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Point Beach Nuclear Plant
Operated by Nuclear Management Company, LLC

November 22, 2004

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10 CFR 54

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

Point Beach Nuclear Plant, Units 1 and 2
Dockets 50-266 and 50-301
License Nos. DPR-24 and DPR-27

Response to Follow-up Request for Additional Information
Regarding the Analysis of Severe Accident Mitigation Alternatives for
Point Beach Nuclear Plant Units 1 and 2
(TAC Nos. MC2049 and MC2050)

By letter dated February 25, 2004 (NRC 2004-0016), Nuclear Management Company, LLC (NMC), submitted the Point Beach Nuclear Plant (PBNP) Units 1 and 2 License Renewal Application (LRA). By letter dated July 2, 2004, the Nuclear Regulatory Commission (NRC) requested additional information regarding Severe Accident Mitigation Alternatives (SAMA) for the PBNP LRA. A response to the NRC requests for additional information was provided on August 31, 2004.

As discussed during conference calls between NRC staff and NMC personnel and as outlined in NRC letter dated October 20, 2004, the NRC has requested additional information to support their review of the PBNP LRA. The enclosure to this letter contains the NMC's response to the staff's questions.

Should you have any questions concerning this submittal, please contact
Mr. James E. Knorr at (920) 755-6863.

This letter contains no new commitments and no revisions to existing commitments.

A001

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I declare under penalty of perjury that the forgoing is true and correct. Executed on November 22, 2004.

Dennis L. Koehl
Site Vice-President, Point Beach Nuclear Plant
Nuclear Management Company, LLC

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW

ENCLOSURE 1

RESPONSE TO FOLLOW UP REQUEST FOR ADDITIONAL INFORMATION REGARDING THE ANALYSIS OF SEVERE ACCIDENT MITIGATION ALTERNATIVES (SAMA) FOR THE POINT BEACH NUCLEAR PLANT UNITS 1 AND 2 LICENSE RENEWAL APPLICATION

24 Pages to Follow

NRC Question RAI 1.a.iii:

The utility reports that the revision of the HRA per the peer review would have impacted two SAMAs -- a new SAMA relative to operator action to cross-tie 480VAC power and an existing SAMA (180) would be more cost beneficial. For other human error events, NMC reports implementation of "procedure mark offs". Do the procedures relative to these two items implement this "procedure mark off"? If not, explain why these should not be further assessed as potential cost-beneficial SAMAs. The response also states that there is no way of reducing the impact of human error except automation, which is too costly. Further justify this premise, especially, since other SAMA analyses were not reviewed as part of the SAMA identification process (see RAI 6 below).

NMC Response:

Procedure mark offs have been implemented as procedure step placekeeping in the procedures for the two SAMAs in question. All Emergency Operating Procedures, Abnormal Operating Procedures, Emergency Contingency Actions, and Critical Safety Procedures implement the procedure placekeeping process. These procedures are considered to be adequate as written. The training program in place at Point Beach is appropriately credited in the human error probability analyses. No further cost-effective method to reduce the HEPs appears to be available.

The response to RAI 6, below, reviewed the low cost options from other SAMA analyses and therefore, the decision to not use automation need not be justified.

NRC Additional Detail Requested in November 9, 2004 Email for RAI 1.a.iii:

Provide the human error probability (HEP) associated with SAMA 180. In the response to RAI 1.a.iii (bottom of page 6 of 147), NMC states that the HEP increased as a result of the HRA update. Provide the HEP value in the original and the revised PRA (Revision 3.02 and Revision 3.13, respectively) in order to properly disposition SAMA 180.

NMC Response:

The human error event that is the subject of SAMA 180 is 125-HEP-EOP10-08 for restoration of the battery chargers following a loss of offsite power and subsequent recovery of AC (either from emergency diesels or from offsite). Revision 3.02 of the PRA model, which was used for the SAMA analyses, had a value of 4.2E-03 for this human error probability. The PRA model referenced as Revision 3.13 in the August 31, 2004, RAI response used an estimated value of 1.4E-03 for this HEP. A more detailed analysis of this HEP with credit for recovery yielded a probability value of 2.1E-03, which is used in the current version of the PRA model, Revision 3.14.

The HEP value for 125-HEP-EOP10-08 used for the LRA SAMA was 4.2E-03.

The value used for the quantification shown in the last three columns of the table in our response to RAI 1.a.iii was 1.4E-03. The importance of the LOSP events increased for reasons other than a change in the value of the HEP for restoring the battery chargers because that HEP value has actually dropped. Therefore, SAMA 180 for providing automatic repowering of the battery chargers is now less cost effective than what was shown in the LRA SAMA report.

NRC Question RAI 1.a.v:

A date of 10/12/2001 is provided for Rev. 3.00 (the PRA version that was peer reviewed). This date is later than the date of the peer review, which was said to have been conducted in June 2001. Explain.

NMC response:

The WOG PRA Peer Review was conducted on a draft of the 3.00 model revision. Initial quantification of the newly revised model had only been accomplished a few weeks before the peer review team arrived on June 18, 2001. October 12, 2001, corresponds to the date when Revision 3.00 of the model was considered complete.

NRC Question RAI 1.b:

CDF and population dose (rem) information provided in the second and third table can be used to determine the population dose (per event) for each event type. The population dose values obtained this way do not agree with the values in ER Table F.1-4. Also, use of the CDF values in the RAI response, in conjunction with the dose and dollar values in ER Table F.1-4, do not yield the same annual dose and offsite economic cost values as used in the ER. Explain.

NMC Response:

The inconsistencies noted are due to the fact that, whereas the second table contains correct CDF values, the third table contains incorrect population dose values. Table A, below, contains the correct population dose values and demonstrates that using the correct population dose values and the CDF values from the second table yields results that do agree with Table F.1-4 of the environmental report. Table A also provides the correction to the annual dose total that the environmental report identifies.

