Maine Yankee
RELIABLE ELECTRICITY FOR MAINE SINCE 1972

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UNITED STATES NUCLEAR REGULATORY COMMISSION
Attention: Document Control Desk
Washington, DC 20555

References:
(a) License No. DPR-36 (Docket No. 50-309)
(b) USNRC Letter to MYAPCo dated September 12, 1990
(c) Maine Yankee Letter to USNRC, MN-90-36, dated March 30, 1990
(d) USNRC Plant Systems Branch and Reactor Systems Branch Request for Additional Information on Maine Yankee Atomic Power Plant Response to Station Blackout Rule, received July 25, 1989
(e) USNRC Letter to MYAPCo dated October 27, 1989
(f) Maine Yankee Letter to USNRC, MN-90-57, dated June 8, 1990

Subject: Safety Evaluation of the Maine Yankee Response to the Station Blackout Rule (TAC No. 65563)

Gentlemen:

This letter provides our response to the NRC Staff Safety Evaluation (Reference (b)) regarding the station blackout rule implementation at Maine Yankee. This letter addresses the recommendations in the Safety Evaluation Report (SER) and identifies modifications or other additional actions which are planned to resolve the outstanding items. For each outstanding issue discussed in Attachment A, the SER section number, title and NRC recommendation is provided along with our response.

Attachment B is our response to Reference (d) which was previously provided by telecopy on October 3, 1989 and November 16, 1989.

Please contact us should you have any questions regarding this matter.

Very truly yours,

SENichols

S. E. Nichols, Manager
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WBD/sjj

Attachments

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ATTACHMENT A

SER Section 2.2.2 - Proposed AAC Power Source

NRC Recommendation:

The licensee should furnish additional information clarifying the testing of DG-2 that confirms that the DG-2 meets the requirements of NUMARC 87-00 Appendix B, B.9. If DG-2 is unable to comply with NUMARC 87-00 Appendix B, B.9 requirements, then a separate AAC should be provided or the licensee should provide a coping analysis which shows that the plant can cope with and recover from an SBO for the required duration, independent of AC power.

Maine Yankee Response:

The ability of DG-2 to handle the voltage transient when starting the largest load, the 75 hp auxiliary charging pump (ACP) motor, has been evaluated using the DAPPER computer program. The evaluation includes: (i) the ability of DG-2 to recover after starting the ACP while base loaded, and (ii) the adequacy of sufficient voltage to start the ACP motor.

(i) The DAPPER results indicate that in the subtransient region, the DG-2 terminal voltage drops to 402.2 volts, or 16.2% below its 480 volt rating.

(ii) The results also indicate a voltage of 351 volts at the ACP motor terminals. The 351 volts represents 76.3% of the motor's rated voltage of 460 volts.

The Diesel Generator vendor was requested to evaluate this same starting case for DG-2, and their independent assessment substantiated the above DAPPER computer results. The vendor also stated that the industry rule-of-thumb for starting large loads on the diesel generator is that the largest load (expressed in horsepower) be within one-half the kilowatt rating of the generator. Thus, for a 250 kw machine rating, starting a motor as large as 125 hp is within the generator's capability. Further, the resultant diesel generator terminal voltage drop would be approximately 35%. For starting cases, 50% terminal voltage drop is allowable without collapse of the diesel generator field. The vendor also indicated that the voltage regulator would respond after 50 milliseconds and full voltage recovery would be from one to two seconds. The vendor concluded that their experience covered many field motor starting applications similar to this case and they had full confidence that the ACP motor would successfully start. Since the vendor information conservatively bounds the DAPPER analysis, the conclusion is that DG-2 can accommodate the voltage transient when starting the ACP.

With regard to the second issue, the motor manufacturer's data indicates the minimum voltage to accelerate to full speed at normal discharge pressure is 345 volts with a 15 second maximum acceleration time. As indicated previously, the DAPPER program determined that the applied voltage would be 351 volts. Thus, the ACP motor would have adequate starting voltage to accelerate to full speed.

To confirm the DAPPER analysis results, Maine Yankee will perform a transient load test on DG-2 during the next refueling outage currently scheduled to start in October, 1991.

SER Section 2.3.2 - Class 1E Battery Capacity

NRC Recommendation:

The licensee should develop and implement the necessary modifications, such as battery charging from an AAC power source or additional battery capacity, which will maintain the Control Room functional and manned for the full 4 hour duration.

