	211	209.3	

Equipment Title	RB Volumes	Qualified Temp. (°F)	EPU Peak Temp (°F)	Note
Amphenol Connectors (DOR)	14, 18, 19, 22, 33	266	211.7	
SOR Pressure Switches (50.49)	14, 22, 33	350	211.7	
General Electric Terminal Blocks (50.49)	22, 33, 34	340	211.7	
Patel P-1 Thread Sealant	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	400	219.8	
Rockbestos Firewall SR Cable	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	351	219.8	
Rockbestos Firewall III/SIS Cable	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	342	219.8	
Rockbestos Firewall EP Cable	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	320	219.8	
Loctite PST 580 Thread Sealant	14, 18, 19, 20, 22, 27, 31, 32, 33, 34	364	219.8	
Scotch 130C and 69 Electrical Tape	13, 14, 18, 19, 20, 22, 27, 31, 32, 33, 34	372	219.8	
Cutler-Hammer Motor Starter/Control Transformer	14, 19	253	209.3	
ASCO Scram Solenoid Pilot Valves	14, 18	277	209.7	

Note: Additional supporting qualification analysis to be performed and documented in EQ qualification file and/or equipment to be replaced/modified prior to EPU implementation.

Post-LOCA Heat-up in the Reactor Building

The Reactor Building post-LOCA heat-up temperatures are provided in the associated EPU evaluation. The EPU data as compared to the current post-LOCA heat-up (PLHU) data is presented below. It is observed that most post-LOCA area temperatures are relatively benign and will not present particular challenges to the EQ components that are generally tested or analyzed to much higher accident temperatures at their location. However, additional supporting qualification analysis to be performed and documented

in EQ qualification file and/or equipment to be replaced/modified prior to EPU implementation.

RB Volume	Current PLHU Temp. (°F)	EPU PLHU Temp. (°F)
1	110.0	104.3
2	110.0	106.2
3	129.1	129.7
4	129.1	129.5
5	109.9	107.4
6	140.4	140.6
7	116.3	123.6
8	106.2	111.9
9	160.4	177.5
10	159.9	177.5
11	158.7	177.5
12	157.3	177.5
13	112.6	112.7
14	107.6	112.3
15	106.3	108.7
16	135.2	141.5
17	106.1	108.9
18	109.3	114.9
19	106.3	114.9
20	112.6	113.1
21	112.2	107.8
22	106.7	114.1
23	106.4	113.8
24	104	104
25	113.9	114.1
26	109.1	109.7
27	109.1	115.4
28	120	121.3
29	120.1	121.1
30	120.2	128
31	120.2	129.7
32	120.2	120.7
33	115.6	115.4
34	107.9	114.2
35	107.8	114.2
36	134.4	120.5
37	112.8	120.5

RB Volume	Current PLHU Temp. (°F)	EPU PLHU Temp. (°F)
38	100	100
39	126.3	134.5
40	105.6	113.2
41	106.9	109.8
42	104.6	114.2
43	109.7	110.9
44	108.1	112.1
45	104	114
46	107.2	110.3
47	100	113.7
48	103.9	113.2

SUMMARY

Calculations were prepared to evaluate the impact of EPU conditions on equipment for radiation, temperature, pressure and flood level for safety related equipment. These calculations and related results are described above. The majority of issues will be addressed by revisions to the EQ files that support continued qualification of existing equipment with the new EPU conditions. EQ file updates will be completed as required by 10 CFR 50.49 prior to EPU implementation. Any required modifications or replacement of equipment will also be completed prior to EPU implementation.