Table B demonstrates calculation of the offsite economic cost and provides the correction to the total that the environmental report identifies.

Table A. Corrected population doses.

A	B	C	D	E
Event Type	**CDF (No Change)**	**Population Dose (person-rem) (Corrected)**	**Population Dose per Event (person-sv)[1]**	**Table F.1-4 Population Dose Values**
Late SGTR	7.859E-06	1.09E+00	1.39E+03	1.39E+03
Early SGTR	8.781E-07	1.65E-01	1.88E+03	1.88E+03
Isolation Failure	7.517E-09	8.49E-04	1.13E+03	1.13E+03
ISLOCA	1.100E-07	1.24E-01	1.13E+04	
Other CM	2.704E-05	1.04E-01	3.86E+01	3.86E+01
Total	3.589E-05	1.49E+00[2]		

1. Column D values are determined by dividing Column C values by corresponding Column B values and dividing by 100 to convert to person-sieverts.
2. Page 4-38 of the environmental report incorrectly identifies this total offsite exposure risk value as 1.83 person-rem.

Table B. Offsite economic costs.

A	B	C	D
Event Type	**CDF (No Change)**	**Table F.1-4 Offsite Effects (Dollars)**	**Annual Offsite Economic Risk (Dollars)[1]**
Late SGTR	7.859E-06	1.21E+08	9.51E+02
Early SGTR	8.781E-07	1.87E+08	1.64E+02
Isolation Failure	7.517E-09	5.94E+07	4.47E-01
ISLOCA	1.100E-07	1.12E+09[2]	1.23E+02
Other CM	2.704E-05	1.59E+05	4.30E+00
Total	3.589E-05	---	1.243E+03[3]

1. Column D values are determined by multiplying Column B values by corresponding Column C values.
2. These values are assumed to be six times the early SGTR values and are not in ER Table F.1-4.
3. Page 4-39 of the environmental report incorrectly identifies the annual offsite economic risk monetary equivalent as $2,594.

NRC Question RAI 1.e:

ER Table F.1-2 and F.1-4 provided information for only 4 release categories. Early SGTR and ISLOCA are grouped together in Table F.1-2, but ISLOCA results are not shown in Table F.1-4. Per the RAI response, ISLOCA consequences were assumed to be 6X larger than the SGTR values, but it is not clear whether both the person-rem and dollar values for ISLOCA were increased in this manner. Provide a separate breakout of the ISLOCA consequences.

NMC Response:

Table F.1-4 provides a separate breakout of the ISLOCA consequences.

Table F.1-4. Summary of Offsite Consequence Results for Each Release Mode.

	Offsite Effects/Accident	
Release Category	**Person-SV**	**Dollars**
Late SGTR	1.39E+03	1.21E+08
Early SGTR	1.88E+03	1.87E+08
Isolation Failure	1.13E+03	5.94E+07
ISLOCA[1]	1.13E+04	1.12E+09
Other CM	3.86E+01	1.59E+05

[1] ISLOCA values are based upon an assumption of 6 times the value of the Early SGTR values.

NRC Question RAI 3:

The response does not provide the one-to-one cross reference requested. Please indicate which SAMA number from Table F.2-1 considers each of the dominant contributors. For each dominant contributor from Attachment 1 that does not tie to a SAMA in Table F.2-1, justify why no SAMA was identified and evaluated.

NMC Response:

Table C, below, provides the cross-reference of the PRA dominant contributors to the SAMA in which each was evaluated. The dominant contributors were determined based on Risk Reduction Worth (RRW). Those marked "N/A" are PRA basic events which do not represent actual equipment failure or operator error. These are "flag" events used for classifying the cutset as a certain type/sequence (e.g., ATWS, NON-SBO-FLAG) or to determine the location of an initiator. For those initiating events marked as "Note 1" (e.g., INIT-S2, INIT-EXC, INIT-T3, INIT-SBO), there were no SAMA items identified that could decrease the frequency of the initiating event. Evaluation of these items was through the evaluation of the SAMAs related to mitigation SSCs and actions. Those events marked "Note 2" (e.g., FO-MDP-CM-CC44, 480-BS-TM-2B04, AF--AOV-CC-4012, AF--AOV-CC-4019, 138-GT--FS-G05) are hardware related SAMAs that have a benefit of less than $100K based on their RRW importance. This benefit is the minimum estimated cost of a plant hardware modification.

Table C. PRA Contributors to SAMA Cross Reference.

Rank	EVENT NAME	EVENT DESCRIPTION	SAMA
1	INIT-R	INITIATING EVENT SGTR	108, 154
2	INIT-T2	INITIATING EVENT TRANSIENT WITHOUT PCS	89
3	HEP-HHR-EOP13-23	OPERATOR FAILS TO ALIGN FOR HHR	126
4	HEP-ODC-EOP-3-21	OPERATOR FAILS TO DEPRESS INTACT SG AFTER SGTR	149, 150, 151
5	HEP-RHR-EOP13-23	OPERATOR FAILS TO ALIGN FOR LHR	126
6	SGTR-A	FRACTION OF SGTR EVENTS IN "A" TRAIN	N/A
7	INIT-TCC	INITIATING EVENT LOSS OF COMPONENT COOLING	39, 44, 139
8	SGTR-B	FRACTION OF SGTR EVENTS IN "B" TRAIN	N/A
9	HEP-RCS-CSPH1-12	OPERATOR FAILS TO ESTABLISH BLEED AND FEED (NO SI)	181

Table C. PRA Contributors to SAMA Cross Reference.

