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Dominion®

April 5, 2007

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

Serial No. 07-0008A
KPS/LIC/CDS: R13
Docket No. 50-305
License No. DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST 230,
"EMERGENCY DIESEL GENERATOR SHORT-TIME LOAD TESTING"

Pursuant to 10 CFR 50.90, Dominion Energy Kewaunee, Inc. (DEK) submitted a request for approval of a proposed amendment to the Kewaunee Power Station (KPS) Technical Specifications (TS) (reference 1). The proposed amendment would modify KPS TS 4.6.a.5 to permit performance of the emergency diesel generator (EDG) short-time load test at a reduced load. Specifically the proposed amendment would lower the load at which the rated load test is performed from 2950 kW to a load band between 2730 and 2860 kW.

Subsequently, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI) regarding the proposed amendment (reference 2). The RAI questions and associated DEK responses are provided in attachment 1 to this letter. Attachment 2 and 3 provide copies of a calculation and evaluation that were requested in two of the RAI's. Attachment 4 provides copies of selected "difficult-to-retrieve" documents that are referenced in the RAI responses. In addition, based on the NRC questions, changes have been made to the proposed TS and TS bases pages. These changes are included as attachment 5 and are discussed in attachment 1.

Please note that the RAI responses attached assume implementation of a modification which is not yet completed. When implemented, this modification will prevent the spent fuel pool cooling pumps from automatically loading on the EDGs, thereby reducing short-term loading by approximately 34.9 kW for each EDG. This modification is necessary in order to reduce actual peak EDG loading on both EDGs to below the short-time rating. The calculations for EDG loading in attachment 2 and the RAI responses which reference this calculation assume that this modification is complete. DEK will provide the NRC with a follow-up letter when this modification is completed.

The attached responses do not change the conclusions of the no significant hazards determination in reference 1. DEK requests that the NRC review the attached responses as soon as possible.

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If you have any questions or require additional information, please contact Mr. Craig Sly at (804) 273-2784. A complete copy of this submittal has been transmitted to the State of Wisconsin as required by 10 CFR 50.91(b)(1).

Very truly yours,

Gerald T. Bischof
Vice President - Nuclear Engineering

Commitments made by this letter:

1. DEK will submit written notification to NRC when the design change request (DCR 3668) to remove the spent fuel pool cooling pumps from automatic loading on the KPS emergency diesel generators is complete.
2. DEK will update IPEOPs to limit post-accident EDG loading to no greater than 2860 kW upon implementation of DCR 3668.

References:

1. Letter from Gerald T. Bischof (DEK) to Document Control Desk, "License Amendment Request 230 – Emergency Diesel Generator Short-Time Load Testing," dated January 10, 2007 (ADAMS Accession No. ML070120088).
2. Letter from R. F. Kuntz (NRC) to D. A. Christian (DEK), "Kewaunee Power Station – Request for Additional Information Related to Emergency Diesel Generator Short-Time Load Testing (TAC No. MD3995)," dated March 8, 2007 (ADAMS Accession No. ML070600485).

Attachments:

1. Response to NRC Request for Additional Information Regarding Kewaunee License Amendment Request 230.
2. Kewaunee Power Station Emergency Diesel Generator Load Calculation C-042-001.
3. Kewaunee Power Station Operability Determination (OD)-151, Diesel Generator Room Temperature Evaluation.
4. Copies of Selected References.
5. Revised Marked Up and Affected Technical Specification Pages.

cc: Regional Administrator, Region III
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COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Gerald T. Bischof, who is Vice President – Nuclear Engineering of Dominion Energy Kewaunee, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 5th day of April, 2007.

My Commission Expires: August 31, 2008.

Margaret B. Bennett
Notary Public

(SEAL)

ATTACHMENT 1

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING KEWAUNEE LICENSE AMENDMENT REQUEST 230

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

Response to NRC Request for Additional Information Regarding Kewaunee License Amendment Request 230

Pursuant to 10 CFR 50.90, Dominion Energy Kewaunee, Inc. (DEK) submitted a request for approval of a proposed amendment to the Kewaunee Power Station (KPS) Technical Specifications (reference 1). The proposed amendment would modify KPS Technical Specification 4.6.a.5 to permit performance of the emergency diesel generator (EDG) short-time load test at a reduced load. Specifically, the proposed amendment would lower the load at which the rated load test is performed from 2950 kilo-Watts (kW) to a load band between 2730 kW and 2860 kW.

Subsequently, on March 8, 2007, the Nuclear Regulatory Commission (NRC) transmitted a request for additional information (RAI) regarding the proposed amendment (reference 2). The RAI questions and associated DEK responses are provided below.

Please note that the RAI responses below assume implementation of a modification which is not yet completed. This modification is being performed under KPS design change request (DCR) 3668. When implemented, this modification will prevent the spent fuel pool cooling pumps from automatically loading on the EDGs, thereby reducing peak short-term loading by approximately 34.9 kW for each EDG. This modification is necessary in order to reduce actual peak EDG loading on both EDGs to below the short-time rating. The calculations for EDG loading in attachment 2 and the RAI responses which reference this calculation assume that this modification is complete. DEK will provide the NRC with a follow-up letter when this modification is completed.

In addition, the proposed TS and TS bases pages have been changed and are included in attachment 5. The reason for and description of these changes are discussed in the responses below.

NRC Question 1

Confirm the short time rating of the EDGs considering the definition of "short-time rating" in Institute of Electrical Engineers (IEEE) Standard 387. Provide the necessary documentation and/or basis which confirms this short-time rating.

Response:

IEEE 387-1977 (reference 5), paragraph 3.7.2, defines short time rating as:

"The electric power output capability that the diesel-generator unit can maintain in the service environment for 2 h in any 24-h period, without exceeding the manufactures design limit and without reducing the maintenance interval established for the continuous rating."

On May 19, 2006, KPS received a letter from diesel engine manufacturer Engine Systems, Incorporated (ESI) (reference 8) that discusses engine ratings for the KPS emergency diesel generators (EDGs). This letter confirmed that the June 11, 1992 (reference 9) letter from MKW Power Systems regarding diesel engine ratings at elevated temperatures applies to the KPS EDGs. This letter also provides 2000-hour, 200-hour, 4-hour, and 30-minute ratings for the EDGs based on a 90 °F intake air temperature. Additionally, this letter provides the following statement:

"Unit will operate at the Continuous Rating 24 hours with 10% overload for any 2 hours per 24 hours without additional maintenance."

Thus, per the May 19, 2006 letter from ESI, the short-time rating of the KPS EDGs is equal to the continuous rating (2600 kW) plus 10% overload (260 kW) or 2860 kW. Copies of reference 8 and reference 9 are provided in attachment 4.

NRC Question 2

Provide the licensing and design basis history for EDG rating and testing. Confirm all applicable guidance, such as regulatory guides (RGs) and IEEE standards, including which revisions of, and the exceptions taken to that guidance, that KPS has committed to regarding EDG rating and testing. Provide the docketed correspondence (or references thereto) in which these commitments were made. In particular, specify the revisions of IEEE 387 and RG 1.9 to which the plant was originally licensed and the revisions to which KPS is now committing for the purpose of EDG sizing and testing.

Response:

Kewaunee Power Station was licensed to operate on December 21, 1973. The KPS Operating License Safety Evaluation Report, Revision 0 (OL SER) (reference 3) Section 8.3.1, AC Power System, states the following:

"The applicant has stated that each diesel generator has a 2000 hour rating of 2860 kW. The maximum load that occurs is 2737 kW during the first 30 minutes following an accident; after that, the load is significantly less. The limiting criterion of Safety Guide No. 9 is that which limits the maximum accident load to less than 90% of the 30 minute rating (2750 kW). We conclude that the standby power system meets the intent of Safety Guide No. 9."

Thus, KPS was initially licensed to Safety Guide No. 9 (reference 4). Safety Guide No. 9 provides typical load ratings for emergency diesel generators. Specifically, Safety Guide No. 9 states the following:

> *"The definition used throughout this guide for "continuous rating" is "that load for which the supplier guarantees continuous operation at a high availability (expected to be about 95%) with an annual maintenance interval." The overload ratings are similarly defined except that the specified maintenance intervals are shorter. For example, the following are the load ratings of a typical diesel generator set:*

	Ratings	***Maintenance Interval***
Continuous	*2500 kW*	*Annual (8760 hr)*
Overload	*2850 kW*	*2000 hr*
	2950 kW	*7 day*
	3050 kW	*30 min"*

The KPS EDGs had similarly defined load ratings when the plant was licensed to operate. These defined load ratings were provided by the manufacturer and did not change until recent correspondence was received from the vendor (see reference 8). These load ratings are discussed in the KPS Updated Safety Analysis Report (USAR) Section 8.2.3, and are provided below.

Table 1
KPS Emergency Diesel Generator Load Ratings

Continuous	3250 kVA	100.0%
Continuous	2600 kW at 0.8 P.F.	100.0%
Overload, 2000 hours per year	2860 kW at 0.8 P.F.	110.0%
Overload, 7 days per year	2950 kW at 0.8 P.F.	113.5%
Overload, 30 minutes per year	3050 kW at 0.8 P.F.	117.3%

The KPS diesel generator load ratings provided above do not include a short-time rating as defined in IEEE 387-1977 (reference 5). This is because the KPS emergency diesel generator ratings were defined even before the initial issuance of IEEE 387 in 1972.

In 1973, the original KPS TS were issued by the AEC. KPS TS surveillance 4.6.a required the EDGs to be tested per the following:

"1. Manually initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly in accordance with the intent of Paragraph 6.2.1, 6.2.3(1) and 6.2.5 of IEEE-387."

Since the KPS TS were originally issued in 1973, the only version of IEEE-387 that could have been referenced in the original TS was IEEE 387-1972. In IEEE 387-1972 (a trial use standard) paragraph 6.2.3 is the "Rated Load Test." IEEE 387-1972, paragraph 6.2.3 and item (1) states:

"6.2.3 Rated Load Test. Rated load tests shall demonstrate the capability of carrying the following loads for the indicated times without exceeding the manufacturer's design limits:

(1) A load equal to the continuous rating for a time required to reach a temperature equilibrium plus one hour."

