

# Maine Yankee

RELIABLE ELECTRICITY SINCE 1972

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December 12, 1996

MN-96-179

JRH-96-274

## UNITED STATES NUCLEAR REGULATORY COMMISSION

Attention: Document Control Desk

Washington DC 20555

- Reference:
- (a) License No. DPR-36 (Docket No. 50-309)
  - (b) Letter: D.H. Dorman, USNRC to C.D. Frizzle; "Adequacy Of The Offsite Power System At Maine Yankee Atomic Power Station (TAC No. M96589)" Dated November 21, 1996.
  - (c) "Proposed IEEE Criteria for Class IE Electrical Systems for Nuclear Power Generating Stations" dated June 1969; as referenced on page 8-6 of the Maine Yankee Final Safety Analysis Report.
  - (d) Maine Yankee Final Safety Analysis Report, License No. DPR-36 (Docket No. 50-309) through Revision 12, April 1996. Appendix A.
  - (e) Letter: USNRC to J.B. Randazza; "Technical Specification Amendment 106"; September 7, 1988.
  - (f) Letter: USNRC to C.D. Frizzle; "Issuance of Amendment 140 to Facility Operating License No. DPR-36, Maine Yankee Atomic Power Station (TAC No. M85902); dated August 3, 1993; with Safety Evaluation Report Enclosed.
  - (g) Letter: SECY-92-223, dated September 18, 1992
  - (h) Letter: R. C. DeYoung, USAEC to W. H. Dunham; February 29, 1972; Enclosure: Safety Evaluation prepared by the Division of Reactor Licensing concerning application for Operating License.

Subject: Response to "Adequacy of the Offsite Power System at Maine Yankee Atomic Power Company"

Gentlemen:

Reference (b) documents a November 15, 1996 telephone conference call between members of the NRC staff and Maine Yankee engineering and licensing personnel. Reference (b) also requested Maine Yankee to respond to three questions regarding the Offsite Power Systems for Maine Yankee. The purpose of this letter is to provide the requested information.

During the conference call and in Reference (b), the staff stated that it appeared that Maine Yankee has changed its design basis from General Design Criterion (GDC) 17 in Appendix A to 10CFR Part 50 to draft Criterion 39. As explained in more detail below, Maine Yankee has not changed its licensing basis. Since initial licensing, the licensing basis for Maine Yankee has been two redundant 115 kV lines and a 345 kV line available within six hours, with only one of the two redundant 115 kV lines required to be operable. Furthermore, Appendix A of the Final Safety Analysis Report for Maine Yankee has stated since initial licensing that the licensing basis for the Offsite Power System meets draft Criterion 39. Additionally, subsequent to initial licensing, Maine Yankee and NRC have concluded that the design of the Offsite Power System also meets GDC 17.

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In order to respond to the specific questions in Reference (b), Maine Yankee wishes first to restate its position relative to the licensing Basis of the Maine Yankee Offsite Power Systems.

Maine Yankee's Offsite System is comprised of two sources:

- (1) The primary source is the 115 kV offsite source which is comprised of 115 kV Section 69, "Suroweic Line"; 115 kV Section 207, "Mason Line"; the X-14 reserve transformer (115 kV/4160 V), the X-16 reserve transformer (115 kV/6.9 kV), and the associated breakers and busses. Either the Suroweic Line or the Mason Line should be able to function as the primary source of offsite power. This position is stated on page 8-3 of the FSAR, "Either of the two 115 kV incoming lines are independently capable of supplying the plant auxiliary power requirements". Suroweic is not the backup power source to Mason or vice-versa. This position is consistent with Technical Specification 3.12 which requires one 115 kV incoming line to be operable, but does not specify which one, Suroweic or Mason.
- (2) The backup source is the 345 kV offsite supply, which is comprised of the 345 kV transmission system, the main station transformers X-1A and 1B (22 kV/345 kV), the station service transformers X-24 (22 kV/4160 V) and X-26 (22 kV/6.9 kV), and the associated breakers and busses. This power source has always been considered the "...alternate access to the transmission network within 8 hours of post accident unit shutdown" specified in Reference (c) as specified in the Maine Yankee FSAR. This position is also stated on page 8-4 and A-33 of the Maine Yankee FSAR which states that the 345 kV backfeed can be completed within six hours.