Rank	EVENT NAME	EVENT DESCRIPTION	SAMA
10	NON-SBO-FLG	FLAG TO INDICATE NON-SBO SEQUENCES	N/A
11	INIT-T1	INITIATING EVENT LOSS OF OFFSITE POWER (DUAL)	62, 63
12	AF--HEP-CST-LOW-	FAILURE OF OPERATOR TO RESPOND TO LOW CST LEVEL ALARM	185
13	REC-OPEN-CV0112	OPERATOR FAILS TO MANUALLY OPEN CV-112B VALVE (RWST TO CHARGING PUMPS)	187
14	125-HEP-EOP10-08	NO BATTERY CHARGER AFTER UV AND POWER RECOVERY	180
15	AF--TDP-FR--1P29	BLOCK 9 TDP 1P29	182
16	INIT-TFB	INITIATING EVENT STEAM/FEED BREAK INSIDE CONTAINMENT	102
17	INIT-TSW	INITIATING EVENT LOSS OF SERVICE WATER	177
18	TSB-TFB-B	FRACTION OF STM/FW LINE BREAKS INSIDE CONTAINMENT IN TRAIN "B"	N/A
19	TSB-TFB-A	FRACTION OF STM/FW LINE BREAKS INSIDE CONTAINMENT IN TRAIN "A"	N/A
20	IRB-INDUCED-SGTR	INDUCED STEAM GENER ATOR TUBE RUPTURE	108, 154
21	INIT-TSB	INITIATING EVENT STEAM LINE BREAK OUTSIDE CONTAINMENT	102
22	CCW-SYS-PR-LOWER	CCW PRESSURE LOWER THAN WASTE GAS PRESSURE	183
23	WG--HX--IL-0048A	WASTE GAS HX-48A TUBE LEAKAGE TO CCW	183
24	INIT-S1	INITIATING EVENT MEDIUM LOCA (>2 TO 6)	Note 1
25	CV--MOV-CC-0112B	MOV CV-112B FAILS TO OPEN	194
26	FLAG-SW-SUPPLY	FLAG TO IDENTIFY SW SUPPLY FAILURES	N/A
27	HEP-ECA-EOP31-32	OPERATOR FAILS TO COOL DOWN AND DEPRESSURIZE	149, 150, 151
28	CC--MDP-TM-0011B	CCW PUMP P-11B TEST/MAINTENANCE UNAVAILABILITY	198
29	480-BS--LP--1B03	480 VAC BUS 1B-03 LOSS OF POWER	199
30	FP--MDP-TM-0035A	FIRE PUMP P-35A UNAVAILABLE DUE TO TEST OR MAINTENANCE	200
31	AF--HEP-CST-FW--	FIRE WATER TO CST	185

Table C. PRA Contributors to SAMA Cross Reference.

Rank	EVENT NAME	EVENT DESCRIPTION	SAMA
32	FLAG-1ASG-OUT	FLAG TO IDENTIFY WHEN 1ASG HAS BREAK	N/A
33	FLAG-B-SI-REC	FLAG B SI RECIRCULATION	N/A
34	FP--DDP-FR-0035B	DIESEL FIRE PUMP P-35B FAILS TO RUN (24 HRS)	201
35	FLAG-A-SI-REC	A SI RECIRCULATION	N/A
36	HEP-MS--EOP-3-02	OPERATOR FAILS TO DIAGNOSE SGTR EVENT	188
37	FLAG-P38A-U2	50/50 CHANCE THAT P-38A IS USED BY U2 APPLIES DUAL UNIT	N/A
38	AF--MDP-FR---38A	BLOCK 16 MDP P-38A	195
39	AF--MDP-TM---38A	BLOCK 16 MDP P38A	202
40	AF--HEP-CST-SW--	MEX EVENT ZERO	185
41	HEP-RCS-CSPH1-13	OPERATOR FAILS TO ESTABLISH BLEED AND FEED (W/ SI)	189
42	FLAG-1BSG-OUT	FLAG TO IDENTIFY WHEN 1BSG HAS BREAK	N/A
43	AF--MDP-FR---38B	BLOCK 20 MDP P-38B	195
44	AF--MDP-TM---38B	BLOCK 16 MDP P-38B	202
45	INIT-EXC	INITIATING EVENT EXCESSIVE LOCA (VESSEL FAILURE)	Note 1
46	AF--HEP-MDP-FLOW	FAILURE TO MANUALLY CONTROL MDAFW AFTER A LOSS OF IA	184
47	FLAG-P38B-U2	50/50 CHANCE THAT P-38B IS USED BY U2 APPLIES TO DUAL UNIT	N/A
48	138-HEP-STARTG05	OPERATOR FAILS TO START GAS TURBINE G-05	186
49	ATWS-FLAG	DUMMY EVENT USED TO IDENTIFY ATWS EVENTS	N/A
50	PLA-RX-POWER-HI	REACTOR POWER GREATER THAN 40%	N/A
51	AF--HEP-CST-SWMD	SERVICE WATER TO THE MOTOR-DRIVEN PUMP	185
52	REC-MAN-OPENVLV2	OPERATOR FAILS TO MANUALLY OPEN IA SUPPLY VALVES TO CONTAINMENT	191
53	HEP-IA--FO-04748	OPERATOR FAILS TO REOPEN 3047 OR 3048	192
54	FLAG-SW-DISCHARG	FLAG TO IDENTIFY SW DISCHARGE FAILURES	N/A
55	INIT-T3	INITIATING EVENT TRANSIENT WITH PCS	Note 1

Table C. PRA Contributors to SAMA Cross Reference.