IEEE 387-1972, paragraph 6.2.3, item (2) states: (Note: this item was not a part of the TS surveillance requirements for the KPS EDG):

"(2) A load equal to the short time rating for two hours."

Therefore, at the time of initial plant licensing (*circa* 1973) the KPS TS stated that the KPS surveillances met the intent of IEEE 387, paragraphs 6.2.1 (starting test), 6.2.3(1) (rated load test at continuous rating), and 6.2.5 (load rejection test). Other surveillance testing included a load sequencing test and a diesel inspection. The Final Safety Analysis Report (FSAR) described how the KPS met Safety Guide No. 9.

On April 8, 1981, the NRC issued Kewaunee TS Amendment 33 (reference 6). This amendment stated that the following emergency diesel generator surveillance shall be performed:

"Manually initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly in accordance with the intent of paragraph 6.4.1 and 6.4.3 of IEEE 387-1977."

IEEE 387-1977 paragraph 6.4.1 was the starting test (similar to IEEE 387-1972, paragraph 6.2.1) while paragraph 6.4.3 was the rated load test at both the continuous rating and the short time rating. These tests (starting and rated load test) were to be performed monthly. The load rejection test (IEEE 387-1977, paragraph 6.4.5, similar to IEEE-387-1972, paragraph 6.2.5) was changed to an 18-month performance interval. At this time, KPS defined the short-time rating of the EDGs as 2950 kW and incorporated this into the load test procedure.

Therefore, in 1981 KPS became committed to load testing the EDGs in accordance with the intent of the above specific paragraphs of IEEE 387-1977.

On July 10, 1986, the NRC issued Kewaunee TS Amendment No. 68 (reference 7). This amendment noted that the existing monthly surveillance test requirement incorrectly included paragraph 6.4.3 of IEEE 387-1977. The short time rating test prescribed by paragraph 6.4.3 should have been designated as a refueling cycle surveillance. This amendment deleted the existing surveillance requirement and replaced it with two new surveillance requirements. The first new surveillance requirement specified performance of a monthly test at 2600 kW for one hour (meeting the intent of IEEE 387-1977 item 6.4.3(1)). The second new surveillance specified performance of a refueling frequency test at 2950 kW for 2 hours (meeting the intent of IEEE 387-1977 item 6.4.3(2)). The NRC Safety Evaluation for this amendment states the following:

> *"Technical Specification 4.6.a.1 presently states that tests will be conducted monthly in accordance with the intent of paragraph 6.4.1 and 6.4.3 of IEEE 387-1977. The licensee proposes to replace the words, in accordance with the intent of Paragraph 6.4.1 and 6.4.3 of IEEE 387-1977 with the words "loading the diesel generator to at least 2600 kW (nominal) for a period of at least 1 hour." In addition the applicants propose to add Technical Specification 4.6.a.5 as follows:*
>
> *5. Each diesel generator shall be loaded to 2950 kW (nominal) for 2 hours every operating cycle, not to exceed 18 months.*
>
> *The effect of the changes would be to apply the continuous rating load test on a monthly cycle and a short-term test on a refueling cycle basis. We find that these changes are consistent with paragraph 6.6.1 of IEEE Std. 387-1977, which require monthly tests at the lower continuous rating, and Paragraph 6.6.2 of IEEE Std. 387-1977, which requires less frequent tests at the higher short-term rating."*

Thus, KPS TS Amendment 68 established 2950 kW as an acceptable load at which to conduct the "short-term" or short-time test. This load (2950 kW) is equivalent to the "Overload, 7 days per year" rating provided in Table 1 above. This refueling frequency test has not changed since TS Amendment 68 was issued.

In conclusion, the current version of the KPS USAR indicates that the plant conforms with the requirements of NRC Regulatory Guide 1.9, Revision 2 and IEEE-387-1977 for the purposes of EDG testing as described in the KPS USAR and license amendments. The KPS TS surveillance testing change history for the EDGs shows that the tests performed on the EDG meet the intent of certain paragraphs of IEEE 387-1977. KPS does not wish to change the current commitments to this Regulatory Guide and IEEE standard.

NRC Question 3

Provide the most current (and QA-approved/accepted) calculation (based on the worst-case accident analyses) of the EDG load profile for the first 24 hours of a design basis accident (DBA) and subsequent safe shutdown.

Response:

The requested calculation C-042-001, Revision 6, Addendum C, "Safeguards Diesel Generator Loading," is provided in attachment 2. This calculation has been approved but will not be officially issued as the calculation of record until a planned modification (DCR 3668), which will prevent the spent fuel pool cooling pumps from automatically loading on the EDGs is completed. This calculation provides the worst-case peak KPS EDG load profile. The calculation assumes that during the first 60 seconds, the EDG load sequencer automatically loads all the necessary engineered safety feature equipment onto the emergency diesel generator. After the first 60 seconds, the operating crew will follow KPS integrated plant emergency operating procedures (IPEOPs). KPS IPEOPs currently contain a requirement to limit EDG loading to less than 2950 kW. However, after completion of DCR 3668 the IPEOPs will be changed to lower the current limit of 2950 kW to a new limit of 2860 kW. Thus, after the initial loading sequence, the updated IPEOPs will allow operators to load the EDGs to a maximum of 2860 kW. The calculation assumes a large-break loss of coolant accident (LBLOCA) has occurred concurrent with a loss of off-site power (LOOP). The calculation determines the loading on each EDG assuming the other EDG is not available.

From section 6 of the EDG loading calculation (page 9 of 10), the peak loading is 2823.0 kW and 2839.6 kW for EDG A and B, respectively. These loads are both below the short-time rating of the EDGs (2860 kW). Please note that the EDG loading values of 2823.0 and 2839.6 kW assume implementation of a modification which is not yet completed. This modification is being performed under KPS design change request (DCR) 3668. When implemented, this modification will prevent the spent fuel pool cooling pumps from automatically loading on the EDGs, thereby reducing short-term loading by approximately 34.9 kW for each EDG. This modification is necessary in order to reduce actual peak EDG loading on both EDGs to below the short-time rating. The calculations for EDG loading in attachment 2 and the RAI responses which reference this calculation assume that this modification is complete. DEK will provide the NRC with a follow-up letter when this modification is completed.

After two hours (120 minutes) the loading on the EDG is 2019.1 kW and 2035.7 kW for EDG A and B, respectively. After 4-hours (240 minutes), the calculated loads remain at 2019.1 kW and 2035.7 kW for EDG A and B, respectively. At 4-hours, the plant is in a

stable ECCS recirculation condition, and it is not expected that EDG loads will increase above the continuous load rating over the longer-term.

Calculation C-042-001, Revision 6, Addendum C discussed above assumes a large break LOCA. In addition to the above calculation, an evaluation was performed to determine the EDG loading requirements during a small break (SB) LOCA event. The SB LOCA EDG loading evaluation used Calculation C-042-001, Revision 6, Addendum C, as a baseline for the evaluation. The evaluation covered about the first 6 hours after accident initiation.

Operations' senior reactor operators (SROs) and engineering performed the analysis using simulator timing data from LB and SB LOCA scenarios, USAR accident analysis information from 2-inch, 3-inch, and 4-inch reactor coolant system breaks, and IPEOP steps to estimate when and for how long different EDG loads would be started, run, and stopped. The KPS engineering staff provided the SROs with the load requirements for these components. Loads were either added to or subtracted from the base calculation for the associated period depending on whether the load was started or stopped. Assumptions made during the evaluation were intended to provide the worst-case (bounding) conditions. For example, initial RWST level was assumed to be at its maximum versus the TS minimum to provide the longest run times for pumps and therefore higher EDG loading over time.

This evaluation concluded that peak EDG loading after a small break (SB) LOCA is bounded by the large break LOCA peak loading calculation. However, while the peak EDG loading during a SB LOCA is less than peak loading during a LB LOCA, the SB LOCA loading does not drop off as fast post-peak as with the LB LOCA. The evaluation shows that SB LOCA load is near (2620 kW to 2660 kW) the EDG continuous load rating of 2600 kW with two exceptions of short duration. During the first hour after a SB LOCA, a load increase occurs to about 2720 kW on EDG A (less on EDG B). The duration of the load increase is about 15 minutes. A second load increase to about 2770 KW on EDG A (less on EDG B) occurs more than 2 hours after event initiation. The second load increase is about 30 minutes in duration.

The two peaks have a combined duration of about 45 minutes and the peak for the limiting EDG (about 2770 kW) is below the short-time rating of 2860 kW for the EDGs. Therefore, the EDG loading peaks are bounded by the proposed short-time test at 2860 kW for 2 hours and are not considered adverse to continued long term operation of the EDGs.

NRC Question 4

Explain how the proposed testing in the license amendment request will verify that the EDGs are capable of meeting the worst-case load profile for 24 hours. In addition, since the loads indicated in the KPS updated final safety analysis report appear to exceed the EDG's continuous rating, explain how the proposed testing meets the intent of Revision 3 of RG 1.9.

Response:

The EDG loads provided in the current version of the KPS USAR (Revision 19) have not been revised to show the results of the current loading calculation and recent plant design changes. The current EDG loading calculation provided in response to question 3 above shows that the current maximum EDG loads are less than the loads provided in the USAR Revision 19. At the present time the worst-case peak loading is 2857.9 kW and 2874.5 kW for EDG A and B, respectively. KPS IPEOPs currently contain a requirement to limit EDG loading to less than 2950 kW. However, after completion of DCR 3668 the IPEOPs will be changed to lower the current limit of 2950 kW to a new limit of 2860 kW. The completion of a planned modification to eliminate automatic loading of the spent fuel pool cooling pumps after an accident will eliminate a load of 34.9 kW from each EDG. Therefore, after the modification is completed the calculated worst-case peak EDG loads will be 2823.0 kW for EDG A and 2839.6 kW for EDG B.