Reference (b) states that "The NRC Staff understands that Suroweic is no longer capable of sustaining required voltage while receiving a fast transfer of plant loads as the second (delayed) offsite power source. It appears that MYAPCo has changed the licensing basis from GDC 17 to Criterion 39 and has now chosen the 345 kV back-up feed as the delayed offsite power source."

As discussed above, the 345 kV line has always been the back-up source as has been stated in the FSAR and the operating license Safety Evaluation Report. As stated on pages 46 and 47 of the Safety Evaluation Report for issuance of the operating license for Maine Yankee (Reference (h)), the Offsite Power System consists of 345 kV and 115 kV lines with power from the independent 345 kV line being available in six hours, which the staff concluded was acceptable. In fact, Maine Yankee management agreed to put in place the procedures to implement the 345 kV system as the backup or delayed power source in response to a request of the Regulator (AEC) concerning the postulated failure of a common 115 kV transmission tower.

Since the original licensing of the Plant, Maine Yankee has committed to maintaining both 115 kV lines as the primary source. For example:

In response to an additional request during the licensing phase, Maine Yankee purchased and installed the X-16 transformer with a 4160 V tertiary winding to allow it to operate as a manually initiated, limited capacity alternative to X-14 should the X-14 transformer be unavailable.

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After initial licensing, questions arose regarding the reliability of the Suroweic line. Based on these questions Maine Yankee took the following actions:

- (A) Maine Yankee applied for a change to its Technical Specifications to prohibit reliance upon the Suroweic Line for satisfying the Technical Specification requirement to have one 115 kV line in service. In a Safety Evaluation dated September 7, 1989, (Reference (e)), NRC found this to be acceptable, citing the fact that power could be supplied by the 345 kV line within six hours.
- (B) Maine Yankee installed a capacitor bank to improve the voltage stability of the Suroweic Line. Upon installation of the capacitor bank, the NRC approved Technical Specifications changes on August 3, 1993 (Reference (f)), allowing Maine Yankee to take credit for the Suroweic Line as a primary source of 115 kV power.
- (C) The NRC has requested that Maine Yankee perform a 115 kV Offsite Power Voltage analysis on a regular basis. Maine Yankee has performed these studies, and as a result, has determined that under severe system and plant loading conditions, including a Safety Injection Actuation Signal (SIAS), the Suroweic Line may be unable to support voltage requirements. Some of the difficulty with voltage recovery on the Suroweic Line results from a change in voltage acceptance criterion to support the conservative voltage assumptions of the MOV Program and a change in assumptions concerning the automatic plant response to a plant trip. Maine Yankee has informed the NRC of this concern by letter dated July 19, 1996 (Reference (i)), and stated that Maine Yankee would consider the Suroweic Line to be inoperable when these conditions existed. This letter also stated that Maine Yankee continued to satisfy its licensing basis, because the Technical Specifications only required one of the redundant 115 kV lines to be operable and because the 345 kV line is available as a backup supply.

In summary, since initial licensing, Maine Yankee's licensing basis for the Offsite Power Systems has been two redundant 115 kV lines, and a 345 kV line available within six hours, with only one of the two redundant 115 kV lines required to be operable. NRC has found this to be acceptable, as indicated in Safety Evaluations dated February 29, 1972, April 23, 1987, September 7, 1988 and August 3, 1993.

Maine Yankee is reviewing several options to restore the Suroweic Line to a fully capable power source by reducing the load impressed on the Suroweic Line after fast transfer. These options include, but are not limited to, the installation of Safety Injection Actuation Signal (SIAS) Feedwater Pump breaker close blocks to preclude the auto-start of non-essential large motors. Also being considered is the addition of SIAS trip signals to non-essential running equipment, such as containment recirculation fans, which have no safety function at Maine Yankee. The implementation of some options may require further regulatory review and some may be implemented at the discretion of Maine Yankee. We will inform your Staff of the results of our evaluation.

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The following discussion is in response to the specific statements and questions contained in reference (b):

## **NRC Statement:**

"By letter dated February 29, 1980 (WMY 80-32), MYAPCo submitted a voltage study, 'Auxiliary Power Systems Voltage Study for Maine Yankee Atomic Power Station,' that was conducted to determine, 'if the offsite power system and the onsite electric distribution system is of sufficient capacity with capability to automatically start and operate all safety loads if all onsite power sources are not available.' In that letter, MYAPCo stated that, 'We have also reviewed the electric power systems at Maine Yankee and found total compliance with [General Design Criterion (GDC)] 17.'"