Rank	EVENT NAME	EVENT DESCRIPTION	SAMA
56	RH--VLV-RE-0706A	A RHR FULL FLOW TEST LINE NOT ISOLATED PRE-INITIATER	196
57	RH--VLV-RE-0706B	B RHR FULL FLOW TEST LINE NOT ISOLATED PRE-INITIATER	196
58	IRA-INDUCED-SGTR	INDUCED STEAM GENERATOR TUBE RUPTURE	108, 154
59	PRA-PRESS-RELIEF	PRIMARY PRESSURE RELIEF AFTER ATWS	N/A
60	HEP-SW--AOP9A-63	OPERATOR FAILS TO START STANDBY SW PUMPS	190
61	HEP-MFW-CSPH1-XX	OPERATOR FAILS TO OPEN MOV SW-2880 AFTER SI	193
62	FO--MDP-CM-CC44	COMMON CAUSE FAILURE OF ALL 4 FUEL TRANSFER PUMPS	Note 2
63	480-BS--TM--2B04	480 VAC BUS 2B-04 LOSS OF POWER	Note 2
64	DGS-TO-A05-A06	FAILURE OF DGS TO 1/2A05 AND 1/2A06 FLAG	N/A
65	AF--T---TM--T24A	BLOCK 1 "A" CONDENSATE STORAGE TANK	88, 163, 166
66	AF--T—TM--T24B	BLOCK 2 "B" CONDENSATE STORAGE TANK	88, 163, 166
67	AF--CKV-CC---117	BLOCK 35 RECIRC LINE FROM ALL AFW PUMPS TO CSTS	197
68	FLAG-1BSG-INTACT	FLAG TO IDENTIFY WHERE 1BSG IS INTACT	N/A
69	AF--AOV-CC1-4002	BLOCK 9 1P-29 MIN FLOW RECIRC 1-AF-4002	197
70	SW--MV--PG-00165	SW TO CCW HXS ISOLATION VALVE SW-165 PLUGS	37, 38, 39, 41, 45, 124, 139, 141
71	B-LHR-FAIL-FLAG	FLAG FAILURE OF B RHR RECIRCULATION	N/A
72	A-LHR-FAIL-FLAG	FLAG FAILURE OF A RHR RECIRCULATION	N/A
73	INIT-SBO	INITIATING EVENT SBO	Note 1
74	SBO-INIT-FLG	DUMMY EVENT USED TO IDENTIFY STATION BLACKOUT EVENTS	N/A
75	FLAG-NON-ATWS	FLAG TO IDENTIFY NON-ATWS FAILURES	N/A
76	RP--CRD-FO-00000	MOST CONTROL RODS FAIL TO DROP INTO CORE	32, 50, 153

Table C. PRA Contributors to SAMA Cross Reference.

Rank	EVENT NAME	EVENT DESCRIPTION	SAMA
77	FLAG-1ASG-INTACT	FLAG TO IDENTIFY WHERE 1ASG IS INTACT	N/A
78	AF--TDP-TM--1P29	BLOCK 9 TDP 1P29	182
79	AF--AOV-CC--4007	BLOCK 16 P38A RECIRCULATION VALVE FAILS CLOSED	197
80	AF--AOV-CC--4012	BLOCK 16 AOV FROM MDP P38A TO UNIT 1 "A" STEAM GENERATOR	Note 2
81	AF--AOV-CC--4014	BLOCK 20 P38B RECIRCULATION VALVE FAILS CLOSED	197
82	AF--AOV-CC--4019	BLOCK 20 AOV FROM PUMP P38B TO "B" STEAM GENERATORS	Note 2
83	138-GT--FS-G05	GAS TURBINE G-05 FEEDING H-01	Note 2
84	INIT-S2	INITIATING EVENT SMALL LOCA (3/8 TO 2)	Note 1

NRC Question RAI 4:

Based on the response, the costs per unit for SAMA 169 could be conservatively estimated at $100K (1/2 of the reported value). This SAMA would appear cost beneficial at 3% discount rate or when uncertainties are considered. Provide additional justification why this SAMA should not be implemented (including a more realistic estimate of costs or benefits, if appropriate).

NMC Response:

In the previous analyses, the benefit for SAMA 169 was calculated based upon the assumption that removing the DC dependence from AFW would bound SAMA 169. However, this approach was too conservative because the SAMA deals with SBO only. A more realistic (but still bounding) approach to examining the benefit is to compare the cost of this SAMA with the benefit of eliminating all SBO contribution to risk. This approach is more realistic because there are many mechanisms for DC failure that were eliminated in the conservative modeling approach that would not be mitigated by implementation of this SAMA.

The benefit of eliminating all SBO events was calculated as $15K per unit. Implementation of SAMA 169 would not result in this full benefit since an SBO would still result in a loss of cooling to the RCP seals, giving a possibility of RCP seal failure due to loss of cooling. Implementation of this SAMA would also not eliminate core damage due to other equipment failures. The actual benefit would therefore be less than $15K per unit.

With the benefit of less than $15K per unit ($30K total) and implementation costs estimated to be $200K, this SAMA is determined to not be cost beneficial.

NRC Question RAI 6:

The response does not address the request to consider low-cost options identified in Ft. Calhoun, R.E. Ginna, and D.C. Cook. This information is needed to conclude the adequacy of the set of candidate SAMAs evaluated in the ER.

NMC Response:

The low-cost options identified in the Ft. Calhoun, R.E. Ginna, and D.C. Cook submittals are evaluated below. All but two of these options were determined to be either not applicable to Point Beach or already implemented at Point Beach. The remaining two SAMAs were determined to not be cost beneficial.

Table D. Discussion of Recent Applicant SAMA Low Cost Options.