Maine Yankee Response:

We understand that the NRC comments in this section of the SER are based upon the impression that the Maine Yankee Control Room will be abandoned during SBO since the Science Applications International Corporation (SAIC) Technical Evaluation Report (TER) states the Class 1E station batteries do not have sufficient capacity to last for the four hour blackout coping duration. This impression seems to be related to the identified coping philosophy of controlling the plant during an SBO from the Alternate Shutdown Panel (ASP) in lieu of the Main Control Board. However, selected operations personnel would remain in the Control Room during SBO to monitor plant parameters (see Reference (c)) and, therefore, the Control Room will not be abandoned during a station blackout.

To clarify the Maine Yankee SBO coping approach, several issues are addressed herein. These issues are: (i) Class 1E battery capacity; (ii) the operating philosophy of using the ASP; and (iii) Control Room habitability and equipment operability. We have examined each of these issues and we believe that the coping approach reflected in Maine Yankee SBO response procedures is sound and reasonable.

The first issue to be clarified is the Class 1E battery capacity available over the SBO coping and recovery period. An evaluation has been performed which demonstrates the capability of the Class 1E station batteries to provide in excess of 4 hours of capacity without charging or load shedding. This evaluation was based upon each battery powering its normal respective loads considered in the battery sizing calculation, extended for a four hour duration, with AC power restoration loads considered at the end of the 4 hour period. Therefore, the Class 1E batteries will be maintained during the coping period and the Control Room instrumentation powered from these batteries will be available to monitor plant parameters while SBO coping and recovery actions are directed from the Control Room.

The next issue is the philosophy of operating the plant at a hot shutdown condition from the ASP in lieu of the Control Room. As previously stated under SBO conditions, a shift supervisor and the Auxiliary Control Room Operator have no specified duties and are expected to remain in the Control Room to monitor plant parameters. The primary purpose for dispatching operators to the ASP during SBO is to initiate operation of DG-2, the AAC power source. Procedures require the first step taken by operators dispatched to the ASP to be establishment of communications with the Control Room. The subsequent steps include the transfer of instrument indication and control of specific valves and pumps to the ASP from the Control Room once DG-2 is running. Upon transfer to "alternate", a Main Control Board annunciator alarms to indicate the abnormal condition. Once the transfer is made, the identical Control Room capability is unavailable. However, plant status instrument indications are still available in the Control Room since only a single instrument channel is transferred to the ASP.

The Maine Yankee plant operators are trained to use the ASP for a variety of fire scenarios including those which require a "blacked-out" condition to be created to protect against spurious equipment actuations and erratic indications. The major advantage to performing operator actions at the ASP during SBO is the consistency of the operating philosophy applied to SBO and Appendix R shutdown scenarios which both involve the operation of DG-2. Conversely, defining different operating strategies for SBO and Appendix R, we believe, may be detrimental since the operators would have to decide which operating strategy is applicable and then correctly execute the proper response.

Another advantage of providing for operator action from the ASP is a direct result of its proximity to the Emergency Feedwater (EFW) Flow Control manual bypass valves. The manual bypass valves, located in the EFW Pump Room along with the ASP, are used during the coping scenario to control flow to the Steam Generators. As previously discussed, plant status indications such as EFW flow, Steam Generator level, and RCS temperature are available at the ASP to assist the operators with this decay heat removal operation.

In response to EOP concerns expressed in Reference (e), Maine Yankee is developing a separate SBO procedure. This procedure will clarify the role of the operators during SBO. The guidance in this procedure will be consistent with question and answer 4.1 of the NUMARC 87-00 supplemental guidance which states:

> "Q: Is it acceptable to dispatch an operator from the Control Room to the remote shutdown panel for the purpose of providing power from the Appendix R diesel or the safe shutdown facility?"
>
> "A: Yes. However, the Control Room should not be abandoned. It is anticipated that recovery from a station blackout may require operator action or monitoring from the Control Room."

The guidance in the new SBO procedure will reflect occupancy of the Control Room by a senior reactor operator to monitor plant status and assist operators who have been dispatched to the ASP as well as elsewhere in the plant. This procedure will also describe the specific ASP operations and AC power restoration activities. AC power restoration activities will be directed from the Control Room. This procedure, per Reference (f), is scheduled to be completed by March 31, 1991.

