SAFETY REVIEW COVER SHEET

DOCUMENT NO. PM 92-108 REV. NO. 2

DESCRIPTION OR TITLE: CBEAF IMPROVEMENTS

1. Assigned Responsibilities:
   Safety Analysis Preparer: N.D. SMITH
   Lead 1st Safety Reviewer: N.D. SMITH
   2nd Safety Reviewer: C.R. FLETCHER
2. Safety Analysis Preparer: Complete PART I, SAFETY ANALYSIS
   Safety Analysis Preparer [signature] SIGNATURE / 1-7-93 DATE
3. Lead 1st Safety Reviewer: Complete Part II, Item Classification.
4. Lead 1st Safety Reviewer: Part III may be completed. If either question 1 or 2 is "yes," then Part IV is not required.
5. Lead 1st Safety Reviewer: Determine which DISCIPLINES are required for review of this item (including own) and mark the appropriate block(s) below.

DISCIPLINES Required:	(Print Name)	Signature/Date (Step 7)
[] Nuclear Plant Operations		
[] Nuclear Engineering		
■ Mechanical & HVAC	Deborah A. Norton	Deborah A. Norton 1-8-93
■ Electrical	LARRY W. KLEIN	Larry W Klein 1-8-93
■ Instrumentation & Control	N.D. SMITH	[signature] 1-7-93
■ Structural	Anthony Coyle	Anthony Coyle 1-8-93
[] Metallurgy		
[] Chemistry/Radiochemistry		
[] Health Physics		
[] Administrative Controls		

6. A QUALIFIED SAFETY REVIEWER will be assigned for each DISCIPLINE marked in step 5 and his/her name printed in the space provided. Each person listed shall perform a SAFETY REVIEW and provide input into the Safety Review Package.
7. The Lead 1st Safety Reviewer will assure that a Part III or Part IV is completed (see step 4 above) and a Part VI if required (see 9.d of Part II). Each person listed in step 5 shall sign and date next to his/her name in step 5, indicating completion of a SAFETY REVIEW.
8. 2nd Safety Reviewer: Perform a SAFETY REVIEW in accordance with Section 8.0.
   2nd Safety Reviewer [signature] Date 1/8/93
   DISCIPLINE: I&C
9. PNSC review required? If "yes," attach Part V and mark reason below: Yes ■ No []
   [] Potential UNREVIEWED SAFETY QUESTION
   [] Question 9 of Part IV answered "Yes"
   ■ Other (specify): TECHNICAL SPECIFICATION CHANGE

PART I: SAFETY ANALYSIS
(See instructions in Section 8.4.1)
(Attach additional sheets as necessary.)

DOCUMENT NO. PM 92-108 REV. NO. 2

DESCRIPTION OF CHANGE: SEE ATTACHED DESCRIPTION

ANALYSIS: SEE ATTACHED ANALYSIS

REFERENCES:
SEE ATTACHED REFERENCES

PART II: ITEM CLASSIFICATION

DOCUMENT NO. 92-108 REV. NO. 2

		Yes	No
1.	Does this item represent:		
	a. A change to the facility as described in the SAFETY ANALYSIS REPORT?	[X]	[ ]
	b. A change to the procedures as described in the SAFETY ANALYSIS REPORT?	[ ]	[X]
	c. A test or experiment not described in the SAFETY ANALYSIS REPORT?	[ ]	[X]
2.	Does this item involve a change to the individual plant Operating License or to its Technical Specifications?	[X]	[ ]
3.	Does this item require a revision to the FSAR?	[X]	[ ]
4.	Does this item involve a change to the Off-Site Dose Calculation Manual?	[ ]	[X]
5.	Does this item constitute a change to the Process Control Program?	[ ]	[X]
6.	Does this item involve a major change to a Radwaste Treatment System?	[ ]	[X]
7.	Does this item involve a change to the Technical Specification Equipment List (BSEP and SHNPP only)?	[X]	[ ]
8.	Does this item impact the NPDES Permit (all 3 sites) or constitute an "unreviewed environmental question" (SHNPP Environmental Plan, Section 3.1) or a "significant environmental impact" (BSEP)?	[ ]	[X]
9.	Does this item involve a change to a previously accepted:		
	a. Quality Assurance Program	[ ]	[X]
	b. Security Plan (including Training, Qualification, and Contingency Plans)?	[ ]	[X]
	c. Emergency Plan?	[ ]	[X]
	d. Independent Spent Fuel Storage Installation license? (If "yes," refer to Section 8.4.2, "Question 9," for special considerations. Complete Part VI in accordance with Section 8.4.6)	[ ]	[X]