Point Beach SAMA Number	Potential Improvement	Discussion
A	Ginna - Modify procedures to allow charging pump B or C to be manually aligned to bus 14. This alignment could be used to mitigate fires requiring entry into procedure "Alternate Shutdown for Control Complex Fire" or fires disabling train B, where the A charging pump is out of service or fails to run.	The Point Beach design already incorporates the intent of this SAMA. The B and C charging pumps are powered from independent power supplies. The A charging pump has two power sources.
B	Ginna - Modify air operated valve (AOV) 112C to fail closed and AOV 112B to fail open on loss of instrument air. This change would allow the RWST to become the suction source for charging, instead of the Volume Control Tank.	The Point Beach design does not have air operated valves in this application. Valves 112B and 112C are motor operated valves. This SAMA is not applicable to Point Beach.
C	Cook - Revise ISLOCA procedure to specifically address the ISLOCA sequence with the frequency that was dominant in Rev. 1 of the PRA.	Not applicable to Point Beach. No corresponding ISLOCA sequence exists. The top PRA contributors were addressed individually in the SAMA analysis.
D	Cook - Stage backup fans in switchgear rooms. This provides alternate ventilation in the event of a loss of switchgear ventilation, preventing potential failure of the switchgear from loss of cooling.	Per the PRA, AC power and other systems are not dependent on ventilation. Procedures are already in place for providing temporary ventilation. This item is considered already implemented for Point Beach.

Table D. Discussion of Recent Applicant SAMA Low Cost Options.

Point Beach SAMA Number	Potential Improvement	Discussion
E	Cook - Provide redundant train of ventilation to 480V board room. This potentially improves reliability of 480V HVAC.	Per the PRA, AC power and other systems are not dependent on ventilation. Procedures are already in place for providing temporary ventilation. This item is considered already implemented for Point Beach.
F	Cook - Implement procedures for temporary HVAC. Provides for improved credit to be taken for loss of HVAC sequences. Areas evaluated include backup ventilation for the EDG rooms and switchgear rooms.	Per the PRA, AC power and other systems are not dependent on ventilation. Procedures are already in place for providing temporary ventilation. This item is considered already implemented for Point Beach.
G	Ft. Calhoun - Perform specific procedural and/or hardware changes to give the plant alternate capability to increase heat removal from the RCS and accelerate RCS cooldown. Introducing an alternate cooldown pathway will increase the capability of the plant to cope with ISLOCAs, SGTRs, and long-term SBOs.	Point Beach has the capability for local manual control of the steam generator secondary side dump valves. This action is proceduralized. This capability and procedural actions meet the intent of this SAMA.
H	Ft. Calhoun - Provide a portable power source, inverter, associated implementing cables, and necessary operating and implementation instructions for use as a backup power supply for opening the power-operated relief valve(s) (PORVs). Guidance for use of the backup power supply will be provided in the FCS SAMG.	The PORVs at Point Beach require 125VDC power and instrument air to operate. There are accumulators installed, but the accumulators are isolated locally due to Appendix R compliance issues and are therefore not available post initiator. Since no instrument air is available during SBO scenarios, providing backup control power will have no impact. This SAMA is not applicable to Point Beach.

Table D. Discussion of Recent Applicant SAMA Low Cost Options.

Point Beach SAMA Number	Potential Improvement	Discussion
I	Ft. Calhoun - This SAMA is intended to increase the capability to cope with an SBO event when one or more emergency diesel generator (EDG) fails to start or an EDG failure occurs and restart is required after battery depletion. This SAMA would require hardware modification and operational changes. The hardware modification includes the addition of a power supply to flash the field. Operational changes include the development of procedures for restoring the affected EDGs to operability and the associated operator training.	This SAMA was evaluated by assuming that 20% of all failures of the diesel generators would be recoverable. This included mechanical failure of the diesel generator and battery-related failures that prevented the EDG startup. . The benefit of this SAMA was determined to be $3800 per unit. The estimated implementation cost at Ft. Calhoun was estimated to be $30K for a single unit site. Dual unit implementation costs would be slightly higher than this estimate. The implementation costs for this SAMA are greater than 2 times the benefit. This SAMA was not considered cost beneficial for Point Beach.
J	Ft. Calhoun - Increase the capability of the plant to cope with an SBO event by extending the steam generator level indication. Provide a portable 120VAC generator with manual clamps to provide the power supply to the level instrumentation.	This SAMA was evaluated by assuming that all SBO core damage sequences that do not result in an RCP seal failure would be eliminated. In the baseline PRA model, all SBO sequences that do not recover AC power proceed to core damage. The sequences do not differentiate between RCP seal LOCA and those with no seal LOCA. To determine the benefit of eliminating those sequences that do not result in RCP seal failure, the AC power non-recovery probability was multiplied by the RCP seal failure probability. This eliminates all risk from SBO scenarios that do not include successful recovery of offsite power and do not result in RCP seal failure. The benefit of this SAMA was determined to be $5500 per unit. The estimated implementation cost at Ft. Calhoun was estimated to be $30K. Dual unit implementation costs would be slightly higher than this estimate. The implementation costs for this SAMA are greater than 2 times the benefit. This SAMA was not considered cost beneficial for Point Beach.

Table D. Discussion of Recent Applicant SAMA Low Cost Options.

Point Beach SAMA Number	Potential Improvement	Discussion
K	Ft. Calhoun - Add the capability to prevent an early Recirculation Actuation Signal (RAS) following the loss of instrument air. Depletion of the SIRWT blubbers will result in a low-level indication in the SIRWT and cause a premature RAS. This may cause the ECCS and spray pumps to take suction from a sump with inadequate net positive suction head. Pump damage and failure are possible.	This is a design specific issue that is not applicable to Point Beach.
L	Ft. Calhoun - Modify procedures or prolong the inventory in the Borated Water Storage Tank during SGTRs. At Ft. Calhoun, this would be implemented by providing procedures to refill the BWST with borated water and ensuring that the necessary boration and water sources are available.	Point Beach has implemented RWST makeup guidance in the Point Beach SAMG. This item is considered already implemented.