The testing proposed in KPS LAR 230 (reference 1) is to load the EDG at a short-time test band of 105-110% (2730-2860 kW) of the continuous rated load (consistent with RG 1.9, revision 3, item 2.2.9) for two hours and then load the EDG at the 90-100% (2340-2600 kW) of the continuous rating (2600 kW) for the remainder of a 24 hour loaded run.

The diesel loading calculation provided in attachment 2 shows that worst-case loads will be less than the short-time rating of 2860 kW (equivalent to 110% of continuous rated load) for the first two hours (after DCR 3668 is complete). The calculated worst-case loading on the EDGs will be 108.6% (2823.0 kW) of continuous load for EDG A and 109.2% (2839.6 kW) of continuous load for EDG B. Thus, the worst-case loading on the EDGs will be below the upper limit of the proposed test band (below 110% of continuous load), but will not be below the lower limit of the proposed test band (105% of rated load).

An EDG margin recovery project is underway at KPS. This project consists of planned modifications and proposed modifications that will reduce peak loading on the EDGs. The long-term goal of the margin recovery project is to reduce EDG loading through implementation of longer-term load reduction modifications. In addition, DEK is pursuing a modification to directly duct outside air to the EDG air intake. This design

change would significantly reduce or eliminate the difference between outside air temperature and EDG intake air temperature and eliminate the need for administrative controls based on outside air temperature.

As discussed in the response to question 3 above, during the first 60 seconds, the EDG load sequencer automatically loads all the necessary engineered safety feature equipment onto the emergency diesel generator. After the first 60 seconds, the operating crew will follow KPS IPEOPs. KPS IPEOPs currently contain a requirement to limit EDG loading to less than 2950 kW. However, after completion of DCR 3668 the IPEOPs will be changed to lower the current limit of 2950 kW to a new limit of 2860 kW. Thus, after the initial loading sequence, the updated IPEOPs will allow operators to load the EDGs to a maximum of 2860 kW. Therefore, in order to ensure that the proposed testing will verify that the EDGs are capable of meeting the worst-case load profile for the 2-hour short-time test (including loads allowed by IPEOPs), DEK proposes the test band requested in LAR 230 (reference 1) not be implemented for the 2-hour short-time load test. DEK proposes TS 4.6.a.5.A be modified as follows:

From wording proposed in KPS LAR 230 (reference 1):

"For ≥ 2 hours loaded ≥ 2730 KW and ≤ 2860 KW, and,"

To proposed new wording:

"For ≥ 2 hours loaded to 2860 KW (nominal), and,"

An evaluation was performed to determine the EDG loading requirements during a SB LOCA event. The evaluation results are discussed in the response to question 3 above. This evaluation determined that during a SB LOCA, EDG loading is in the range of approximately 2620 kW to 2660 kW (except for two loading increases of about 15 and 30 minutes in duration) for the first 6 hours after event initiation. Therefore, since EDG loading after a SB LOCA will remain near 2600 kW, DEK proposes that the test band of 2340 to 2600 kW requested in LAR 230 (reference 1) not be implemented for the 22-hour portion of the test. DEK proposes that TS 4.6.a.5.B be modified as follows:

From wording proposed in KPS LAR 230 (reference 1):

"For the remaining hours of the test loaded > 2340 KW and < 2600 KW,"

To proposed new wording:

"For the remaining hours of the test loaded to 2700 KW (nominal),"

Revisions to the affected and marked up TS pages and TS bases pages submitted in LAR 230 which reflect these proposed changes are provided in attachment 5. Thus, the

proposed tests would verify the EDGs are capable of meeting their worst-case peak loads.

The proposed change to load the EDGs to 2700 kW for the 22-hour portion of the load test is not strictly in accordance with IEEE 387-1977, which states that the 22-hour portion of the test should be performed at the continuous rating of the EDG. The continuous rating of the KPS EDGs is 2600 kW. However, DEK proposes that performing the 22-hour portion of the test at 2700 kW is appropriate based on the following:

- Performing the test at 2700 kW will bound the worst-case accident load profile for the SB LOCA and is conservative with respect to IEEE 387-1977.
- Per the EDG vendor, the effect of performing the 22-hour portion of the test at 2700 kW versus the continuous load rating of 2600 kW will have no effect on the currently required KPS maintenance interval for the EDGs.

NRC Question 5

Provide the calculation and vendor manual (or guidance) that explains how temperature affects the rating and the operation of the EDGs. Provide the necessary calculation of the derating factors which would be applied to various EDG ratings, especially the continuous and short-time ratings, considering the maximum assumed outside temperature. Considering these derating factors, provide the corresponding EDG ratings. In addition, page 13 of KPS's license amendment request states, "A calculation performed by KPS staff has shown that the EDGs can be loaded to 2864 kW with an outside air temperature of 97.8 °F without requiring de-rate." Provide this calculation if it differs from the above requested calculation.

Response:

5.1 *Provide the calculation and vendor manual (or guidance) that explains how temperature affects the rating and the operation of the EDGs.*

Based on discussions with the vendor, two issues affect the rating of the EDGs as combustion air temperature changes. These issues are the density of the air and the impact of elevated combustion air temperature on the overall engine power assembly temperature.

When the temperature of the combustion air increases, its mass density decreases. This change in air mass density affects the cylinder exhaust scavenging efficiency following the power stroke. Better scavenging occurs with higher air density, resulting in

increased combustion air charge and more efficient combustion. As the combustion air temperature increases, the decreased quality of scavenging air results in the inability of the engine to produce additional brake horsepower. This is the basis for the 30-minute load derate curve C in reference 9.

Increasing combustion air temperature also affects the overall engine power assembly temperature. An increase in combustion air temperature is felt throughout the engine power assembly and causes the exhaust temperature to increase more than the corresponding increase in combustion air (e.g., for a combustion air temperature increase of 1 °F, exhaust temperature may increase by 1.7 °F to 2 °F). This overall engine system temperature increase has a long-term effect, including accelerated wear of internal engine components, causing an increase in the inspection frequency. This is the basis for curve A in reference 9.

If the engine coolant temperature is limited to 190 °F, and the load is limited to the continuous, short time, or 2000-hour ratings, the long-term effect of the increased combustion air temperature is reduced. Under these conditions curve B in reference 9 can be used.

5.2 *Provide the necessary calculation of the derating factors which would be applied to various EDG ratings, especially the continuous and short-time ratings, considering the maximum assumed outside temperature. Considering these derating factors, provide the corresponding EDG ratings.*

A review of historical meteorological data for Kewaunee Power Station shows that from 1987 to 2006, the maximum recorded 15 minute average temperature was approximately 96 °F. Table 1 below provides a summary of the derating factors that would be applied for each KPS EDG load rating at this air temperature.

Table 1 below assumes the following:

1. A maximum ambient air temperature of 96 °F for Kewaunee Power Station.
2. A maximum temperature rise of 19 °F between outside air temperature and EDG intake air temperature. Note that this maximum temperature rise of 19 °F is conservative when compared with the temperature rise calculated in KPS operability determination (OD)-151, revision 1 (see response to question 8 below).
3. Use of the vendor derating curves provided in letter from D. A. Strickland (MKW Power Systems, Inc.) to M. Anthony (Duke Engineering Services), dated June 11, 1992 (reference 9).

Table 1
Kewaunee Diesel Engine De-rating
At Maximum Expected Ambient Temperature of 96 °F

Engine Rating	Non-Derated Load (kW)	Applicable Curve (Engine Coolant ≤190 °F)	Derating Factor	Engine Rating at 96 °F Ambient (kW)
Continuous	2600	B	100%	2600
Short-time	2860	B	100%	2860
2000-hour	2864	B	100%	2864
7-day	2950	None	N/A	N/A
200-hour	2973	A	92.9%	2762
4-hour	3009	A	92.9%	2795
30-minute	3050	C	97.0%	2959

KPS recognizes that future ambient temperatures could exceed the maximum ambient temperature experienced at the site in the past. KPS has implemented administrative controls that ensure that outside air temperatures do not cause the EDGs to be derated to a load that is less than the peak load. In addition, DEK is pursuing a modification to directly duct outside air to the EDG air intake. This design change would significantly reduce or eliminate the difference between outside air temperature and EDG intake air temperature and eliminate the need for administrative controls on outside air temperature. KPS Operability Determination (OD)-151, revision 1, attachment 2, appendix A contains a table which indicates the allowable combustion and outside air temperatures for both EDGs as a function of EDG loading. OD-151, revision 1 is provided in attachment 3.

5.3 *In addition, page 13 of KPS's license amendment request states, "A calculation performed by KPS staff has shown that the EDGs can be loaded to 2864 kW with an outside air temperature of 97.8°F without requiring de-rate." Provide this calculation if it differs from the above requested calculation.*

Kewaunee operability recommendation (OPR)-151, revision 2 included an evaluation that determined the EDGs could be loaded to 2864 kW (2000-hour rating) with an outside air temperature of up to 97.8 °F. Since the initial OPR-151 was completed, additional loads on the EDGs and changes in assumptions have resulted in a revision to OPR-151 and a designation change to operability determination (OD)-151. The current version of OD-151 (revision 1) indicates that the EDGs can be loaded to a maximum of 2864 kW when outside air temperature is as high as 97.7 °F while remaining within the vendor ratings for combustion air temperature. The requested information is contained

in OD-151, revision 1, attachment 2, appendix A. OD-151, revision 1 is provided in attachment 3.

NRC Question 6

Provide justification that the EDGs will be able to perform their design function during a DBA and subsequent shutdown of the reactor assuming the worst-case derating due to an outside temperature that results in derating the EDG.

Response:

A review of historical meteorological data for Kewaunee Power Station shows that from 1987 to 2006, the maximum recorded 15 minute average temperature was approximately 96 °F.

At the present time, the worst-case peak loading is 2857 kW and 2874.5 kW for EDG A and B, respectively. KPS IPEOPs currently contain a requirement to limit EDG loading to less than 2950 kW. However, after completion of DCR 3668, the IPEOPs will be changed to lower the current limit of 2950 kW to a new limit of 2860 kW. Thus, after the initial loading sequence, the updated IPEOPs will allow operators to load the EDGs to a maximum of 2860 kW. The completion of a planned modification (DCR 3668) to eliminate automatic loading of the spent fuel pool cooling pumps after an accident will eliminate a load of 34.9 kW from each EDG. Therefore, after DCR 3668 is completed, the calculated worst-case peak EDG loads will be 2823.0 kW for EDG A and 2839.6 kW for EDG B.