SEE SECTION 8.4.2 FOR INSTRUCTIONS FOR EACH "YES" ANSWER.

REFERENCES. List FSAR and Technical Specification references used to answer questions 1-9 above. Identify specific reference sections used for any "Yes" answer. SEE ATTACHED REFERENCES

PART III: UNREVIEWED SAFETY QUESTION DETERMINATION SCREEN

DOCUMENT NO. PM 92-108 REV. NO. 2

	Yes	No
1. Is this change fully addressed by another completed UNREVIEWED SAFETY QUESTION determination? (See Sections 7.2.1, 7.2.2.5, and 7.9.1.1)	[]	■

REFERENCE DOCUMENT: ____________ REV. NO. ____

	Yes	No
2. For procedures, is the change a non-intent change which only (check all that apply): (See Section 7.2.2.3)	[]	[]

[] Corrects typographical errors which do not alter the meaning or intent of the procedure; or,

[] Adds or revises steps for clarification (provided they are consistent with the original purpose or applicability of the procedure); or,

[] Changes the title of an organizational position; or,

[] Changes names, addresses, or telephone numbers of persons; or,

[] Changes the designation of an item of equipment where the equipment is the same as the original equipment or is an authorized replacement; or,

[] Changes a specified tool or instrument to an equivalent substitute; or,

[] Changes the format of a procedure without altering the meaning, intent, or content; or

[] Deletes a part or all of a procedure, the deleted portions of which are wholly covered by approved plant procedures?

If the answer to either Question 1 or Question 2 in PART III is "Yes," then PART IV need not be completed.

PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION

DOCUMENT NO. PM 92-108 REV. NO. 2

Using the SAFETY ANALYSIS developed for the change, test or experiment, as well as other required references (LICENSING BASIS DOCUMENTATION, Design Drawings, Design Basis Documents, codes, etc.), the preparer of the Unreviewed Safety Question Determination must directly answer each of the following seven questions and make a determination of whether an UNREVIEWED SAFETY QUESTION exists.

A WRITTEN BASIS IS REQUIRED FOR EACH ANSWER

	Yes	No
1. May the proposed activity increase the probability of occurrence of an accident evaluated previously in the SAFETY ANALYSIS REPORT? SEE ATTACHED	[]	■
2. May the proposed activity increase the consequences of an accident evaluated previously in the SAFETY ANALYSIS REPORT? SEE ATTACHED	[]	■
3. May the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT? SEE ATTACHED	[]	■
4. May the proposed activity increase the consequence of a malfunction of equipment important to safety evaluated previously in the SAFETY ANALYSIS REPORT? SEE ATTACHED	[]	■
5. May the proposed activity create the possibility of an accident of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT? SEE ATTACHED	[]	■

PART IV: (Continued)

DOCUMENT NO. PM 92-108 REV. NO. 2

		Yes	No
6.	May the proposed activity create the possibility of a malfunction of equipment important to safety of a different type than any evaluated previously in the SAFETY ANALYSIS REPORT?	[]	■

SEE ATTACHED

		Yes	No
7.	Does the proposed activity reduce the margin of safety as defined in the basis of any Technical Specification?	[]	■

SEE ATTACHED

		Yes	No
8.	Based on the answers to questions 1 - 7, does this item result in an UNREVIEWED SAFETY QUESTION? If the answer to any of the questions 1-7 is "Yes," then the item is considered to constitute an UNREVIEWED SAFETY QUESTION.	[]	■
9.	Is PNSC review required for any of the following reasons?	[]	■

If, in answering question 1 or 3 "No," it was determined that the probability increase was small relative to the uncertainties; or, in answering question 2 or 4 "No," it was determined that the doses increased, but the dose was still less than the NRC ACCEPTANCE LIMIT; or, in answering question 7 "No," a parameter would be closer to the NRC ACCEPTANCE LIMIT, but the end result was still within the NRC ACCEPTANCE LIMIT; then PNSC review is required.