The third issue to be clarified is the habitability of the Control Room and reasonable assurance that the equipment contained therein will remain operable. A loss of ventilation calculation has been performed to assess the ambient temperature rise in the Control Room during an SBO. The results of the calculation reflect an ambient temperature rise to 110°F and therefore indicate that the Control Room remains habitable. Since the ambient temperature remains below 120°F, individual Control Room equipment operability need not be addressed. To ensure that internal cabinet temperatures are in equilibrium with the ambient conditions, we will include in our new SBO procedure that the cabinets should be opened within 30 minutes of station blackout onset. This procedure is scheduled to be completed by March 31, 1991.

SER Section 2.3.3 - Compressed Air

NRC Recommendation:

The licensee should simulate the proposed operator coordination scenario and demonstrate that core cooling for decay heat removal can be adequately maintained. In addition, the quality of the backup compressor air supply should be verif :d to insure that the air supply quality will be instrument grade to operate the valves under SBO conditions.

Maine Yankee Response:

The ability to perform the manual operations required to control EFW feedwater flow is ensured by the proximity of the valves to plant status instrumentation available at the ASP. As discussed previously, the EFW flow control manual bypass valves are located in the EFW pump room adjacent to the ASP. A single operator can observe the ASP instruments, operate the Atmospheric Steam Dump Valve and manually control EFW flow to each steam generator. The coordination involved is relatively simple. Once DG-2 is running, it provides power to the bus associated with the ASP instrument indications. Therefore, plant status indication such as EFW flow, steam generator level, and RCS temperature would be available throughout the station blackout event at the ASP.

This section of the SER also identifies concerns with compressor air supply quality in light of the ambient temperature rise predicted during SBO. As a means of addressing compressor operability and associated air quality for SBO, we have investigated the option of restoring ventilation to the Steam Valve Enclosure. We have confirmed that spare capacity is available on DG-2 and MCC-9B1 to provide power to restore Steam Valve Enclosure ventilation. Therefore, an equipment modification will be made to restore ventilation to the Steam Valve Enclosure. The modification involves providing exhaust fan FN-25 with power from DG-2 via MCC-9B1. We expect to complete this modification during the next refueling outage, currently scheduled to start in October 1991.

We have previously performed an air quality test to ANSI/ISA-S7.3-1975 (R1981) specifications and verified that the EFCV air compressors provide instrument quality air under normal operating conditions. With the restoration of ventilation to the Steam Valve Enclosure, the compressors will be operating in an environment which is similar to that which exists during normal operation. Therefore, air quality during station blackout will be similar to air quality supplied during normal plant operation.

SER Section 2.3.4 - Loss of Ventilation

NRC Recommendations:

The licensee should reevaluate the effects of loss of ventilation for the areas identified in this section and correct the deficiencies in the supporting documentation. In addition, in the Control Room, cabinet doors should be opened within 30 minutes of the onset of SBO to provide adequate air mixing to maintain internal cabinet temperatures in equilibrium with the Control Room temperature.

Maine Yankee Response:

In this section of the SER, the NRC indicates concurrence with concerns expressed in the SAIC Technical Evaluation Report (TER). The concerns expressed relate to three plant areas: the Steam Valve Enclosure, the Protected Switchgear Room, and the Control Room. Each of these areas will be addressed separately in the following paragraphs.

Steam Valve Enclosure:

The SAIC TER discusses three concerns with the loss of ventilation evaluation performed for this area. Stated briefly, these concerns are:

1. Crediting roof hatches as vent spaces;
2. Failure to consider heat generated by uninsulated safety valve discharge piping;
3. Validity of the assumed initial air and wall temperature of 104°F.

The Steam Valve Enclosure roof hatches have been considered as a vent space as they are elevated by means of wood cribbing along their east and west sides. This has been confirmed during a recent plant walkdown. To ensure that the Steam Valve Enclosure roof hatches are maintained in this elevated position, we plan to replace the wood cribbing with metal cribbing, paint the cribbing red (Appendix "R" color code), affix a metal caution label and revise the controlled drawing which details these hatches to reflect the installation of the painted metal cribbing. This modification and the drawing revision will be completed by December 31, 1991.

The concern about the contribution of heat from the safety valve discharge lines was identified in Reference (d). In response to Reference (d), we revised our calculation and informally transmitted the results, 153°F doors open/164°F doors closed, to the NRC. A copy of our response to Reference (d) is provided as Attachment B.