These peak loads occur within the first 60 minutes after accident initiation. After that, the worst-case accident EDG loads are less. After completion of DCR 3668, the peak loading will be less than the short-time load rating (less than 2860 kW) for the EDGs. Therefore, a maximum outside air temperature of 96 °F and a maximum design basis loading of 2860 kW is assumed.

Using these values, Curve B of the May 1992 MKW Power System temperature derate curves is the applicable derating curve (reference 9). The EDGs are required to be derated at air intake temperatures of greater than 115 °F when using Curve B. Using Curve B and adding a maximum temperature rise between the outside air temperature (96 °F) and EDG air intake temperature of 19 °F results in an air inlet temperature of 115 °F. Thus, no de-rating factor needs to be applied to the EDGs and they are fully capable of maintaining their short-time load rating of 2860 kW. The short-time load rating of 2860 kW will be greater than the calculated peak worst-case loading for both EDGs after implementation of DCR 3668 (2823.0 kW for EDG A and 2839.6 kW for EDG B).

After 2 hours, the worst-case post accident loading is dominated by the small break LOCA event. An evaluation was performed to determine the EDG loading requirements during a SB LOCA event. The evaluation results are discussed in the response to question 3 above. This evaluation determined that during a SB LOCA, EDG loading is in the range of approximately 2620 kW to 2660 kW (except for two loading increases of about 15 and 30 minutes) for about the first 6 hours after event initiation. Therefore, after two hours the EDGs load will be near the continuous load rating of 2600 kW and less than the proposed TS test criteria of 2700 kW for the 22-hour portion of the load test. The definition of short-time load rating, as supplied by the manufacturer (reference 8) is as follows.

> *"Unit will operate at the Continuous Rating 24 hours with 10% overload for any 2 hours per 24 hours without additional maintenance."*

Therefore, it is concluded that the EDGs will be capable of performing their design function during a DBA and subsequent shutdown at the expected worst-case outside temperature. This is because the calculated worst-case post accident loading will remain below the 110% overload value for any 2 hours and EDG loading will be near the continuous rating for the remainder of the first 24 hours. This conclusion is based on the following:

- In the case of LB LOCA, the calculated worst-case post-accident loading is below 110% of overload for the first two hours after the event and falls and remains below the continuous rating after the first two hours.
- In the case of the SB LOCA, the evaluation concluded that loading is in the range of 2620 kW to 2660 kW except for two loading increases of about 15 and 30 minutes in duration. The load increases are less than 110% rated load and cumulatively less than 2-hours in duration.
- The proposed testing for greater than 2 hours at 2860 kW and the remainder of 24 hours at 2700 kW bounds the worst-case load profile for both the LB LOCA event and SB LOCA event.

As previously mentioned, KPS has initiated an EDG load margin recovery project to reduce the calculated load on the EDGs. Maintaining the calculated worst-case load to within the short-time load rating of 2860 kW rating will allow the combustion air temperature to be as high as 115 °F based on de-rating curve 'B'.

To ensure that the vendor ratings are not exceeded, KPS has implemented administrative controls, based on outside air temperature, which will ensure that plant operation is restricted when outside air temperatures will result in exceeding the manufacturer's limitations for EDG combustion air temperature. In addition, DEK is pursuing a modification to directly duct outside air to the EDG air intake. This design change would significantly reduce or eliminate the difference between outside air

temperature and EDG intake air temperature and eliminate the need for administrative controls on outside air temperature.

NRC Question 7

Your letter dated January 10, 2007, stated that the KPS EDG engine coolant outlet temperature is limited to less than 190 °F. Provide the calculation or vendor manual (or guidance) that explains how the temperature is limited to less than 190 °F.

Response:

The statement indicating that KPS EDG coolant outlet temperature is limited to 190 °F is based on a review of historic trending data of the engine coolant outlet temperature and the design of the EDG cooling system. Coolant temperature is monitored and logged during engine operation for surveillance testing under normal and overload conditions (including EDG loading as high as 2950 kW). Engine coolant outlet temperature logs were reviewed and confirm EDG coolant outlet temperature has remained at or below 190 °F.

The KPS EDG engine coolant is cooled by heat exchangers using service water as a cooling source. Flow through the heat exchangers is controlled with thermostatic valves downstream of the engine coolant outlet. Based on the temperature of the engine coolant at the outlet, the thermostatic valves open to control the amount of coolant diverted to the heat exchangers or re-circulated back to the lube oil heat exchanger. Cooled and re-circulated engine coolant combine and then flow through the lube oil heat exchanger and into the suction of the water pumps. From the water pumps, a small amount of engine coolant is diverted to the turbo after-coolers with the remaining coolant returning to the engine to complete the cooling loop.

The engine coolant outlet temperature is measured from a probe immersed in the coolant at the engine coolant outlet pipe. The acceptable range for the engine coolant outlet temperature is between 160 °F and 190 °F and the average temperature during surveillance testing is normally below 180 °F. This temperature is recorded hourly during surveillance testing and is trended by the KPS diesel system engineer.

Based on a comparison of service water temperature to engine coolant outlet temperature while the EDG was operating under a range of output loads from 2600 kW to 2950 kW, it is concluded that the EDG control and cooling system have sufficient margin to ensure that coolant temperature does not exceed 190 °F.

NRC Question 8

Your letter dated January 10, 2007, stated that calculations have shown that the difference between outside air temperature and diesel engine room temperature is approximately 15 °F to 20 °F during the summer months. Provide these calculations.

Response:

This calculation was performed in OD-151. A copy of OD-151, revision 1 is provided in attachment 3. The requested calculation is contained in OD-151, revision 1, attachment 2.

References:

** Indicates that this reference is provided in attachment 2, 3, or 4 to this document.

1. Letter from Gerald T. Bischof (DEK) to Document Control Desk, "License Amendment Request 230 – Emergency Diesel Generator Short-Time Load Testing," dated January 10, 2007 (ADAMS Accession No. ML070120088).
2. Letter from R. F. Kuntz (NRC) to D. A. Christian (DEK), "Kewaunee Power Station – Request for Additional Information Related to Emergency Diesel Generator Short-Time Load Testing (TAC No. MD3995)," dated March 8, 2007 (ADAMS Accession No. ML070600485).
3. ** "Safety Evaluation by the Directorate of Licensing, U. S. Atomic Energy Commission in the Matter of Wisconsin Public Service Corporation, Wisconsin Power and Light, and Madison Gas and Electric Company, Kewaunee Nuclear Power Plant, Kewaunee County, Wisconsin, Docket No. 50-305," dated July 24, 1972. (Enclosed in attachment 4)
4. Safety Guide 9, "Selection of Diesel Generator Set Capacity for Standby Power Supplies," dated March 10, 1971.
5. IEEE 387-1977, "IEEE Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations."
6. ** Letter from S. A. Varga (NRC) to E. R. Mathews (WPSC), Amendment No. 33 to Facility Operating License No. DPR-43, Kewaunee Power Plant, dated April 8, 1981. (Enclosed in attachment 4)
7. ** Letter from M. B. Fairtile (NRC) to D. C. Hintz (WPSC), Amendment No. 68 to Facility Operating License DPR-43, Kewaunee Power Plant, dated July 10, 1986. (Enclosed in attachment 4)

8. ** Letter from Robin L. Weeks (Engine Systems, Inc.) to P. DeTemple (DEK), "Reference: 20-645E4 Engine Ratings with EMD A20 Generator," dated May 19, 2006. (Enclosed in attachment 4)
9. ** Letter from D. A. Strickland (MKW Power Systems, Inc.) to M. Anthony (Duke Engineering and Services, Inc.), dated June 11, 1992. (Enclosed in attachment 4)
10. ** Calculation C-042-001, Revision 6, Addendum C, "Safeguards Diesel Generator Loading," dated March 2007. (Enclosed in attachment 2)
11. ** Kewaunee Power Station Operability Determination OD-151, Revision 1. (Enclosed in attachment 3)

ATTACHMENT 2

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING KEWAUNEE LICENSE AMENDMENT REQUEST 230

KEWAUNEE POWER STATION EMERGENCY DIESEL GENERATOR LOAD CALCULATION

CALCULATION C-042-001, REVISION 6, ADDENDUM C, "SAFEGUARDS DIESEL GENERATOR LOADING," DATED MARCH 2007.

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

CALCULATION COVER SHEET AND REVIEW REPORT

Calculation No. C-042-001	Title of Calculation: Safeguards Diesel Generator Loading
Rev. No. 6	
Addendum Letter C	Title of Addendum: Revise D/G Loading and Limiting Rating
Safety Related ☒ Yes ☐ No (1)	(2)

System(s) / System No(s):

Diesel Generator - Electrical / System 42 (3)

Originating Document:

Operability Determination Documentation 151, Rev. 0 (4)

Supersedes:	Superseded By:
Calculation No(s). n/a	Calculation No(s). n/a
Addendum No(s). n/a	Addendum No(s). n/a
(5)	(6)

Discipline:

- ☐ Engineering Mechanics/Structural Engineering (EM/SE)
- ☐ Chemistry/Radiation Protection (Chem/RP)
- ☐ Computer
- ☒ Electrical
- ☐ I&C
- ☐ Nuclear
- ☐ Mechanical

(7)

This Calculation has been reviewed and was accomplished by the following: Reviewers' Initials (8)

- ☒ Verification (Independent Review)
- ☐ Technical Review

Preparer	Reviewer	Comments Attached	Discipline	Printed Name	Signature	Date (9)
☒	☐	☐ Yes ☒ No	Electrical	William C. Stallings	MC Phillips for WCS	03/15/2007
☐	☒	☒ Yes ☐ No	Electrical	Dan P. Hundley	MC Phillips for	03/15/2007
☐	☐	☐ Yes ☐ No			D.P. Hundley per telecon 3/15/07 15:00	
☐	☐	☐ Yes ☐ No				