REFERENCES: SEE ATTACHED

This Unreviewed Safety Question Determination is for the following DISCIPLINE(s): (Additional Part IV forms may be included as appropriate.)

- [] Nuclear Plant Operations
- [] Nuclear Engineering
- ■ Mechanical
- ■ Electrical
- ■ Instrumentation & Control
- ■ Structural
- [] Metallurgy
- [] Chemistry/Radiochemistry
- [] Health Physics
- [] Administrative Controls

PART V: PNSC REVIEW

DOCUMENT NO. PM 92-108 REV. NO. 2

Determination/Evaluation: ______

Action Taken: ______

Basis: ______

PNSC Chairman: ______ Date: ______

PART VI: ISFSI CHANGES (10CFR72.48)

DOCUMENT NO. PM 92-108 REV. NO. 2

		Yes	No
1.	Does this item represent:		
a.	A change to the Independent Spent Fuel Storage Installation (ISFSI) as described in the ISFSI Safety Analysis Report?	[ ]	[X]
b.	A change to the procedures as described in the ISFSI Safety Analysis Report?	[ ]	[X]
c.	A test or experiment not described in the ISFSI Safety Analysis Report?	[ ]	[X]
2.	Does this item involve a change to the license conditions incorporated in the ISFSI Operating License?	[ ]	[X]
3.	Does this item result in a significant increase in occupational exposure?	[ ]	[X]
4.	Does this item result in a significant unreviewed environmental impact?	[ ]	[X]

SEE SECTION 8.4.6 FOR INSTRUCTIONS FOR EACH "YES" ANSWER.

REFERENCES. List ISFSI SAR and Technical Specification references used to answer questions 1 and 2 above. Identify specific reference sections used for any "Yes" answer.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

DESCRIPTION OF CHANGE:

This safety analysis has been prepared to discuss the changes to be implemented by Plant Modification No. 92-108. The necessity for the modification stems from the fact that single failure modes to the Control Building Emergency Air Filtration System (CBEAF) have been identified. One of the two single failure modes can be eliminated in a relatively short time frame. The other requires extensive modification to the chlorine detection logic.

EER 92-0352 has been prepared which demonstrates that although a single failure within the logic of the CBEAF does not meet the design criteria for the Control Building Heating, Ventilation, and Air Conditioning System (CBHVAC) as stated in the UFSAR, the consequences of that single failure will not result in a situation in which the NRC Acceptance Limit for radiological consequences to Control Room personnel could be exceeded.

The proposed resolution to the above stated problem is included in this two phase modification. Phase I requires modification to the start logic of both trains of CBEAF. Should it become apparent that Phase II modifications would not be complete until after startup, the relocation of the Chlorine detection system logic power to a UPS source would be required. This work would be required to be complete prior to start-up of either unit. This temporary UPS power source design is included in the Phase I package.

Phase II contains the permanent design required to eliminate the Chlorine detection system single failure input to the EAF. The work to install this design will take place during the current forced outage (B108F9 & B210F6) but could continue during power operation with NRC approval of a Request for Authorization to Operate (RAO) based on EER 92-0352. Details of the single failure modes and how the problem was identified follow.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

During investigation of an Operating Experience (OE) Report #5366 concerning "preferred/standby" logic for Standby Gas trains, it was noted that the Control Building HVAC Emergency Air Filtration (EAF) also utilized a "preferred/standby" logic configuration. As the Standby Gas Trains do not use the "preferred/standby" logic there was no problem with the existing design (ref.: DBD-10 for SBGT design details). The logic for the CBEAF was also reviewed and it was revealed that previously unidentified single failures could occur (ref.: ACR 92-642).