The initial air temperature of 104°F used in the ambient temperature rise calculation is considered to be a bulk air temperature for the Steam Valve Enclosure and is appropriate for use in the steady state calculation. To alleviate ambient temperature rise concerns in this plant area, we intend to implement an equipment modification which will allow ventilation to be restored. (This modification was discussed previously in the section addressing compressed air.) In addition, our new SBO response procedure will include instructions to open the doors to this area within 30 minutes to enhance ventilation effectiveness until normal ventilation is restored. As mentioned previously, this procedure is scheduled to be complete March 31, 1991.

Protected Switchgear Room:

The SAIC TER discusses four concerns with the loss of ventilation evaluation performed for this area. Stated briefly, these concerns are:

1. No heat generation from the 120 VAC vital busses was considered;
2. Inverters are assumed to be 80% efficient which requires confirmation;
3. The temperature outside of the doors to be opened has not been determined;
4. If the room temperature exceeds 120°F, an evaluation of equipment operability was needed.

These concerns were previously identified to Maine Yankee in Reference (d). In response to Reference (d), we revised our calculation to include a statement that the vital busses are located in the Control Room and therefore are not considered in the Protected Switchgear Room evaluation. The calculation also provides justification for the inverter efficiency applied in the calculation. The inverter efficiency of 80% is taken from the table of data supplied by the manufacturer in the equipment specification and is felt to be appropriate for use in the calculation.

We have also evaluated the plant areas located adjacent to the open doors of the Protected Switchgear Room. The two sets of doors leading from the Protected Switchgear Room are opened to the Unprotected Switchgear Room and the Turbine Building. During SBO, there are no significant heat sources present in the Unprotected Switchgear Room and it is reasonable to expect that the ambient temperature in this area will be no higher than 104°F. The doors to the Turbine Building open to an interior open grating stairway area. No steam piping is located in the general area of the doors. In addition, any heat generated in the Turbine Building from hot piping will be exhausted by natural convection through the roof ventilators. We therefore believe that it is reasonable to assume that the temperature will be no higher than 104°F outside this door. This information was previously transmitted informally to the NRC in response to Reference (d) (see Attachment B).

A recent revision to our calculation conservatively added an additional heat source to the Protected Switchgear Room which resulted in an ambient temperature of 126.6°F with the doors open. We have therefore performed an equipment operability review in accordance with the guidance of Appendix F to NUMARC 87-00 and have documented reasonable assurance of operability for the equipment in the Protected Switchgear Room.

Control Room:

Both the SER and the SAIC TER refer to the need to open Control Room cabinet doors within 30 minutes of the onset of SBO to provide adequate air mixing to maintain internal cabinet temperatures in equilibrium with the Control Room temperature. To ensure that this guidance is implemented during SBO, the new SBO procedure will include the need to open cabinet doors within 30 minutes. This procedure will be issued by March 31, 1991.

SER Section 2.3.5 - Containment Isolation

NRC Recommendation:

The licensee should reevaluate the 4 inch valve and provide an appropriate justification for this omission, or correct this omission.

Maine Yankee Response:

We have reviewed the FSAR and SBO supporting documentation to identify the missing valve. The valve in question has been identified as MS-M-255 which is located in the Steam Valve Enclosure. Consistent with the Maine Yankee FSAR, this valve is normally open to allow the Main Steam System to supply auxiliary steam for various plant processes including building heating. To be consistent with the guidance in NUMARC 87-00, the new SBO response procedure will include the requirement for this valve to be closed by local manual action if containment isolation is required. This procedure will be issued by March 31, 1991.

SER Section 2.3.6 - Reactor Coolant System (RCS) Inventory

NRC Recommendation:

The licensee should provide verification that the valves necessary for RCS makeup using the auxiliary charging pumps can be lined up to supplement RCS inventory independent of preferred and Class 1E power supplies. Also, the necessary instrumentation for reactor vessel monitoring should remain operational inside the Control Room during a station blackout.