NRC Question RAI 9:

The response did not address the question regarding the differences in release fractions between Point Beach and Ginna. In the absence of this information, justify that no SGTR-related SAMAs would be become cost-beneficial if the fission product releases for SGTR events were substantially higher, and similar to those for Ginna. Also address the implications of higher SGTR releases on the identification of cost-beneficial SAMAs for ISLOCA, since the consequences for ISLOCA events are treated as a multiple of those for SGTR.

NMC Response:

This question was withdrawn by the NRC on October 20, 2004.

NRC Question RAI 10b :

Information requested in the first portion of this RAI has not been provided (details of the benefit assessment for selected SAMAs, description of the modifications considered, and explanation why human error probability could not be reduced by other means). This information is needed to conclude the adequacy of the set of candidate SAMAs evaluated for SGTR events.

NMC Response:

The information requested is found below and in Table E below.

Point Beach procedures are considered to be adequate as written. The training program in place at Point Beach is appropriately credited in the human error probability analyses. The Human Reliability Analysis methodology used by Point Beach provides for a factor of 2-3 reduction of the cognitive portion of the Human Error Probability if placekeeping aids are used. The practice of marking off each EOP, AOP, ECA, and CSP step when executed was implemented at Point Beach in 2002. No further cost-effective method to reduce the HEPs appears to be available.

No low cost options identified from the review of other SAMA evaluations are applicable to these events. The importance analysis approach to identification of Point Beach-specific SAMAs did not identify any other items related to SGTR than those included in this analysis.

Table E. SAMA Evaluations.

Point Beach SAMA Number	Potential Improvement	Discussion	Reference	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Evaluation	Basis for Conclusion
108	Improved SGTR coping abilities.	Improved instrumentation to detect SGTR, or additional systems to scrub fission product releases.	(7), (9), (10), (13), (14), (16), (17)	29	79	$518k	Not Determined (EP)	No cost-effective hardware changes identified.	Evaluation case NOSGTR determined the impact of eliminating all steam generator tube rupture events. The benefit was determined to be $588,060. SGTR2 reduced the probability of tube failure by a factor of 10. The benefit was determined to be $517,949 Early detection capability: No readily available data to support reduction in frequency of rupture given early detection. The probability of leak-before-break is not known. Vent scrubbing: This would be extremely expensive and would exceed the benefit.	This item has been evaluated at Point Beach. The contribution to potential economic risk is significant but it is driven by human actions that are very important. The PRA model sensitivity run that was intended to bound the reduction of the SGTR events was performed by reducing the frequency by a factor of 10. The steam generators have been replaced on both units at Point Beach, and the condition of the tubes is monitored as required. The procedural criteria for identifying a ruptured steam generator are already simple and straight forward. No cost-effective hardware changes have been identified that will improve our ability to cope with a SGTR event. The response to SGTR events is driven by human actions. Procedures are considered to be adequate as written. The Human Reliability Analysis methodology used by Point Beach provides for a factor of 2-3 reduction of the cognitive portion of the Human Error Probability if placekeeping aids are used. The practice of marking off each EOP, AOP, ECA, and CSP step when executed was implemented at Point Beach in 2002. No further cost-effective method to reduce the HEP appears to be available.
126	Create automatic swapover to recirculation on RWST depletion.	Would remove human error contribution from recirculation failure.	(5), (6), (11)	30	48	$500.7k	>$1000k per unit (EP) Cost estimate at PTN was $450K.	This SAMA is not cost beneficial.	Evaluation case SWAP determined the benefit of no failures of swap to recirculation to be $504,081. Evaluation case SWAP2 evaluated the benefit of an assumed automatic system to be $500,730. The human action basic events evaluated are HEP-HHR-EOP13-23 and HEP-RHR-EOP13-23. These actions are also dominant contributors to the benefit of the SGTR coping SAMA (#108).	This item has been evaluated at Point Beach. These human actions are also considered as other SAMA items. The human actions involved impact other SAMAs. It is recognized that they are very important actions. The detailed cost estimate for the implementation of automatic swap-over at PB provides the requested justification for the cost presented in Table F.2-2. Refer to the Point Beach License Renewal Topical Report, LR-TOP-902-ESF, Revision 0, dated February 2004, for this cost estimate. The cost of installation of the automatic swap-over capability was estimated at $2426k per unit.
149	Install a redundant spray system to depressurize the primary system during a SGTR.	Enhanced depressurization ability during SGTR.	(16), (17)	17	52	$275.4k	>$1000k (EP)	This SAMA is not cost beneficial.	Evaluation case HEP2 evaluated the impact of eliminating all human errors related to depressurization, thus ensuring that the depressurization is successful. The benefit was determined to be $275,356.	The cost associated with this modification is expected to greatly exceed the benefit.

Table E. SAMA Evaluations.