## **Maine Yankee Response:**

The February 29, 1980 letter referenced above documents an analysis Maine Yankee performed in accordance with the guidelines contained in the August 8, 1979 NRC letter to All Power Reactor Licensees; "Adequacy of Station Electrical Distribution Systems Voltages" which examined the capabilities of the offsite power systems without the benefit of onsite systems. The analysis confirmed that either the Suroweic Line or the Mason Line met the requirements stipulated in the letter. At that time, the Motor Driven Main Feed Pumps were always in the "run" mode. Consequently, starting current for these large motors was not a factor in the voltage study. In addition, the Emergency Feedwater Pumps were manually started and, consequently, were not a load to be considered during fast transfer. The degraded voltage relay system at that time only provided an alarm function and the setting was lower than the present setting. Maine Yankee was able to conclude that either the Mason or the Suroweic Lines could each independently meet the requirements of the August 8, 1979, NRC letter.

Maine Yankee's response to NRC's letter was not intended to change Maine Yankee's licensing basis from draft Criterion 39 to GDC 17. Maine Yankee's response referenced GDC 17 because NRC's letter requested licensees to review their offsite power systems "to determine if any potential exists for violation of GDC 17." Thus Maine Yankee was trying to be responsive to the NRC's request. No change in the design basis was intended, as indicated by the fact that the FSAR has continued to reference draft Criterion 39.

## **NRC Statement:**

"The NRC Staff understands that the Suroweic Line is no longer capable of sustaining required voltage while receiving fast transfer of plant loads as the second (delayed) offsite power source."

## **Maine Yankee Response:**

The NRC is correct in that the Suroweic line is not considered capable of sustaining voltage while receiving fast transfer under worst case system and plant loading conditions. However, the assumption that the Suroweic Line is "the second (delayed) offsite power source", is not correct. Furthermore, even if the Suroweic Line was considered to be the second (delayed) offsite power source it would not be required to be capable of immediately accepting plant loads on a fast transfer under the GDC 17. A delay in accepting loads would require the Suroweic supplied 115 kV source to only accommodate those loads which would be restarted upon failure of fast transfer, essentially the same loads which would have been loaded on the Emergency Diesels. Suroweic is capable of handling these loads which would not include Reactor Coolant Pumps, Main Feed Pumps, Condensate Pumps, and Circulating Water Pumps. These large loads would be manually started in



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a controlled and deliberate fashion if required or desired. In addition, the system voltage limitation associated with MOV operating voltage would no longer be applicable since the valves would have performed their safety function

Although the Suroweic line is not necessary to satisfy the technical specifications, Maine Yankee is not yet prepared to abandon the Suroweic line as a primary 115 kV source with fast transfer capability. As a result Maine Yankee will pursue further enhancements to reestablish Suroweic as a fully capable 115 kV line.

## **NRC Statement:**

"It appears that MYAPCo has changed the license basis from GDC 17 to Criterion 39 and has now chosen the 345 kV backfeed as the delayed offsite power source."

## **Maine Yankee Response:**

As stated previously, the license basis has continued to reference Criterion 39, based on acceptance of the plant design basis during the operating license reviews, (References (d), (g), and (h)). The delayed offsite power source is and has always been the 345 kV source.

## **NRC Statement:**

"Based on the 1980 adequacy study, MYAPCo took a position of total compliance with GDC 17 for the offsite power system. It has been the Staff's understanding during the subsequent discussions regarding the offsite power system that MYAPCo was working hard toward satisfying that requirement. The NRC was not aware of MYAPCo's new position."

## **Maine Yankee Response:**

Refer to the responses to statements above.

GDC 17 requires that "One of these circuits shall be designed to be available within a few seconds following a loss of coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained." Maine Yankee desires that both Suroweic and Mason Line should each meet this provision, even though GDC 17 only required that one of these lines meet this provision. In fact, as stated in safety evaluations dated April 23, 1987, and September 7, 1988, the NRC has found that the Offsite Power System for Maine Yankee satisfies GDC 17 without any reliance on the Suroweic Line.

## **NRC Statement:**

"Criterion 39 requires that the onsite and offsite power systems be independent and each system be single failure proof. Therefore, criterion 39 is more stringent than GDC 17. Because a single failure proof offsite power system is not attainable, GDC 17 does not require the offsite power system to be single failure proof."

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## **Maine Yankee Response:**

Draft Criterion 39 does not require the offsite power system to be single failure proof, as that term is used in the GDC in Appendix A to Part 50. Instead, draft Criterion 39 states that the offsite power system shall permit the functioning of the engineered safety features "assuming a failure of a single active component" in the system.