Maine Yankee Response:

SBO response procedures contain a specific valve lineup for operating the auxiliary charging pump (ACP) with suction from the RWST to provide make up to the RCS. In order to verify the ability to operate the identified valves independent of Class 1E or preferred power, the following has been verified:

- The valves are located in areas which are habitable; i.e., supports local operator action,
- The valves are accessible; i.e., the operators have access to secured areas whose doors may fail in the locked-closed position upon SBO and there is adequate portable or emergency lighting in the areas, and
- The valves have handwheels to permit local manual operation.

With regard to operation of the Primary Inventory Trend System (PITS) which provides information on RCS water level in scenarios where the pressurizer is empty, we have confirmed that the PITS is powered from the 120 Volt AC vital busses. Therefore, the Maine Yankee design provides PITS indication in the Control Room for use during SBO.

NRC Question 1a:

You have stated during our site audit review (June 13 through 16, 1989) that no reactor coolant makeup is needed for the duration of the SBO. Your calculations are based on no Reactor Coolant System (RCS) volume shrinkage due to cooldown. Assuming 88 gpm leakage rate, the pressurizer will be emptied in less than an hour. Therefore, RCS makeup appears to be required. Provide assurance that the operators will be able to assess the reactor coolant level after pressurizer level indication is lost and the pressurizer is empty due to the loss of RCS or possible RCS shrinkage.

MY Response 1a:

The Maine Yankee SBO Coping Analysis was performed in accordance with the guidance provided in NUMARC 87-00 and Regulatory Guide 1.155. These documents identify the need to define an RCS leakage rate and to then ensure that the reactor core remains covered and can be adequately cooled. There is no explicit requirement in the guidance documents for providing indication of RCS level during SBO.

Maine Yankee has installed instrumentation which can provide indication of reactor vessel level for conditions where the pressurizer is drained. The Primary Inventory Trend System (PITS) is connected to the Vital Bus System and displays indication at the Main Control Board (MCB). The PITS has not previously been identified as required for SBO coping, and will not be considered either as necessary or essential instrumentation for SBO because:

1. Expected RCS leakage and associated inventory loss during SBO will be far less than 88 gpm. System makeup is available in the form of an auxiliary charging pump. The Maine Yankee coping procedure directs the operators to initiate and align this makeup source, it is unreasonable to assume that it will not be used. A more detailed discussion of the considerable margin available on RCP seal leakage and the contribution of the auxiliary charging pump on RCS inventory and core cooling is provided in the response to Question 1b.

2. As discussed in Section 2.5.1 of NUMARC 87-00, the purpose of establishing an RCS leakage rate is to assure adequate core cooling. There is no stated requirement to monitor vessel level throughout the SBO coping duration. The potential to drain the pressurizer during SBO is not unique to Maine Yankee. We therefore feel that NUMARC 87-00 reflects the position developed by NUMARC, and agreed to by the NRC, that vessel level indication need not be provided for SBO.

With regard to the potential for inventory shrink, Maine Yankee's primary inventory calculation demonstrates that the decay heat generated after only one day of operating time is sufficient to overcome system heat losses to the environment over the course of the SBO coping duration. Therefore, it is inappropriate for Maine Yankee to assume inventory shrink in addition to assumed leakage.

<u>NRC Question 1b:</u>

Evaluate the effect of RCS volume shrinkage below the reactor vessel hot legs on inhibiting natural circulation flow of coolant from the reactor core to the Steam Generator (SG) tubes.

<u>MY Response 1b</u>

RCS leakage rates were selected by conservatively applying the NUMARC 87-00 guidelines. The resultant value of 88 gpm was used to assess RCS inventory even though expected leakage for the Maine Yankee RCP seal design is far less. The 88 gpm leakage rate applied in the Maine Yankee coping analysis was comprised of the following assumptions:

- RCP seal leakage of 25 gpm per pump for a total of 75 gpm.
- Maximum allowable RCS leakage of 13 gpm as defined by the plant Technical Specifications.

Imposing a seal leakage rate of 25 gpm per pump is extremely conservative for Maine Yankee as demonstrated by industry tests and operating experiences with both the currently installed Type SU seal and the newly developed Type N-9000 seal. Maine Yankee's coping analysis identified the maximum seal leakage as three gpm under loss of all seal cooling conditions. Therefore, considerable margin clearly exists between the 25 gpm assumed leakage rate and the three gpm expected leakage rate. A more realistic but still conservative assumption of 12 gpm leakage per pump (four times the leakage demonstrated under conservative test conditions) and makeup from the auxiliary charging pump would result in an inventory loss of approximately 850 cubic feet. This estimated inventory loss is not expected to reduce level below the top of the steam generator tube bundles over the four hours for SBO coping. Therefore, natural circulation cooling would be maintained.