Other than normal ventilation and heating/cooling of the Control Building, the CBHVAC system must provide habitability during three different design basis events. The first concerns a radiation event (Main Steam Line Break [MSLB] or Loss of Coolant Accident [LOCA]). The second event concerns the complete rupture of the 55 ton chlorine tank car located near the Service Water Building. The third is a smoke event.

In the MSLB or LOCA event the CBHVAC system is required to isolate and enter the recirculation mode on a Control Room Area or Control Room Intake High Radiation signal from the Area Radiation Monitoring System (ref.: CBHVAC System DBD-37, Section 1.3.1).

Upon receipt of a high radiation signal, the CBHVAC System is automatically realigned to the emergency mode of operation. The fresh air inlets close isolating the control room. At the same time, the emergency air filtration unit begins operation, recirculating the control room air to minimize contaminated build-up in the occupied areas. The system responds to a smoke event in the same manner it does for radiation.

In the event of a Chlorine release the CBHVAC goes into full recirculation mode, with no outdoor air intake (except for the battery rooms). The emergency filtration trains do not start since they do not remove chlorine and may be damaged by it (ref.: CBHVAC System DBD-37, Section 1.3.2).

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

The chlorine detection system is designed "fail-safe" such that any failure (i.e. loss of power, detector failure, etc.) will isolate the control room in the same manner as a true chlorine signal. The CBEAF system is designed to meet the single failure criteria as described in IEEE 279-1971" (ref.: UFSAR Section 9.4.1.3.c,Safety Evaluation). The single active failure criterion referenced previously is satisfied except for 2L-D-CB, 2J-D-CB, 2H-D-CB, and SV-916 (ref.: NUS-3697, Rev. 2, Page A-11). These exceptions have been accepted by the NRC. In contradiction to the above requirement and accepted exceptions, the following describes how the single failure criteria is not met.

As discussed above ACR 92-642 identifies the fact that upon loss of power in the control logic of the preferred CBEAF train, the standby train will not start automatically as intended. This is due to a lack of a start signal upon loss of power. By original design the system uses a 10 second timer which is used to initiate a start signal to the standby train should the preferred train fail to start. On a loss of power to the preferred train the 10 second timer is never energized and therefore an automatic start signal to the standby train is never sent. A plant test was initiated using an AI-117 to verify system operation and demonstrate that although the train would not automatically start, it could be manually started. The fuse providing control power to the A Train of EAF was pulled. The next step required the B Train to be started by placing the control switch to the "ON" position. It was discovered that when the control power fuse was pulled that the control room HVAC isolated. In addition the B Train of CBEAF was unable to be started manually.

It was determined that this was caused by the fact that the chlorine detection logic receives its power from the A Train CBEAF control logic. By pulling the fuse for the A Train the control power to the chlorine system was lost which in turn fails the logic in the "safe" position. The "safe" position for the chlorine system is to isolate control room HVAC and prevent or secure the operation of the CBEAF. This is done to prevent the intrusion of chlorine into the control room and CBEAF filter trains.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

The actions which occur in the CBEAF system as a result of a chlorine system failure or chlorine accident are appropriate and in compliance with the requirement of Reg. Guide 1.95 (Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release). The problem is that should a Main Steam Line Break in the turbine building occur, concurrent with a chlorine system single failure, the control room HVAC would isolate as required but the CBEAF would not start (isolated by the chlorine failure).

Given that the failures identified can render the CBEAF inoperable during a radiation event, a study to determine whether or not the calculated dose received by the control room operator would exceed the limits of GDC 19 was requested from UE&C (ref.: CP&L Calc. No. 0VA-0041).

The assumptions used in this study were that a MSLB had occurred. Concurrent with the MSLB a single failure prevents both trains of CBEAF from starting. The results show that the control room operator would receive approximately 96% of the allowed dose (30 rem thyroid) in six hours. The dose continues to increase up to 29.5 rem in approximately 24 hours. The dose then levels off at 29.5 rem for 30 days (duration of accident). The results of this analysis show that even without both trains of EAF the control room operator dose rates are within GDC 19 limits. Even though there is very little margin in the analysis the assumptions used are conservative.