50.59 Applicability, Form Attached	☑ Yes	50.59 Screen Form Attached	☑ Yes ☐ No
50.59 Pre-Screen Form Attached	☑ Yes ☐ No	50.59 Evaluation Attached	☐ Yes ☑ No

Approver: Printed Name: Jonathan Pollock

Signature:

Date: 3/16/07

Effective Date:
(See Steps 6.4.4 and 6.4.5)
If different from Approver Date)

(10)

Wisconsin PE Stamp (If Required)

(11)

CALCULATION VERIFICATION CHECKLIST

Calculation # C-042-001 Revision 6, Addendum C

Verification Items	YES	NO	N/A
Purpose			
• Clear objective and problem statement	☒	☐	☐
• Affected SSC been identified	☒	☐	☐
• Intended use of results been identified	☒	☐	☐
• Any limitation of applicability	☒	☐	☐
• Revision content been summarized	☒	☐	☐
• Appropriate 50.59 products completed	☒	☐	☐
Methodology			
• Discussion of the method/approach and major steps	☒	☐	☐
• Limitation of use of methodology identified	☒	☐	☐
Acceptance Criteria			
• Clear definition of acceptance criteria	☒	☐	☐
• Exceptions clearly defined	☒	☐	☐
• Sources of acceptance criteria clearly defined	☒	☐	☐
Assumptions			
• Sufficient rationale to permit verification of assumption	☒	☐	☐
• Have unverified assumptions been identified as such	☐	☐	☒
• References provided for assumptions	☒	☐	☐
Inputs			
• All applicable Design Inputs been identified	☒	☐	☐
• Has source document for inputs been identified	☒	☐	☐
• Computer data program SQA approval	☐	☐	☒
References			
• Have all controlled plant input documents been identified	☒	☐	☐
• If a procedure is cited, has the process owner been notified	☒	☐	☐
• Are references available from KPS records, or have they been attached	☒	☐	☐
Calculation and Results			
• Correct formula/method used to support the objective	☒	☐	☐
• Formula variables (including units) clearly labeled and consistent with sources	☒	☐	☐
• Computer program input/output been reviewed	☒	☐	☐
• Reference to sketches provided	☐	☐	☒
• Sufficient bases/rational to permit verification of engineering judgment	☒	☐	☐
• Proper carry over and use of significant digits	☒	☐	☐
• Computations reasonable, correct.	☒	☐	☐
Conclusions and Recommendations			
• Clear statement of the results consistent with the objective	☒	☐	☐
• Acceptability of the results clearly defined	☒	☐	☐
• Recommendation for unacceptable results, AR written if necessary	☐	☐	☒
• Clear definition of limitations or requirements imposed by the calculation necessary to maintain the validity of the results	☒	☐	☐
• Have the effects of the calculation on output documents been identified and addressed	☒	☐	☐

CALCULATION VERIFICATION COMMENT/RESOLUTION - Page 1 of 5

Calculation # C-042-001 Revision 6, Addendum C

Reference Material Used: GNP-04.03.04, Rev. F

Item #	Reviewer's Comment	Preparer Resolution	Reviewer Concurrence
1	Section 1.0 – GNP-04.03.04 Section 6.5.8.1 has not been followed. Purpose does not indicate that Addenda A and B have been considered.	Revised Purpose	☒
2	Section 1.0 – States "various load changes identified in Section 5" – section 5 contains no identified load changes.	Changed "5" to "3"	☒
3	Section 1.0 – "Diesel Generator short-time rating"... suggest adding [2860 kW]. Also a reference is needed for this value.	Added 2860 kW	☒
4	Section 1.0 – "This Addendum will [re-] evaluate sequential loading"... Suggest you get rid of "There are no automatically added electrical loads after this period." This statement is in R0.	changed evaluate to reevaluate; deleted sentent "There are no automatically added .."	☒
5	Section 2.0 – Ref. is needed for 2860 kW that also identifies the 115°F as applicable to this rating..	Attachment 4 and Reference 5.18 added regarding 115. Added Assumption 3.16.	☒
6	Section 2.0 – Second paragraph discusses a proposed DCR 3668- DCR is not in reference section (not sure if it has been developed yet, or just awaiting implementation.	Added DCR 3668 to references	☒
7	Load changes after first 4 hours are indicated as load reductions – there needs to be a design input to back up this statement or a justifiable assumption added to the calc.	Revised paragraph	☒
8	Section 2.0 Last paragraph page 1 of 9 states that this calculation is based upon Large Break Loss of Coolant and loss of offsite power - This may not be the worse case loading for the diesels. If this calculation is to identify the worse case loading on the diesels then a statement should be made that large break results in the worse case – Calculation C11582 Rev. 0 discusses this issue and indicates that small break may worse case.	Stated that this is consistent with previous calculation/addenda	☒

Comment cycle complete:

Preparer: Printed Name William Stallings Signature M.C. Phillips for WCS Date 3/15/2007

CALCULATION VERIFICATION COMMENT/RESOLUTION - Page 2 of 5

Calculation # C-042-001 Revision 6, Addendum C

Reference Material Used: GNP-04.03.04, Rev. F

Item #	Reviewer's Comment	Preparer Resolution	Reviewer Concurrence
9	GNP-04.03.04 Rev. I Section 6.2.7 requires that if spreadsheets are used for a calc. the formulae used in the spreadsheets shall be identified in the Methodology and Acceptance Criteria section. Calculation Verification Comments for Calculation C-042-001 Revision 6 Addendum C	Revised Methodology to address	☒
10	Section 3 page 3 of 9, 3.2 references "Attachment 1. GNP-04.03.04 Section 6.2.10 has not been followed. Generic -No attachment numbers relative to this calculation have been placed on any of the attachments.	Numbered all attachments	☒
11	Section 3.2a – The information presented must either identify a procedure or other document that confirms current plant design has the SI pumps taking suction from the RWST – perhaps a P&ID that shows valve/pump line up. As currently stated, 3.2a is an assumption and per GNP-04.30.40 section 3.4 assumptions that are dependent on future action(s) require verification upon completion of that action. Section 3.2a needs to be a reworked to make it a useable design input. Section 6.5.5 of GNP-04.03.04 Section 6.5.7 also requires a CAP or other tracking mechanism be initiated.	CAP042910 - Since DCR 2786 changed the normal suction of the SI Pumps from the BAT to the RWST, the loading calculation C11582 needs to reflect plant conditions.	☒
12	Section 3.3 identifies calculation C11356 Rev. 0, as the design input, Rev. 1 has been issued and should be used. Reference section of the calc. should also be updated..	Reference section includes both Rev. 0 and Rev. 1. Both are referenced as applicable. Added comment to 3.3.	☒
13	C11356 Rev.1 contains improper design inputs and assumptions based upon the diesel loads being developed in this calculation. Section 6.5.5 of GNP-04.03.04 must initiate a CAP or other tracking mechanism.	CAP042911 - Updates to calculation C11356, Rev. 1 need to be made to be in conformance with the assumptions in calculation C-042-001, Rev. 6, Addendum C.	☒
14	C10915 Rev.4 contains improper design inputs and assumptions based upon the diesel loads being developed in this calculation. Section 6.5.5 of GNP-04.03.04 must initiate a CAP or other tracking mechanism.	CAP042912 Updates to calculation C10915, Rev. 4 need to be made to be in conformance with the assumptions in calculation C-042-001, Rev. 6, Addendum C	☒
15	Item not used.	Not Applicable	☒
16	Section 3.3, page 4 of 9, Calc. C10915, Rev. 4 XFMR RPB-11 value shown is 10.4kW, value in Calc. C10915 Table 4 is 10.5 kW. Should add "Table 3" after C10915, Rev. 4to assist reader.	Changed 3.3 from 10.4kW to 10.5kW; also changed Appendix 2 and Appendix R. Revised section 3.3 to reference table 3.	☒

Comment cycle complete:

Preparer: Printed Name William Stallings Signature MC Phillips for WCS Date 3-15-2007

CALCULATION VERIFICATION COMMENT/RESOLUTION – Page 3 of 5

Calculation # C-042-001 Revision 6, Addendum C

Reference Material Used: GNP-04.03.04, Rev. F

Item #	Reviewer's Comment	Preparer Resolution	Reviewer Concurrence
17	Section 3.5, was Appendix R report corrected to show this load as off?	This calculation does not impact the Appendix R Report.	☒
18	Section 3.5 directs the modification of a procedure to all use of information on instrument air to be used as a design input. Section 6.5.5 of GNP-04.03.04 must initiate a CAP or other tracking mechanism.	CAP042915 - Procedure IPEOP E-1 needs to be updated for steps 10 & 11 (IA to Containment and Starting an Air Compressor; Running of Charging Pumps) to ensure that the emergency diesel generator load limit is restricted to the short-term rating of 2860kW. Other IPEOPs that may reflect this diesel load limit also need to be updated..	☒
19	Section 3.6, Cont. FCU load of 113.5 kW requires a proper design input. In addition, Section 6.5.5 of GNP-04.03.04 must initiate a CAP or other tracking mechanism to ensure that C11582, Rev. 0 is updated. Also see Item # 36.	113.5 is based on section 3.1. CAP042219 requires calculation C11582 changes.	☒
20	Section 3.7, has DCR 3089 been implemented, it should not have been. Since it adds load to the diesel including it will give conservative results. This should be stated in the calculation. In addition, Section 6.5.5 of GNP-04.03.04 must initiate a CAP or other tracking mechanism to ensure that C11582, Rev. 0 is updated..	The work has been implemented. CAP042913 - An update to corrective action OTH 5427 (Update Calculation C-042-001) needs to be made to be in conformance with the assumptions in calculation C-042-001, Rev. 6, Addendum C.	☒
21	Section 3.8, Attachment 3 does not conform to GNP-04.03.04, when spread sheets are used the equations developed are to be included. This was not done, nor has the table been identified as being checked to verify that the table is V&Ved and is responding as expected. (i.e. normally done by sample with hand calculator).	Added comment to 3.8 stating attachment reviewed and accepted by Kewuanee; and output reasonable.	☒
22	Section 3.9, DCR 3668 is not in reference section. Also the removal of the pumps from this calculation is not conservative. For this to be done now, some type of administrative directive is required to ensure that this pump does not come on. I.e. a design input is missing. Section 6.5.5 of GNP-04.03.04 must initiate a CAP or other tracking mechanism to ensure that DCR 3668 is tracked.	DCR 3668 reference added. After installation and acceptance of DCR 3668 the Calculation addendum will be effective.	☒
23	Section 3.12 ICS pump operation after 2 hours is to be considered off. Is there a procedure that requires ops to turn the pump off. If not you should not take credit for it being off.	Added: EOP-ES-1.3 states that any pumps taking suction from the RWST should be stopped upon RWST Lo-Lo Level alarm at 4%.	☒
24	Section 3.13 Until EOP E-1 is modified you should not take credit for the charging pumps not being in operation. Also if statement is true you have a condition where following a procedure step could trip the diesel – this needs to be addressed as a condition report.	CAP042915 - Procedure IPEOP E-1 needs to be updated for steps 10 & 11 (IA to Containment and Starting an Air Compressor; Running of Charging Pumps) to ensure that the emergency diesel generator load limit is restricted to the short-term rating of 2860kW. Other IPEOPs that may reflect this diesel load limit also need to be updated..	☒