The primary source (115 kV system) and the secondary source (345 kV system) meet the intent of GDC 39 for separation and independence. Reasonable and credible failure of one source is unlikely to result in the failure of the other source. Maine Yankee's configuration was examined by the regulator in detail, Reference (h) and the offsite power source was found to be acceptable. Additionally, when the NRC issued Amendment 106 to the Technical Specifications on September 7, 1988 (Reference(e)), it found the offsite Power System for Maine Yankee to be acceptable under GDC 17 based upon the Mason 115 kV line and the 345 kV line.

## **NRC Statement:**

"Provide the assumptions and results of any analyses (i.e., systems and voltages) that demonstrate the ability to maintain safe shutdown (i.e. not exceeding fuel design limits, maintaining reactor coolant pressure boundary, etc.) of the plant during the period required (i.e., 6 hours) to establish the back-feed. "

## **Maine Yankee Response:**

Such an analysis is not required as part of Maine Yankee's licensing basis for the Offsite Power System and therefore does not exist. Under either its licensing basis, draft Criterion 39, or GDC 17, Maine Yankee is not required to assume a loss of coolant accident (LOCA) with a (SIAS), concurrent with a loss of both emergency diesel generators (EDGs), concurrent with a loss of the 115 kV Mason line. In the absence of a LOCA and SIAS (and assuming the loss of the 115 kV Mason line), the Suroweic line is fully capable of supplying required loads in the event of a fast transfer to the 115 kV system. Therefore, Maine Yankee need not analyze the conditions postulated in NRC's question (i.e., an absence of onsite and offsite power for six hours due to a loss of both EDGs and a loss of both 115 kV lines). The assumption of a loss of all on-site alternating current power sources and the coincident non-mechanistic loss of one of the two offsite power sources is a requirement of GDC 17. Maine Yankee's licensing basis assumes a simultaneous single active failure in both the onsite and offsite systems which leaves one emergency diesel generator and one offsite power source (Mason - Suroweic 115 kV or 345 kV backfeed.) operable. This scenario, which Maine Yankee considers its design basis, does not result in a station blackout condition for six hours.

Furthermore, even with the Suroweic line presently not capable of supporting worst case fast transfer if we assume the loss of Mason coincident with a LOCA and a loss of a diesel, we can almost immediately transfer emergency loads from the operating diesel to a Suroweic supplied 115 kV source by operator action. The operator can manually align loads and buses to the X-14 transformer or in the case of failure of the X-14, to manually align limited loads and buses to the tertiary winding of the X-16 transformer. These evolutions would not challenge the Suroweic Line's capability since loads would be added in a controlled manner and would not include Reactor Coolant Pump motors, Feedwater Pump motors, and similar heavy power loads. The capability of Suroweic Line in this scenario is derived from the existing more conservative voltage studies and does not require a new analysis.

In addition, the system voltage limitation associated with MOV operating voltage would no longer be applicable since the majority of valves would have performed their safety function. Therefore, a lower system operating voltage would be acceptable.

Since the scenario described by the Staff, "coping with an unavailability of the 115 kV source simultaneous with no available emergency diesel generator" is considered by Maine Yankee to be beyond the licensing and design basis, as well as of extremely low probability, Maine Yankee has not performed the analysis described. If power is restored after a Station Black Out (SBO) through operator action to re-energize emergency loads on Suroweic, this evolution would be enveloped by the existing SBO four hour coping analysis with significant margin. Furthermore, even if it is assumed that both 115 kV lines were lost and both emergency diesels were unavailable, Maine Yankee would have available the Appendix R diesel (DG-2). DG-2 is relied upon for Appendix R and Station Blackout Scenarios only and is not considered part of the onsite emergency power supply.

## **NRC Statement:**

"Identify MYAPCo's intention regarding the licensing basis (i.e. GDC 17 or Criterion 39) for the offsite power system and state any plans to amend the plant technical specifications to reflect the licensing basis. In addition, submit a copy of your safety evaluation that provided the bases for your determination that the change in the design criterion for the offsite power system did not involve an unreviewed safety question."

## **Maine Yankee Response:**

Maine Yankee has not changed its licensing position. Its position is consistent with the existing Technical Specification 3.12 and is as described in the FSAR, Chapter 8 and Appendix A. Consequently, no 10CFR50.59 evaluation has been performed.