Some of the conservatism included in the analysis is described here for understanding. It is assumed that for the design basis steam line break that a complete rupture of a main steam line break takes place in the turbine building. 140,000 lbs of steam and water is released which in turn fails the turbine building enclosure.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

A puff release is assumed which then envelopes the Control Building. In order to determine the duration of Control Building exposure to the plume a uniform spherical cloud which passes the Control Building at a conservative 1 meter per second wind velocity is assumed. To account for potential for non-spherical shapes and possible reduced wind velocity a conservative factor of 10 times the exposure duration is applied.

An indication of the conservativeness of the factor of 10 is that if the plume were assumed to be not spherical, but turbine building shaped, and to somehow approach the Control Building end-on; and if the inferred (UFSAR Section 2.3.6) plant design basis ground level release wind velocity of 0.54 meter/sec were used, the calculated increase in control room doses would be less than one-third the result obtained using the factor of 10.

Another factor which adds conservatism to this analysis is the fact that the design basis main steam line break as defined in the UFSAR assumes a 10.5 second MSIV closure time after the break. In actuality the technical specification required closure time is ≥3 to ≤5 seconds (Technical Specification 3/4.4.7). The differences in the amount of steam and water released with a 3 to 5 second MSIV closure time have not been calculated but can be assumed to be significantly less than that released in 10.5 seconds. This would serve to reduce the size and activity of any release.

As in all habitability calculations for MSLB performed to date no credit has been taken for atmospheric dilution. This is due to the fact that the turbine building puff release is in such close proximity to the control building intake plenum. All the above conservatism support the fact that doses received by the control room operations personnel would remain below GDC 19 limits. An independent review of the analytical methods and results obtained by UE&C has been performed by NUS (ref.: CP&L Calc. No. 0VA-0042) which further confirms the validity of the study.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

In addition to the dose calculation, a Probability Risk Assessment (PRA) was also performed to determine the probabilities of a main steam line break concurrent with a loss of EAF function due to a Chlorine Detection System failure. The results of that review show that the probability would be 1.1×10^{-7} for a period of four months.

Based on the data presented in EER 92-0352, it can be demonstrated that although the EAF system does not meet the single failure criteria of IEEE 279-1971 for a radiation event, the probability of a MSLB concurrent with a failure which prevents the EAF from starting is extremely unlikely. In addition, should this scenario take place it can be shown by analysis that the GDC 19 dose limits for control room personnel will not be exceeded.

The safety analysis from EER 92-0352 was reviewed by the PNSC due to the reduced margin of safety as calculated in the UE&C dose calculation. The previous maximum calculated dose for any Design Basis Accident to the control room operator was 19 rem as stated in the final SE on control room habitability (NRC-89-103). This EER demonstrates that the maximum dose expected in the control room following an MSLB would be 29.5 rem.

The conclusion reached in the EER and used by the RAO is that it is acceptable to allow power operation of either(both) unit(s) for a duration of four months (basis for PRA Analysis) with the knowledge that this modification, Phase I will be installed and operable prior to start-up and Phase II will be installed within four months after startup. As stated before NRC approval of the plan outlined in the EER is required before implementation. A detailed description of the work to take place in each phase of the modification is provided.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

PHASE I:

Phase I will be designed to permanently eliminate one of the two single failures. This phase will eliminate the single failure associated with the start logic. To resolve this problem a simple change to the logic is required. The change involves reversing the timer logic so that the "preferred train fail-to-start" relays 3-62A and 3-65A are de-energized on a fail-to-start signal. This will automatically place the stand-by train in the "preferred" mode upon a loss of power to the preferred train or if the preferred train fails to start (the original design intent).