Comment cycle complete:

Preparer: Printed Name William Stallings Signature M C Phillips for WCS Date 3-15-2007

CALCULATION VERIFICATION COMMENT/RESOLUTION – page 4 of 5

Calculation # C-042-001 Revision 6, Addendum C

Reference Material Used: GNP-04.03.04, Rev. F

Item #	Reviewer's Comment	Preparer Resolution	Reviewer Concurrence
25	Section 3.14 why is the 60+ acceptable when the largest pf is at 50+? This statement needs justified to show that it will give conservative results.	Added wording.	☒
26	Section 5.0 – 5.15, USAR date is missing.	Added Rev. 19 dated 6/1/2005 (version online)	☒
27	Section 6.0 Recommend that you change the first sentence to "The loading for each Diesel Generator [from the attached tables] is as shown below:"	Added per comment.	☒
28	Section 7 second paragraph, which procedures?.	CAP042976 - Operating and Surveillance procedures need to ensure that the 2860kW rating is the normal maximum diesel loading. allowed	☒
29	Section 7, since this calculation has changed the load on the diesels, the USAR also needs to have a change prepared for it and identified per Section 6.5.5 of GNP-04.03.04. Suggest this change not all of the table data but simply state the maximum rating allowed for the diesels and a statement that it is not exceeded.	CAP042914 - USAR Tables 8.1 and 8.2 need to be revised based on the results of calculation C-042-001, Rev. 6, Addendum C. There has been a verbal commitment to the NRC to ensure that this is completed.	☒
30	The following line items on Diesel A Appendix 1 do not appear conservative: Motor no. 1-110, 1-1112, 1-1225, 1-1223, 1-201, 1-131, 1-601	Revised Appendix 1 and Appendix 3.	☒
31	The following line items on Diesel B Appendix 2 do not appear conservative: 1-139, 1-1113, 1-872, 1-1227, 1-1224, 1-584, 1-211, 1-136, 1-602	Revised Appendix 2 and Appendix 4. Note that 1-872 never operates.	☒
32	Request from Kewaunee - Show spent fuel pool cooling pumps starting at 120 minutes instead of 240.	Revised Appendix 1 and 2 and section 3.9.	☒

Comment cycle complete:

Preparer: Printed Name William Stallings Signature M. C. Phillips for WCS Date 3-15-2007

CALCULATION VERIFICATION COMMENT/RESOLUTION - Page 5 of 5

Calculation # C-042-001 Revision 6, Addendum C

Reference Material Used: GNP-04.03.04, Rev. F

Item #	Reviewer's Comment	Preparer Resolution	Reviewer Concurrence
33	Request from Kewaunee- The load for the RHR pump in recirc mode needs to be 210 HP or 173.1 kWe and be starting at 120 minutes.	Went to Recirc at 60 minutes, 173.5kW. Also changed CC to supply 2 RHR heat exchangers at 30.	☒
34	Request from Kewaunee – Per DCR 3089 there needs to be an additional 0.763 kW added to the B diesel. Total value should be .56 kw + 0.763kw = 1.323 kw. This will require Secton 3.7 to be modified.	Revised 3.7 and all Appendices	☒
35	Instrument Air Compressor 1C on D/G A is being turned off per OPS Procedure N-AS-1 and is identified as an assumption in C-042-002 Rev. 6. I find no statement about this assumption or is impact in the 50.59 performed.	The calculation is correct, 50.59 SCRN 06-044-00 justifies turning 1C off (implemented in N-AS-1), start of 1A is inhibited via SI (bring back after SI when loading lower), 1B is included in loading.	☒
36	Values for FUC1A and FUC 1B show 95.8 kWe after 30 min. what is the source of this design input. Section 3.6 does not discuss.	Section 3.1 address. no changes made.	☒
			☐
			☐
			☐
			☐

Comment cycle complete:

Preparer: Printed Name William Stallings Signature M.C. Phillips for WCS Date 3-15-2007

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Calculation No. C-042-001

Revision No. 6

Addendum Letter C

Section, Attachment, or Other Description	Page #(s)	Revision
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Calculation Verification Checklist (Form GNP-04.03.04-3)	NA	NA
Calculation Verification Comment/Resolution (Form GNP-04.03.04-4)	NA	NA
Table of Contents and Revision Control (Form GNP-04.03.04-2)	NA	NA
50.59 Applicability Review (Form GNP-04.04.01-1)	NA	NA
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2.0 Background	1	ORIG
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Appendix 3 - Diesel Generator 1A Kilo Volt-Ampere Loading	4 pages	ORIG
Appendix 4 - Diesel Generator 1B Kilo Volt-Ampere Loading	4 pages	ORIG
Attachment 1 - Flowserve Pump Division letter dated 5/23/2006	1 page	ORIG
Attachment 2 - BRA106/BRB106 DG Load Reductions based on Load Measurements	6 pages	ORIG
Attachment 3 - DIT-KPS-005-00, "Cable Losses During Steady-State EDG Operation.."	6 pages	ORIG
Attachment 4 - EMD 645 E4 Nuclear Service Diesel Engine Ratings at Elevated Temperatures	5 pages	ORIG
Attachment 5 - Letter ESI 20-645E4 Engine Ratings with EMD A20 Generator, dated 5/19/06	2 pages	ORIG

1.0 PURPOSE

The purpose of this Addendum is to incorporate the various load changes identified in Section 3 and the References into the Diesel Generator Kilowatt and KiloVolt-Ampere Loading tables, C-042-001, Rev. 6 Appendices 1-4.

This calculation identifies the Diesel Generator short-time rating [2860 kW - 110% of 2600kW continuous rating per Attachment 5 to this calculation] as the limiting rating for the Diesel Generator due to Regulatory Guide 1.9, Rev. 2 commitments.

This Addendum will reevaluate sequential loading for the sixty (60) second period of safety injection load additions to the diesel generators. This Addendum will also evaluate load additions/deletions, which occur subsequent to the identified 60 seconds up to the 4 hour time interval.

Addendum A evaluated the impact of one specific load increase and Addendum B clarified the DG ratings. The previous addenda have been factored in this addendum, as applicable.

2.0 BACKGROUND

License Amendment Request 230 identified the Diesel Generator limiting rating as the short-time rating (2860 kW) per Regulatory Guide 1.9, Rev. 2. This calculation addendum evaluates the Diesel Generator Loading in order to ensure the loading does not exceed the short-time rating. The short-time rating of 2860 kW is valid for Diesel Generator inlet air temperatures up to and including 115°F [Reference 5.18 and Assumption 3.16].

This calculation is being addended to account for all the evaluations done to-date on the Diesel Generator Loading. Other calculations have accounted for Large Motor Brake Horsepower operation vs. Rated Horsepower; increased loading due to Diesel Generator operation at elevated frequencies, load reductions based on short-duration load operation of MOVs and Dampers, Transformer load reductions based on field measurements, and other adjustments to the Diesel Generator loading. This addendum credits the modification (DCR 3668) to inhibit the SI initiation of the Spent Fuel Pool Cooling Pump. Cable and overload losses are included as are station service transformer losses.

Additionally, the loading will be expanded to include manual loading actions taken during the 1st four hours of the event. Load changes after that time would not be expected to challenge the DG ratings since the load at four hours is well below the ratings.

This calculation addendum, like the original calculation, will determine Safeguard Diesel Generator Kilowatt electrical load based upon the specific condition of a concurrent large break Loss of Coolant Accident (LOCA) and loss of offsite power;

this will result in an automatic Safety Injection sequence loading on the Safeguard Diesel Generators.

3.0 INPUTS AND ASSUMPTIONS

3.1 Large Motor Brake Horsepower Rating

Calculation C11582, Rev. 0, and Rev. 0, Addendum A developed the brake horsepower (BHP) load for large motors on the Safety Buses. This BHP load is incorporated in the DG loading. The motors and their load values are provided below:

D-G Loading Step	Description	Evaluated Loads BHP	KW	
1	SI Pump	815	653	see 3.2a below
	SI @ 30 min.	815	653	
2	RHR Pump	178	143	
	RHR @ 30 min.	183	146.7	
3	ICS Pump	217	174	
	ICS @ 30 min.	220	176.4	
4	SW Pump	400	321	Add. A
5	Cont. FCU	134	113.5	see 3.6 below
	Cont. FCU @ 30 min	116	93	
5	Cont. FCU	134	113.5	see 3.6 below
	Cont. FCU @ 30 min	116	93	
6	AFW Pump	315	253	
7	CC Pump	213	171	Add. A
	CC Pump @ Recirc Mode	265	213	see 3.2 below
8	SW Pump	400	321	Add. A

3.2 CC Pump at Containment Sump Recirculation with RHR Heat Exchanger Aligned

Calculation C11356 Rev. 1 identifies the increased load rating of the CC Pump at Containment Sump Recirculation with RHR Heat Exchanger aligned due to single pump operation and pump runout. The increased loading is above nameplate at 280 BHP.