Point Beach SAMA Number	Potential Improvement	Discussion	Reference	Percent Reduction in CDF (Bounding)	Percent Reduction in Offsite Person-Rem (Bounding)	Total Benefit (Bounding)	Estimated Cost	Conclusion	Evaluation	Basis for Conclusion
154	Adding other SGTR coping features.	(a)A highly reliable (closed loop) steam generator shell-side heat removal system that relies on natural circulation and stored water sources, (b) a system which returns the discharge from the steam generator relief valve back to the primary containment, (c)an increased pressure capability on the steam generator shell side with corresponding increase in the safety valve setpoints.	(7), (8), (17)	29	79	$517.9k	>$10000k (EP)	This SAMA is not cost beneficial.	Evaluation case NOSGTR determined the impact of eliminating all steam generator tube rupture events. The benefit was determined to be $588,060. SGTR2 reduced the probability of tube failure by a factor of 10. The benefit was determined to be $517,949.	The cost associated with this modification is expected to greatly exceed the benefit.
155	Increase secondary side pressure capacity such that a SGTR would not cause the relief valves to lift.	SGTR sequences would not have a direct release pathway.	(8), (17)	29	79	$517.9k	>$100000k (EP)	This SAMA is not cost beneficial.	Evaluation case NOSGTR determined the impact of eliminating all steam generator tube rupture events. The benefit was determined to be $588,060. SGTR2 reduced the probability of tube failure by a factor of 10. The benefit was determined to be $517,949.	This would require replacement of the current generators. The cost associated with this modification is expected to greatly exceed the benefit.
157	A maintenance practice that inspects 100 percent of the tubes in a steam generator.	Reduce chances of tube rupture.	(16), (17)	29	79	$517.9k	>$500k per outage (EP)	This SAMA is not cost beneficial.	Evaluation case NOSGTR determined the impact of eliminating all steam generator tube rupture events. The benefit was determined to be $588,060. SGTR2 reduced the probability of tube failure by a factor of 10. The benefit was determined to be $517,949.	This would add to the duration of current outages. The costs associated with this ongoing inspection program will greatly exceed the benefit.

NRC Question RAI 10d:

The response does not address the request to provide the residual benefit after implementation, and an explanation why further actions would not be cost-beneficial. (We are unconvinced that any further enhancements would need to involve replacing human action with an automated system. In fact, based on scoping calculations, the change in human errors by a factor of 3 does not change the importance measure of any of the highest (RRW) human errors.) Please provide the requested information.

NRC clarification of RAI 10.d during NMC/NRC telephone conference.

In Table F.2-2 of the ER, a number of potential SAMAs are identified which involve reducing human error. Of these, three seem to show a potential cost benefit (SAMAs 181, 185, & 187) and the rest are relatively close to showing a cost benefit (e.g., about $20K benefit versus about $30K cost). For all of these, the RAI response to 10.d indicates that since the use of PRA 3.02, a procedure step mark-off has been implemented. However, no further evaluation is provided to show how much this change in procedure effects the CDF contribution of these SAMAs. Hence, we are requesting NMC provide a re-evaluation of these SAMAs given the implementation of the Procedure Mark Off to show that SAMAs (181, 185, & 187) are no longer cost beneficial. If any are still cost beneficial, then there needs to be another SAMA identified and evaluated.

NMC Response:

The approach taken to evaluate the benefit of potential SAMAs is to compare the risk (in dollars) of the "baseline" plant with the plant after implementation of a modification intended to reduce risk. SAMAs 181, 185 and 187 all dealt with improvements that could be made to reduce the human error probability associated with human actions required in response to plant events. The SAMA evaluation provided estimates of the reduction in risk associated with individually reducing the HEPs of concern by a factor of 3 to take credit for implementation of procedure enhancements. The plant implemented those procedure enhancements (actually before the SAMA evaluation, although the PRA had not yet been revised).

The new HEPs have been incorporated into the latest version of the Point Beach PRA. The RAI requests re-evaluation of the SAMAs (181, 185 and 187) given the implementation of the procedure mark off process. To perform this evaluation, all HEP basic events in the PRA model used for the SAMA evaluation were reviewed to determine if the HEP value would change based on implementation of a procedure mark off process such as placekeeping. The values of these HEP basic events were modified and a new baseline risk value calculated. The revision of the HEP values

included other factors in addition to procedure placekeeping implementation. It was not possible to include only the procedure placekeeping effect on the human actions.

The revised HEP values provide the equivalent of a $339K benefit manifested by a reduction in baseline risk values before and after the incorporation of the new HEP values. This includes the benefit of the procedure placekeeping for all human actions, not just those specified in SAMA 181, 185, and 187.

The HRA process indicates that there are no enhancements that could result in a significant reduction of the HEP impact on overall risk. Since the HEPs are now optimized, there are no changes that can be proposed regarding these SAMAs. This means an evaluation of these SAMAs would yield a benefit of zero dollars.

The following additional questions were provided by the NRC on October 20, 2004.

NRC Question # 1:

Drop the Question related to RAI 9, but specifically consider SGTR related SAMAS from other plants in the PBNP response to our Question related to RAI 6.

NMC Response:

The response to this question was discussed in the response to RAI 6 above.

NRC Question # 2:

Clarify whether there are two PRAs (Unit 1 and Unit 2), or if there is just one PRA that is being applied to both Units. If there are two PRAs, which is given in the results provided in the ER and the RAI responses.

NMC Response:

Point Beach maintains a separate PRA model for each unit. The differences between the models are due to the power distribution systems not being symmetric between the two units. These model differences produce a difference in CDF results of approximately 5% between the two units. The SAMA benefit analysis was performed using only the Unit 1 model. The differences between the Unit 1 and Unit 2 model are such that for the type of analyses performed, the benefit calculations are valid for both units.

NRC Question # 3:

In Section 4.20.5 of the ER, PBNP identifies that there were 9 SAMA candidates which required further identification. Please identify these nine SAMAs.

NMC Response:

Table F below contains the nine SAMAs.

Table F. SAMA Identification.