Should the Phase II modifications not be able to be completed prior to startup a temporary resolution to the Q/Non-Q separation issue would be required. The temporary resolution of the Q/Non-Q separation issue would involve relocating the power for the Chlorine detection logic from the Div. I/Class A power it now receives to the Uninterruptible Power System. As discussed the Chlorine Detection Logic is Non-Q and can therefore be fed by the Non-Q UPS. The relocation of the power off the CBEAF Train A logic also serves a dual purpose in that by removing the power from the Div. I feed a loss of Div. I power at that point (Train A logic) will not fail both trains of the EAF. This will not eliminate the possibility of a loss of UPS from failing both trains of EAF but reliability will be improved. The relocation of the Chlorine Detection Logic from Train A of EAF to the Non-Q UPS has been reviewed by the Electrical Analysis Group.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

PHASE I (Cont.):

As mentioned the installation work associated with Phase I will be accomplished prior to startup. Should it be required that Phase II installation activities extend beyond the startup of either unit, the temporary UPS power feed described above would have to be performed. The portion of the modification which contains the temporary UPS power is written with the option of performing the installation or not as dictated by such factors as; Phase II completion, unit startup schedules, and NRC acceptance of RAO. The end result of the Phase I changes (with the temporary UPS power feed) would be that the CBEAF would automatically start when required upon receipt of an isolation and initiation signal including the standby train if the preferred train fails to start for whatever reason (failure, loss-of-power, etc). This would not eliminate the possibility of a CBEAF failure due to a single failure within the Chlorine Detection System which has been addressed in EER 92-0352.

PHASE II:

The permanent resolution of the Chlorine Detection Logic single failure input to the CBEAF is to provide a logic design which will be able to take a single credible failure without disabling the protective function of the CBEAF. In order to provide this design a one-out-of-two-taken-twice logic will be utilized. This will require the addition of 2 more detectors per sampling location which consist of the Control Building intake air plenum and the Service Water Intake Building. This will bring the number of detectors utilized at each location from the present design of two to a total of four. As there are two sampling locations the number of detectors associated with the Chlorine Detection logic input to the CBEAF will be increased to eight.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

PHASE II (Cont.):

The four detectors per sampling location will be installed divisionalized such that two will be Division I and two will be Division II. The logic will be designed such that two detectors per location will be required to sense chlorine in order to affect an isolation of the CBEAF. This will insure that spurious detector isolation will not isolate the CBEAF causing unnecessary Licensing Event Reports (LER's). In addition, by using the one-out-of-two-taken-twice logic, a loss of one division of power to the detectors will not place the CBEAF in an isolated condition. This design concept will also eliminate any other single credible failure within the Chlorine Detection logic from isolating the CBEAF.

In order to prevent a loss-of-power on one division from isolating the CBEAF as a result of two chlorine detectors losing power, the chlorine detectors which now "fail-safe" (isolate on loss of power) must be replaced with detectors which do not isolate on loss of power. A revision of the existing Chlorine Detector Specification 252-100 is planned as part of this modification. The new detectors will be installed in approximately the same locations as the existing detectors and will be purchased and installed seismically qualified.

If required, the Phase I installation of a UPS power feed to the Chlorine Detection logic will be removed in Phase II. As the Chlorine Detection logic will now be divisionalized the Div. I and Div. II Chlorine Detection logic will be fed from Div. I and Div. II of the CBEAF start logic respectively. This will insure that a loss-of-power on a complete division will still provide the protective function from radiation and chlorine on the other division. As isolation is required between Q and Non-Q logic, new fuses will be installed between the Non-Q and Q portions of logic. These fuses will be coordinated with the upstream breaker and analyzed to insure that a failure in the Non-Q portion of the logic will not adversely affect the Q portion. The Div. I and Div. II power feeds to the CBEAF will be analyzed to assess the impact of the additional/revised chlorine detection logic.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

PHASE II (Cont.):

The installation of the above mentioned system will require the use of several spare cables between the Control Building, Diesel Building, and Service Water Building. The cables will be terminated in their present location or pulled back to new termination boxes installed specifically for this project. They will be connected to provide the necessary signal function to the CBEAF. The use of spare cables is the only way to provide the necessary signal due to the fact that no raceway exists in which additional cables can be pulled. Attempts have been made to pull new cables but no success has been had to present.