Calculations C11409, Rev. 0 and Rev. 0 Addendum A, revises the CC Pump runout pump flow to 4671 gpm (4246 gpm with a 10% model uncertainty margin) which is equivalent to 265 BHP. Load associated with 265 BHP is

213 kW, which will be used in the DG Loading Tables conservatively at the 30 minutes. This is done to reflect the increased BHP (RWST level ≤ 37%) prior to stopping ICS and SI motors at the 2 hours (RWST level < 4%). Flowserve Pump Division letter dated 5/23/06 from Paul Kasztejna, Supervising Design Engineer, provided the correlation between the pump flow and the BHP in Attachment 1.

3.2a SI Pump Alignment on RWST Impact to Pump Brake Horsepower

Calculation C11582, Rev. 0, shows the SI pumps initially taking suction from the Boric Acid Tank (BAT) and develops a load of 832 BHP or 667 kW. Then the SI pumps are shown to switch over to RWST at Recirculation Mode. Due to the lower boric acid concentration in the RWST relative to the BAT, the load is reduced to 815 BHP or 653 kW. In the current plant design, the SI pumps take suction from the RWST immediately. Therefore, the 815 BHP (653 kW) load will be utilized throughout the operation of the SI pumps. An addendum to Calculation C11582, Rev. 0, will be prepared to document this change in operation.

3.3 MOV, Damper, and Transformer Load Changes

Calculation C11356, Rev. 0 identifies the following DG 1A MOVs and Dampers as zero (0) load prior to 30 minutes into the accident. (Note that Calculation C11356 Rev. 0 and Rev. 1 are both referenced and utilized in this calculation. In some cases, the needed information is more easily extracted from Rev. 0. Based on review of both revisions, the portions taken from Rev. 0 remain valid.) These loads will be shown in the expanded table as being OFF as of 30 minutes. The calculation assumed that DG 1B did not require review due to available margin; therefore, the corresponding DG 1B loads have been reviewed and found to act similarly to the DG 1A loads (short duration loads) and are listed below as well:

DG 1A Loads	DG 1B Loads
MOV CC653	
MOV FW12A	MOV FW12B
MOV SW903A	MOV SW903C
MOV SW903B	MOV SW903D
DAMPER ACC3A	

Calculation C10915, Rev. 4, identified the above loads and DG 1A/1B Starting Air Compressor as loads that would not be running at one (1) hour. Therefore, the loads listed above (short duration loads) are shown OFF at 30 minutes and the DG Starting Air Compressors are shown OFF at one (1) hour.

DG 1A Starting Air Comp
DG 1B Starting Air Comp

Calculation C11356, Rev. 0 identifies a reduction in the BAHTT loading. This load change is also described in Calculation C10650, Rev. 0, which was performed to document the replacement of heat tracing tapes associated with DCR 1236. BAHTT load changes from 30 kW to 14.6 kW for both trains.

Calculation C10915, Rev. 4, Tables 3 & 4 identify the following load changes including a further reduction to the BAHTT load:

Charger BRA-108/BRB-108	3.6 kW
XFMR BRA-106/BRB-106	36.6 kW/24.2 kW
Inverter BRA-111/BRB-111	9.6 kW
Inverter BRA-112/BRB-112	6.4 kW
XFMR RPA-13/RPB-11	10 kW/10.5 kW
BAHTT 1A/1B	14.6 kW/5.4 kW
Inverter BRD-109	6.6 kW

Finally, OD151 Attachment 8, evaluates transformers XFMR BRA-106/BRB-106 in detail and derives a further reduced load. (See Attachment 2)

XFMR BRA-106/BRB-106	16.9 kW/14.4 kW

3.4 Safeguard Diesel Generator Loading Adjustments for Operation at Frequencies Other Than 60 Herz

Calculation C-10915, Rev. 4 identifies the need to increase motor loads due to the Safeguards Diesel Generator operating at higher than nominal frequency. The calculation derived a motor load multiplier of 1.03030 to account for the potential load increase due to operation at frequencies as high as 60.6 Hz (909 rpm). This multiplier is applied to each motor and fan load in the attached Tables.

3.5 Station Air Compressor 1C

It was identified that maintaining the 1C air compressor (1-349) in the OFF position would reduce the load of the EDG 1A by 33.9 kW (40 hp). The normal local switch configuration for the 1C air compressor is to automatically start on decreasing air header pressure. This configuration change reduces the loading of the EDG 1A. This load is a non-safety related Appendix R designated load. This configuration change will not affect air compressor 1A, which will remain on MCC 5262 and air compressor 1B, which will remain on MCC 62A. Procedure changes and a 50.59 Screening (# 06-044-00) were developed to change the operation of this load.

Integrated Plant Emergency Operating Procedure E-1, "Loss of Reactor or Secondary Coolant," starts an instrument air compressor at Step 10. This is not an issue for DG 1B since its instrument air compressor 1B starts during DG Sequencing Step 9. However, neither the 1A nor 1C instrument compressors on DG 1A would be running due to the above identified change. The instrument air system is not credited for accident mitigation. Therefore, procedural requirements will be added not to exceed the DG load rating of 2860 kW when starting extra components. This load will not be shown as running on the DG 1A Loading Tables.

3.6 Containment Fan Cooling Units (Cont. FCUs)

CAP 042219, "CFCU Motor Load on Safeguards Diesel Generator Non-Conservative" identified the need to increase the Cont. FCU loading from 107 kW to 113.5 kW. Calculation C11582, Rev. 0 will be addended to reflect the increased load identified in CAP 042219.

3.7 DCR 3089 Recorder Replacement

Under DCR 3089, Recorder Replacement, an additional load of 560 watts (0.56 kW) was added to each emergency diesel loading assessment. This was calculated under an NEP-04.09, Electrical Load Addition, for the DCR. In the NEP 4.9 Electrical Load Addition, the load additions are documented per panel. There are several BRA and BRB panels that are clearly associated with the A or B diesel. These loads add up to the .56 KW per diesel. There is also a BRD-115 panel listed that had .763 KW added. The BRD-115 panel is fed by BRD-109 which is normally fed by MCC 1-62C which is fed by the B diesel. The correct numbers to add due to this mod are:

Train A = 0.56KW rounded up to 0.6 KW.
Train B = 0.56KW + 0.763KW = 1.323KW.

Corrective Action OTH 5427 (which exists to track the DCR 3089 load changes) will be addended to reflect the increase in load identified in DCR 3089 analysis NEP-04.09, Electrical Load Addition.

3.8 Cable and Overload Losses

DIT-KPS-005-00, S&L Design Information Transmittal (DIT), Cable Losses During Steady-State EDG Operation Concurrent with SI," identified the following additional EDG loading required to account for loading associated with the kW loss of the power cables powering the loads and of the thermal overloads in the 480V power circuits. The Information Transmittal is provided in Attachment 3:

DG 1A Cable and Overload Losses	26.30 kW
DG 1B Cable and Overload Losses	23.16 kW

GNP-04.03.04 normally requires spreadsheet equations to be discussed. The S&L attachment includes simple spreadsheets. Kewaunee has reviewed and accepted this information without further verification. Also, the losses determined appear to be reasonable.

3.9 Spent Fuel Pool Cooling Pump

Modifications have been implemented under DCR 3668, "SI Inhibit on SFP Pumps," to disable the start of the Spent Fuel Pool Cooling Pumps at the initiation of an accident. The pumps are not needed in the first several hours of the accident and will be modeled as starting at the 2 hour time interval.

3.10 Station Service Transformer Losses

Station Service Transformer losses are discussed in Calculation C-042-001, Rev. 6, Section 6.3 and are being added to the spreadsheet for completeness.

Station Service Transformers 1-51 & 1-52	25.5 kW
Station Service Transformers 1-61 & 1-62	20.4 kW

3.11 SI Pump Operation

The SI Pump draws a suction off the RWST. This pump is turned off at minimum RWST, which occurs between 1 and 2 hours into an accident. Per USAR section 6.2.2, if the RCS pressure is greater than the shut off head of the RHR pump, then the SI pump could be used to perform this recirculation. However, under a large break LOCA scenario, the RHR pump is credited for recirculation flow and the SI pumps are assumed OFF. Therefore, this load will be modeled as being OFF at 2 hours. IPEOP-ES-1.3 states that any pumps taking suction from the RWST should be stopped upon RWST Lo-Lo Level alarm at 4%.

3.12 ICS Pump Operation

The ICS Pump takes suction from the RWST and then could take suction from RHR in Recirculation Mode. However, no credit is taken for the pump operation after RWST operation. Per USAR section 6.4.2, "After the injection operation, it is expected that spray flow would be discontinued." Therefore, the pump will be modeled as being OFF at 2 hours. IPEOP-ES-1.3 states that any pumps taking suction from the RWST should be stopped upon RWST Lo-Lo Level alarm at 4%.

3.13 Charging Pump Operation

The Charging Pumps are started in Integrated Plant Emergency Operating Procedure E-1, "Loss of Reactor or Secondary Coolant," Step 11. However,

starting of these pumps could potentially load the DG above its short-time rating. The charging system is not credited for accident mitigation. Therefore, procedural requirements will be added not to exceed the DG load rating of 2860 kW when starting extra components. This load will not be shown as running on the Diesel Generator Loading Tables. Procedure changes were driven by CAP042684, based on a preliminary/draft version of this addendum, to verify DG loading prior to adding a Charging pump to a DG.

3.14 Diesel Generator aggregate power factor will be to the following equation:

PF = kWe (60 + seconds) / kVA (60 + seconds)

This is consistent with the original, Rev. 6, calculation and Addendum A. Note that the load at 50 seconds is slightly higher (1kW) on each DG. The additional MOVs running at 50 seconds do not have a tangible affect the aggregate power factor.