<u>NRC Question 1c</u>

Justify the assumption made in MYC-191 that the RCS pressure will remain at 2,000 psia, throughout the RCS volume shrinkage over the SBO duration.

<u>MY Response 1c</u>

The 2,000 psia assumption chosen in MYC-191 was intended to be used to conservatively estimate the liquid density for the event. As shown on Page 16, the higher density liquid resulting from the 2,000 psia assumption maximizes the inventory shrinkage, thus minimizing the RCS volume filled with liquid.

NRC Question 1d

During the site audit review, you indicated that Main Steam Safety Valves (MSSVs) will be used to remove decay heat to the environment; therefore, there is no need to operate an atmospheric dump valve. Provide an analysis for the expected number of MSSV cycles during the four-hour SBO duration for the decay heat removal mode. Also, provide assurance that the MSSVs will remain operable, considering expected conditions, when subjected to the expected number of cycles, over the SBO duration.

MY Response 1d

As discussed in the Maine Yankee coping analysis, the Decay Heat Release Valve, MS-A-162, is used to remove decay heat and maintain the plant at hot shutdown conditions after the first hour of the SBO coping duration. During SBO, control air needed to operate MS-A-162 is supplied by the Excess Flow Check Valve (EFCV) air compressors, C-10A and C-10B. C-10A and C-10B are connected to MCC-9B1, which is energized by DG-2, the Maine Yankee AAC source. Since credit cannot be taken for starting DG-2 until after one hour (per NUMARC 87-00), MS-A-162 is not considered to be operable for the first hour of the SBO coping duration. During this one hour period, the MSSVs will be used to remove decay heat.

Maine Yankee has evaluated the response of the safety valves during the first hour of the SBO coping duration. The operating conditions predicted in this evaluation show that only one safety valve per header will be actuated. The number of operating cycles are characterized as follows:

- In the first 30 minutes, prior to auxiliary feedwater delivery, the safety valves will lift 40 times and will remain open for approximately five seconds each time.
- After auxiliary feedwater is initiated, the safety valves will lift approximately 7-1/2 times in 30 minutes and will remain open for approximately five seconds each time.

The safety valve manufacturer has provided written confirmation that these operating conditions will not result in failure of the valves.

NRC Question 2a - Protected Switchgear Room

In the calculation of the steady state temperature in this room, no heat generation from the 120V ac vital distribution buses was considered. In addition, the evaluation took credit for opening the doors without determining the temperature of the areas outside of these doors. Furthermore, the inverters are assumed to be 80% efficient. Since the bulk of the room heat input is from the inverters, a decrease in inverter efficiency will result in an increase in the steady state ambient temperature (e.g., by using 70% efficiency for all inverters, the steady state ambient temperature would be 131°F versus the 124.7°F calculated temperature at 80% inverter efficiency). Re-evaluate the protected Switchgear Room temperatures and justify your assumptions to reflect the above information for SBO equipment operability, including inverters at the calculated temperature.

MY Response 2a

The calculation performed to determine the ambient temperature rise during SBO incorrectly states that the 120V ac vital buses are located in the Protected Switchgear Room. The vital bus panels are located in the Control Room and their associated heat generation is included in the value used to assess Control Room ambient temperature. Therefore, the heat generation sources for the Protected Switchgear Room have been appropriately accounted for. In order to limit the ambient temperature rise in the Protected Switchgear Room, the SBO coping procedure has been revised to direct the plant operators to open two sets of double doors in the room. The effects of opening these doors have been evaluated using the method provided in Appendix/E to NUMARC 87-00. Section E.3.3 provides an example of the effects of opening doors and indicates that the correlations are based on the assumption that the ambient air outside the door is constant at 40°C (104°F). The two sets of doors leading from the Protected Switchgear Room are opened to the unprotected Switchgear Room and the Turbine Building, respectively. During SBO, there are no significant heat generation sources in the unprotected Switchgear Room. The double doors to the Turbine Building open to an interior open grating stairway area, located at El. 45'-6" of the Turbine Building. No steam piping is located in the general area of this double door. Additionally, any heat generated in the Turbine Building, during SBO, from steam piping will be exhausted by natural convection through the Turbine Building roof ventilators. Therefore, we feel that the assumption that ambient temperature is no more than 40°C is reasonable for the areas outside the doors.