The installation also requires several new runs of conduit and associated supports in the Service Water Building and Control Building. Structural work also includes the mounting of the eight new Chlorine Detectors within the Control Building and Service Water Building. Stainless steel and coated materials will be utilized in the Service Water Building structural additions to provide resistance to corrosion due to the salt water environment present in that location.

The detectors mounted in the CBHVAC Mechanical Equipment Room and sensors located in the CBHVAC intake plenum will be installed such that they remain operable during and after the design basis earthquake, tornado, flood, missiles, and other natural phenomena. This is to meet the intent of Regulatory Guide 1.95.

The detector sensors located at the Chlorine Loading Area will be seismically qualified and installed in reinforced stainless steel enclosures. It is recognized that the Chlorine Loading area sensors will not be designed to withstand the design basis tornado. This is acceptable due to the fact that any chlorine release resulting from tornadic action would be dispersed at a much greater rate than that assumed for a design basis chlorine release (see "Study of Accidental Chlorine Release" dated 4/2/73) due to extreme wind conditions.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

PHASE II (Cont.):

The sensors will be mounted approximately 28 feet apart to provide divisional separation. The sensors are mounted approximately 1 foot above ground elevation in order to insure that a chlorine release (heavier than air) would be detected. As a result of this, the sensors are protected from flooding to 21.0 ft mean sea level (MSL). Design basis still water flooding/surge for BNP is 22.0 ft MSL. The design basis flood would occur as a result of the Probable Maximum Hurricane (PMH) coincident with the peak local astronomical tides. (ref.: UFSAR Sections 2.4.5, Probable Maximum Surge and Seiche Flooding and 3.4, Water Level (Flood) Design). As in the case of the tornado referenced above, the winds associated with the PMH would disperse any chlorine release at a much greater rate than that assumed for a design basis chlorine spill.

In the unlikely event that chlorine gas should reach the Control Building Intake plenum during a tornado or hurricane, the subsystem in this location would isolate the control room to provide the necessary protective action. Based on the above, incapacitation of the Control Room Operator is prevented during the design basis natural phenomena with the potential to cause a chlorine release.

The new Chlorine Detectors use an amperometric sensor consisting of a platinum cathode and silver anode joined by an electrolytic salt bride all enclosed in a permeable membrane. This design eliminates the majority of the maintenance now required on the existing detectors. This design will also eliminate the majority of LCO's associated with the present "drip" type detectors. The detectors selected for use have been in service at several other nuclear facilities and have proven reliable service.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

ANALYSIS (CONT.):

PHASE II (Cont.):

The current schedule provides for the installation of Phase II work outlined above during the current forced outage. As a contingency plan, a Request for Authorization to Operate (RAO) will be submitted to the NRC based on the conclusions of EER 92-0352. The EER provides the justification for performing Phase II installation work after startup. The modification will provide the necessary cautions and instructions to allow installation during the current outage and will require revision to add specific instruction to accommodate the operating conditions of the unit(s) at power operation.

The current schedule puts installation of the Phase II equipment sometime after the first of the year. This would be beneficial from a chlorination standpoint as the demand for chlorination during the winter months is reduced. In conclusion, the changes as outlined above will eliminate the known single failures within the Control Building Emergency Air Filtration System, eliminate the separation problem, and provide a more reliable Chlorine Detection System.

PART I: SAFETY ANALYSIS

DOCUMENT NO. PM 92-108 REV. NO. 2

REFERENCES:

EER No. 92-0352 - CBEAF Single Failures

DBD-37 - Control Building Heating, Ventilating, and Air Conditioning System

Reg. Guide 1.95 - Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release

NRC-89-103 - Safety Evaluation (SE) Regarding Control Room Radiological Habitability

LER 1-92-018 - Failure of the CBEAF System to Meet Single Failure Criteria for Radiation and Fire Events

NLS-85-311 - Control Room Habitability (NUS-4758 - Control Room Radiological Reanalysis attached)

CP&L Calc. No. 0VA-0041 - UE&C Analysis "Control Room Doses Following a Main Steam Line Break