SAMA Number	Description	Evaluation
108	Improved SGTR coping abilities – instrumentation to detect SGTR or to scrub fission product releases. This is driven by human actions.	The PRA model sensitivity run that was intended to bound the reduction of the SGTR events was performed by reducing the frequency by a factor of 10. The steam generators have been replaced on both units at Point Beach, and the condition of the tubes is monitored as required. The procedural criteria for identifying a ruptured steam generator are already simple and straight forward. No cost-effective hardware changes have been identified that will improve our ability to cope with a SGTR event. The response to SGTR events is driven by human actions. See SAMA 188 for a discussion of the human error reduction measures implemented.
126	Create automatic swapover to recirculation on RWST depletion.	The expert panel judged the cost of this modification to be $500K or greater. If the cost is near $500k, this modification could be considered cost beneficial. A more detailed cost analysis was recommended. The License Renewal Project requested Westinghouse to develop a conceptual design for an automatic system to go from the injection phase to the recirculation phase of core cooling following a LOCA. Westinghouse developed the conceptual design for a semi-automatic and a full-automatic swapover system. The semi-automatic system had manual actions, which defeat the purpose of eliminating human error, so this design was not considered for further evaluation. The conceptual design of the full-automatic system was given to PBNP Construction Engineering to develop a better cost estimate. The complexity of the proposed modification, and the significant changes to the plant infrastructure required to fully implement this modification, resulted in a cost estimate exceeding $1,000K per PBNP unit. The costs associated with the proposed modification are expected to significantly exceed the benefit, thus this modification is not cost beneficial. See SAMA 181 for a discussion of the human error réduction measures implemented.
151	Make procedural changes for the RCS depressurization option	This potential improvement was evaluated by a PRA model sensitivity run that had all human error probabilities for depressurizing the RCS set to zero. This is an extreme bounding case. The calculations for these HEPs were reviewed and there does not appear to be a large opportunity for improvement for any of them by making procedural enhancements. Some credit can now be taken for use of placekeeping aids, but the largest part of these HEPs is from the execution portion, not cognitive.

Table F. SAMA Identification.

SAMA Number	Description	Evaluation
181	Provide procedural improvements and training to improve performance for the task of feed and bleed cooling without SI.	Procedures are considered to be adequate as written. The Human Reliability Analysis methodology used by Point Beach provides for a factor of 2-3 reduction of the cognitive portion of the Human Error Probability if placekeeping aids are used. The practice of marking off each EOP, AOP, ECA, and CSP step when executed was implemented at Point Beach in 2002. No further cost-effective method to reduce the HEP appears to be available.
185	Provide procedural improvements and training to improve operator performance for the task of providing an alternative source of water for AFW following low CST level.	Placekeeping aids were implemented to reduce the human error probability. (See disposition for SAMA 181.)
187	Provide procedural improvements and training to improve operator performance for the task of opening valve CV-112B (charging pump suction from RWST).	Placekeeping aids were implemented to reduce the human error probability. (See disposition for SAMA 181.)
188	Provide procedural improvements and training to improve operator performance for the task of diagnosing steam generator tube rupture.	Placekeeping aids were implemented to reduce the human error probability. (See disposition for SAMA 181.)

Table F. SAMA Identification.

SAMA Number	Description	Evaluation
196	Reduce likelihood of RHR A and B full flow test lines being left open (RH-706A & B)	The probability for this pre-initiator human error used in PRA model Revision 3.02 was a screening value of 1E-03. Because there are actually two series valves in these lines that are both independently verified and locked closed, both would need to be left open for a flow diversion to occur. A more correct value of the HEP was calculated to be 6.4E-06. This corrected value eliminates any need for further evaluation.
197	Reduce likelihood of check valve in common AFW pump recirc line to CSTs failing to open.	Although a modification to remove this check valve was not considered cost beneficial, the valve internals were removed by modification MR 02-0100. This mod was installed on 09/12/2002.

NRC Question # 4. In the PBNP RAI response to Question 2.a, please provide further information on:

Compartment 187: A cost-benefit assessment of adding Automatic Suppression and any other actions considered, relative to the PBNP statement "No other actions have been identified."

Compartment 326: Rationale for the statement, "No further action is necessary."

Compartment 319: What modification was installed to correct the situation, and how that modification makes "No further action necessary."

NMC Response:

A cost-benefit evaluation was performed for Compartment 187 at the time of the IPEEE submittal. At that time it was determined that the cost (in excess of $1 Million) was not justified by the benefit that could be obtained. Plant personnel, including the operating crews, have been trained on the possible consequences of fires in this area. This training is part of the ongoing training programs. Operating crews are also routinely trained on operating (shutdown) the plant if there is a loss of equipment control due to a fire in this area.

Compartment 326 is the control room. The risk due to a fire in the control room is dominated by operator errors while controlling the plant shutdown from outside the control room. The procedures for performing shutdown from outside the control room have been revised and enhanced. The operating crews are routinely trained on this evolution. There are no additional low cost alternatives that can be implemented to improve the operator performance in this evolution.

Compartment 319:
There were two modifications installed in 1995 (one on each unit) to correct this problem:

MR 92-053, Correct Train Separation of Control Circuits for Auxiliary Feedwater Pump (Unit 1), accepted on April 20, 1995.

MR 92-054, Correct Train Separation of Control Circuits for Auxiliary Feedwater Pump (Unit 2), accepted on December 02, 1995.

These modifications correct a train separation problem that existed in the undervoltage circuitry for buses A01 and A02 on both units. These buses supply the main steam generator feedwater pumps. The auto-start of the auxiliary feedwater pumps on bus undervoltage is a non-safety-related anticipatory start of auxiliary feedwater when power is lost to the main feed pumps. This auto-start was originally safety-related and had the same power supplies as the safety-related auto-start for auxiliary feedwater on steam generator low level. A short at the undervoltage relays or in the cable run for the auto-start wiring that had both Trains A and B run together in the same wiring bundle could have disabled the auto-start of all of the auxiliary feedwater pumps. These modifications moved the power supplies for the bus undervoltage auto-start of auxiliary feedwater to non-safety related sources and isolated the Train A and B wiring that was in the same wiring bundle from the rest of the auxiliary feedwater start circuitry. Now, a short circuit at the A01 or A02 buses due to a fire, for example, can no longer affect the auxiliary feedwater auto-start on steam generator low level. Installation of the modifications has eliminated the vulnerability identified by the IPEEE.