A difficulty, similar to the present day concern, in demonstrating the adequacy of the Suroweic line to function as a fully capable 115 kV offsite line was reviewed by the NRC (USNRC to J.B. Randazza, Amendment 106, September 7, 1988, "Safety Evaluation by the Office of Nuclear Reactor Regulation Relating to Amendment No. 106 to Facility Operating License DPR-36"). In this review NRC found the Offsite Power System for Maine Yankee to be acceptable under GDC 17 based on the 345 kV line and the Mason line without reliance on the Suroweic 115 kV line.

## **NRC Statement**

"Provide MYAPC's plans and schedule to restore the adequacy of the Suroweic line and/or to reduce the time to establish the back-feed."

## **Maine Yankee Response:**

Maine Yankee is actively pursuing design changes to reestablish the capability of the Suroweic line as a fully capable offsite 115 kV line. Some of these potential design changes may be able to be implemented during the 1997 outage, but we have not yet determined the full scope of the work required.

One potential change is to install a blocking signal in the Motor Driven Main Feed Pump's auto start circuitry when a Safety Injection Actuation Signal is present. However, there may be operational or safety ramifications to this proposed change which we have not yet fully evaluated.

Another potential change under review is the tripping of the containment air recirculation fans coincident with an accident condition. This modification would also reduce the fast transfer load.

We are also revisiting possible changes to the X-14 transformer configuration originally considered when the capacitor bank installation was being discussed with the NRC. This possibility also may not be a complete solution and would be a long lead time effort.

An examination of the voltage study and a reappraisal of the criterion established by Generic Letter 89-10 for Motor Operated Valves has caused us to drop any further consideration of changes directly associated with Motor Operated Valves.

We continually discuss procedural changes with the utility, Central Maine Power, to enhance the voltage control on the 115 kV grid. This type of "soft" modification may enable us to modify some of the assumptions in the voltage analysis, but since this discussion has been ongoing for many years, the likelihood of significant relief is limited.

The NRC requested additional information during the conference call discussed previously.

## **NRC Question:**

"Is the 345 kV backfeed modeled in the IPE/IPEEE?"

## **Maine Yankee Response**

The 345 kV backfeed is not explicitly modeled in the PRA (IPE). Offsite power (both 115 kV and 345 kV) was originally modeled as a single unit for IPE purposes (although fast transfer is modeled). To date we have not identified a need to enhance the model, but we are revisiting that conclusion at the present time.

## **NRC Question**

"What is the Emergency Diesel Generator Mission time?"

## **Maine Yankee Response**

The base mission time for everything in the PRA, including the EDGs, is 24 hours. However, a time dependent recovery calculation is then applied for electric power. For most cases, it's likely that 115 kV would be recovered within a few hours.

In addition, Emergency Diesel Generators have adequate on-site fuel oil inventory to support required electrical loads for 7 days without replenishing the fuel supply.



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## NRC Question

"Is there a voltage analysis for the 345 backfeed configuration."

## Maine Yankee Response

No analysis has been performed. Since the 345 kV backfeed option would only manually energize safety significant loads and those other loads considered beneficial, this loading would be much less than the normal plant operating loads. The 345 kV system by nature is more robust than the 115 kV system and therefore is inherently more stable. Furthermore, the system voltage limitation associated with MOV operating voltage would not longer be applicable since the valves would have performed their safety function.

## NRC Question

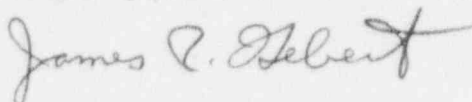
"What is the core damage probability calculated for the incident which occurred on November 9 when both the Mason and the Suroweic line were not available?"

## Maine Yankee Response

Maine Yankee calculated a core damage probability of  $3.5 \times 10^{-6}$  based on the assumption that both Suroweic and Mason were not available for about 10 hours and 20 minutes. Suroweic was actually restored in under five hours, however due to the Technical Specification interpretation in effect, no credit was given for operability of the Suroweic supplied 115 kV source. Even though, as discussed previously, loads could be transferred to the 115 kV source supplied from the Suroweic Line by operator action within a very short time after fast transfer failure.

In conclusion, Maine Yankee will work with the Staff to resolve any misunderstandings and remains committed to restoration of the Suroweic line as a fully capable 115 kV offsite power source.

Very truly yours,



James R. Hebert, Manager  
Licensing and Engineering Support

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