CP&L Calc. No. 0VA-0042 - NUS Design Verification of UE&C Calculation Set #9527-8-CB-01

10CFR50, App. A, General Design Criteria 19 - Radiation Protection for Control Room Operators

NUS-3697 Rev. 2 - Control Room Habitability Evaluation Brunswick Steam Electric Plant (NRC TMI Action Plan Item III.D.3.4)

NUREG-75/087 Rev. 1 - Standard Review Plan

UC-07582 - Study of Accidental Chlorine Release, 4/2/73

PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION

DOCUMENT NO. PM 92-108 REV. NO. 2

RESPONSES TO:

QUESTION 1: No. As discussed in the analysis the CBEAF System is provided to provide protection to the control room operators from a radiological event. Of the accidents discussed in Chapter 15 of the SAR the main steam line break is the most limiting. The acceptability of not meeting the single failure criteria of IEEE 279-1971 for the CBEAF system does not impact any system, structure or component associated with the initiation of a Main Steam Line Break (MSLB) accident and therefore the probability of occurrence of an accident analyzed in the UFSAR is not changed.

QUESTION 2: No. The operability assessment provided in EER 92-0352 demonstrates that the consequences associated with a main steam line break do not exceed the 10CFR50, App. A, GDC-19 limits. Although the GDC-19 limits are not exceeded the parameter (dose to control room operators) would be closer to the NRC acceptance limit thus requiring PNSC review of EER 92-0352 and associated Unreviewed Safety Question Determination. This modification does not change or accept changes to the accident analysis included in Chapter 15.

QUESTION 3: No. The CBEAF was designed to the single failure criteria of IEEE 279-1971. This modification brings the system into compliance with the single failure criteria as required by IEEE 279-1971. By providing the single failure design the system is able to provide the design basis protection for which it is installed.

QUESTION 4: No. The consequences of malfunction of the CBEAF are specifically addressed in EER 92-0352. It has been demonstrated by analysis and verified that a failure of the CBEAF to initiate will not increase the consequences of an equipment failure above the limits set by GDC-19.

PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION

DOCUMENT NO. PM 92-108 ________ REV. NO. 2

RESPONSES TO:

QUESTION 5: No. This analysis is written to address existing accident protection and does not affect the accident modes themselves. As this modification only addresses the capability of the CBEAF to perform its safety function during a design basis event, no new accidents are created.

QUESTION 6: No. Part of the previously accepted design basis for the CBEAF is that it meet the single failure criteria of IEEE 279-1971 with exceptions. This analysis shows that modifications performed by PM 92-108 will bring the CBEAF system into compliance with the original design bases of the system. By restoring the system to its original design requirements no new malfunctions of equipment important to safety are created.

QUESTION 7: No. The bases given for the Control Room Emergency Filtration System (3/4.7.2) are that radiation exposures be limited to 5 rem or less whole body or its equivalent. This is consistent with the guidance provided in 10CFR50, App. A, GDC-19. As discussed, the operability assessment included in EER 92-0352 demonstrates that exposures will meet the bases for Technical Specification 3/4.7.2. The technical specification bases for Chlorine Detection Systems (3/4.3.5.5) states "Operability of the chlorine detection system ensures that an accidental chlorine release will be detected promptly and the necessary protective actions will be automatically initiated to provide protection for control room personnel." The chlorine detection system will be modified by Phase II to this modification to provide the same or better level of protection.

It should be noted that this modification will revise the Chlorine Detection Technical Specification 3/4.3.5.5to reflect the new system configuration. For details on this change refer to the RCI 2.1 prepared for this licensing change.

PART IV: UNREVIEWED SAFETY QUESTION DETERMINATION

DOCUMENT NO. PM 92-108 REV. NO. 2

REFERENCES:

UFSAR Sections 5.4.4, 5.4.5, 6.4, 9.4.1, 15.6.3, and 15.6.4

Tech. Spec. Sections including bases 3/4 7.2, 3/4.4.7 and 3/4 3.5.5