The largest heat source in the Protected Switchgear Room is the station inverters. The inverter efficiency of 80% is taken from the table of data supplied by the inverter manufacturer, which is included in the inverter procurement specification. This is felt to be an adequate basis for the inverter efficiency used in our room heatup calculation and does not require re-evaluation. Based on original procurement information, we believe the inverters will remain operable under the calculated ambient conditions in the Protected Switchgear Room.

NRC Question 2b - Steam Valve Enclosure

During an SBO, MSSVs are expected to cycle to release decay heat to the atmosphere. Are the discharge lines on these safety valves insulated? What is the effect of heat transfer from these discharge lines on the steady state ambient temperature? If the temperature exceeds 165°F, what is the effect of fire damper closure on the final temperature?

MY Response 2b

Although the calculation considered the heat generated by the safety valve headers, the individual inlet lines, the decay heat release valve piping, and the safety valve discharge lines were not included. We have evaluated the heat generated from the discharge lines of the three safety valves, which will cycle during the first hour of SBO (refer to the response to Question 1d). This was assumed to be a constant heat source for four hours to provide conservative results. The additional heat generated results in an ambient room temperature of 153°F when the doors are opened and 164°F with the doors closed. The doors are to be opened as directed by the SBO coping procedure (AOP 2-90-1). The fusible link fire damper is located in a supply opening in the wall and is actuated at 165°F. Since the opening containing the damper is located at floor level (El. 21'-0") and the ambient temperature calculated is a nominal bulk air temperature, we expect that the ambient temperature calculated in the area of the fire damper will remain below the 165°F actuation setpoint.

NRC Question 3

Provide results of the transient loading test for the Appendix R diesel (DG-2) AAC power source for the SBO, with the largest motor load while isolated from the IE power system.

MY Response 3

Maine Yankee evaluated the voltage dip on DG-2 associated with starting the single largest load (auxiliary charging pump, P-7) while DG-2 is running and base loaded. We found that, upon start of the 75 horsepower P-7, the DG-2 terminal voltage drops 16.2%. The voltage then recovers sufficiently to limit the starting voltage drop at P-7 to 351 volts (76.3%) which exceeds the 345 (75%) minimum starting voltage. Full voltage would be restored on DG-2 within one to two seconds after starting P-7. Therefore, DG-2 can accept the starting of the largest load without significant effect on the voltage, and P-7 has adequate voltage for acceleration to rated speed.

NRC Question 4

Provide power source information concerning the two motorized actuators for the Appendix R diesel (DG-2) intake louver.

MY Response 4

The intake louvers are powered via circuit number 10 of the 120/240V distribution cabinet panel supplied by MCC-9B1. MCC-9B1 is powered by DG-2 in the event of an SBO.

NRC Question 5

Verify that the QA program for the Appendix R alternate shutdown panel, SBO safe shutdown panel, is in accordance with the QA guidance of Regulatory Guide 1.155, Section 3.5.

MY Response 5

The Maine Yankee QA Manual is being revised to incorporate the QA guidance of Regulatory Guide 1.155, Section 3.5 for the SBO safe-shutdown panel (Appendix R - Alternate Shutdown Panel). This effort is scheduled for completion by 12/31/89.

NRC Question 6

You have stated during the site audit review that you have not verified any Control Room and other area SBO equipment for operability during a four-hour SBO, and assumed that such equipment would be operable since Control Room and other areas steady state ambient temperatures would not increase above 120°F. Provide analysis concerning selected vulnerable SBO equipment inside the Control Room and other areas which (a) are not enveloped by its design to 120°F and therefore require an operability assessment, and/or (b) would likely require special actions to assure operability for a four-hour SBO.

MY Response 6

SBO coping for Maine Yankee has been evaluated using the guidance provided in NUMARC 87-00. The approach discussed in Sections 2.7.1(2) and 2.7.2(2) of NUMARC 87-00, and the information provided in Question No. 6 of the question/answer document provided by NUMARC, indicate that equipment operability need not be addressed for areas with an ambient temperature of 120°F or less. Since both NUMARC 87-00 and the question and answer document have been accepted by the NRC, we believe that our evaluation is adequate and further analysis is not required.