3.15 RHR Pump Operation

The RHR pumps are realigned to sump recirculation mode at RWST level ≤ 10 percent via IPEOP-ES-1.3. Calculation C11695 Rev. 0 states that the RHR motors will operate at 210 HP in this mode. This is an increase in BHP/kW for RHR. The increase will be reflected in the loading tables at 60 minutes, prior to removal of the SI and ICS motors at 120 minutes.

3.16 DG Engine Coolant Outlet Temperature

Attachment 4 includes curves from the DG manufacturer. Based on Curve B, Section 2 above states that the short-time rating of 2860 kW is valid for Diesel Generator inlet air temperatures up to and including 115°F. Use of the curve requires a maximum coolant temperature of 190F. Based on discussions with the System Engineer, the temperature has been monitored during various system conditions and the measured coolant temperature has not exceeded 190F.

4.0 METHODOLOGY AND ACCEPTANCE CRITERIA

The Diesel Generator Loading is evaluated in the attached Diesel Generator Loading Tables for each Diesel Generator. Each load interval should remain below the short-time rating of the Diesel Generator (2860 kW) in order to meet the requirements of Regulatory Guide 1.9, Rev. 2 for Diesel Generator Loading. The loading tables are consistent with previous tables included in the original calculation and Addendum A except a multiplication factor was added to account for potentially higher frequency (greater than 60 hertz) of the DG.

5.0 REFERENCES

5.1 Calculation C11582, Rev. 0, Safeguard's Large Motor Load Evaluation, dated 5/18/04
5.2 Calculation C11582, Rev. 0, Addendum A, Re-evaluate CC & SW Pump Motor Loads, dated 5/27/04
5.3 Calculation C11356, Rev. 0, CC Pump Motor Operation at 280 HP, Electrical System Impact, dated 1/25/02
5.4 Calculation C11356, Rev. 1, CC Pump Motor Operation at 280 HP, Electrical System Impact, dated 10/29/03
5.5 Calculation C11409, Rev. 0, CC System Flow Model Development, dated 8/28/02
5.6 Calculation C11409, Rev. 0, Addendum A, CCS Flow Impact due to Flow Increase for RCPs, dated 7/22/05
5.7 Flowserve Pump Division letter dated 5/23/06; from Paul Kasztejna, Supervising Design Engineer, re: Run Out Flow Conditions, 8SE pumps, s/n's 0600-9, -10 (Attachment 1)
5.8 Calculation C10915, Rev. 4, Safeguard Diesel Generator Loading Adjustments for Operation at Frequencies Other Than 60 Hertz, dated 10/29/03
5.9 Calculation C10650, Rev. 0, Addendum A, DCR 2786 Phase 2 - Boric Acid Heat Tracing Transformer Evaluation, 02/15/99
5.10 BRA106/BRB106 DG Load Reductions based on Load Measurements OD151, Attachment 8 (see Attachment 2)
5.11 Station Air Compressor 1C 50.59 Screening # 06-044-00
5.12 CAP 042219, "CFCU Motor Load on Safeguards Diesel Generator Non-Conservative," dated 2/26/2007
5.13 DCR 3089, Recorder Replacement
5.14 DIT-KPS-005-00, S&L Design Information Transmittal (DIT), Cable Losses During Steady-State EDG Operation Concurrent with SI," dated March 5, 2007 (Attachment 3)
5.15 USAR Rev. 19, dated 06/01/2005, Sections 6.2.2 and 6.4.2
5.16 Regulatory Guide 1.9, Rev. 2, Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants, dated December 1979
5.17 DCR 3668, SI Inhibit on SFP Pumps
5.18 ESI-EMD Owners Group Guidance Document EMD 645 E4 Nuclear Service Diesel Engine Ratings at Elevated Temperatures
5.19 Integrated Plant Emergency Operating Procedure ES-1.3, Rev. AA, Transfer To Containment Sump Recirculation
5.20 Calculation C11695, Rev. 0, RHR Pump Motor Operation at 210 HP Electrical System Impact, dated 06/19/05.
5.21 CAP 042684, "Additional EDG loading based on Integrated Plant Emergency Operating Procedures"
5.22 License Amendment Request 230

5.23 Integrated Plant Emergency Operating Procedure IPEOP E-1
5.24 Corrective Action OTH 5427

6.0 CALCULATION AND RESULTS

The loading for each Diesel Generator from the attached tables is as shown below:

	DG 1A kW Loading	DB 1B kW Loading
50 Second Load*	2822.5	2838.7
30 Minute Load	2823.0	2839.6
60 Minute Load	2657.0	2673.6
120 Minute Load	2019.1	2035.7
240 Minute Load	2019.1	2035.7

*The maximum loading during sequencing (60 seconds) has changed from the 60 second time interval to the 50 second time interval due to removing the SFP Pump from SI Initiation at 60 seconds and the stopping of MOVs ICS5A/B and ICS6A/B after 50 seconds.

The final (60 + seconds) aggregate Safeguard Diesel Generator power factors are:

	DG 1A	DG 1B
Aggregate PF	0.892	0.893

The Diesel Generator is shown to operate below the short-time rating of 2860 kW at all intervals and therefore meets the requirements of Regulatory Guide 1.9, Rev. 2 for Diesel Generator Loading.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The Diesel Generator Loading is within its short-time rating of 2860 kW for each load interval evaluated. Therefore, there is no restriction on operation below a Diesel Generator Intake Air Temperature of 115°F.

Operating and Surveillance procedures need to ensure that the 2860kW rating is the normal maximum diesel loading allowed. (CAP042976)

An addendum to Calculation C11582, Rev. 0, will be prepared to (CAP042910):
- Document the SI pumps suction change from BAT to RWST.
- Reflect the increased load identified in CAP 042219.

Update Corrective Action OTH 5427 to reflect the increased load identified in DCR 3089 analysis NEP-04.09, Electrical Load Addition. (CAP042913)

Procedural requirements will be added to the Emergency Procedures not to exceed the DG short-time load rating of 2860 kW when starting extra components. (CAP042915)

USAR Table 8.2-1 (2 pages) will be revised based on this calculation. (CAP042914)

An addendum to Calculation C11356, Rev. 1, will be prepared to reflect the strokes of 'B' train MOVs FW12B, SW903C, and SW903D. (CAP042911)

An addendum to Calculation C10915, Rev. 4, will be prepared to reflect the added load reduction for transformers BRA-106 and BRB-106, as evaluated by OD-151, Attachment 8, to a load of 16.9kW and 14.4kW, respectively. (CAP042912)

DIESEL GENERATOR A LOAD INFORMATION						SEQUENCE LOAD STEPS (kWe ELECTRICAL LOAD)											
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10	
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.	Notes
1.1	Maintained Contact Loads																
1-125	Chgr BRA-108	150	A	1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	
1-119	XFMR BRA-106	113	kVA	1.0303	16.9	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	
1-331	Inv BRA-111	7.5	kVA	1	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	
1-358	Inv BRA-112	7.5	kVA	1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	
1-103	XFMR RPA-13	15	kVA	1	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
1-398	IA Dryer 1A	3	kW	1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
1-138	BAHTT 1A	37.5	kVA	1	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	
1-813	H2 Anal Htd Ln	5.2	kW	1	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	
1-953	Chgr BRA/B-108	150	A	1.0303	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1.2	Auto Start Loads																
1-016	MOV RHR1A	4	HP	1.0303	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-132	Tb TG Oil Pump	50	HP	1.0303	42.4	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	43.7	
1-205	MOV C13	4	HP	1.0303	3.4	3.5	3.5	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-978	Chg Pump C FCU	2	HP	1.0303	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	
1-110	DG FO Xfer Pump	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
1-419	MOV ICS5A	0.66	HP	1.0303													See Seq #2.4
1-420	MOV ICS6A	0.66	HP	1.0303													See Seq #2.4
1-207	RHR Sump Pump	2.5	kW	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-107	ICS Pump 1A	250	HP	1.0303													See Seq #2.4
1-116	DG Vent Fan 1A	25	HP	1.0303	21.2	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	
1-451	SH Exh Fan 1A	15	HP	1.0303	12.7	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	
1-123	Trav Screen 1A1	2.25	HP	1.0303	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
1-291	TB HP Seal Oil	20	HP	1.0303	17.0	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	
1-426	MOV BT2A	0.33	HP	1.0303	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	CI Close-N.O.
1-1112	DG1A Turbo Pmp	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
1-258A	DG1A Circ Pmp	1	HP	1.0303	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	
1-258B	DG1A Imm Htr	15	kW	1	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-104	MOV MS2A	0.5	HP	1.0303	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-410	Fire Jockey Pump	3	HP	1.0303	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	
1-1013	SBV Hydr Pack	1.25	HP	1.0303	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
1-351	MOV CVC301	0.7	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-418	MOV CVC1	0.7	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-301	MOV RHR2A	4	HP	1.0303	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-869	DDT Emer Pump	15.5	kW	1.0303	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-353	MOV CVC212	0.33	HP	1.0303	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CI Close-N.O.
1-102	MOV CC653	0.13	HP	1.0303	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	CI Close-N.O.
1-871	MOV MD(R) 323A	1.9	HP	1.0303	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CI Close-N.C.
1.3	Manual Control Loads																
1-366	MOV SI4A	3	HP	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

DIESEL GENERATOR A LOAD INFORMATION									
Motor #	Name	Load	Units	Freq Mult.	kWe	30 Min.	60 Min	120 Min	240 Min
1.1	Maintained Contact Loads								
1-125	Chgr BRA-108	150	A	1	3.6	3.6	3.6	3.6	3.6
1-119	XFMR BRA-106	113	kVA	1.0303	16.9	17.4	17.4	17.4	17.4
1-331	Inv BRA-111	7.5	kVA	1	9.6	9.6	9.6	9.6	9.6
1-358	Inv BRA-112	7.5	kVA	1	6.4	6.4	6.4	6.4	6.4
1-103	XFMR RPA-13	15	kVA	1	10.0	10.0	10.0	10.0	10.0
1-398	IA Dryer 1A	3	kW	1	3.0	3.0	3.0	3.0	3.0
1-138	BAHTT 1A	37.5	kVA	1	14.6	14.6	14.6	14.6	14.6
1-813	H2 Anal Htd Ln	5.2	kW	1	5.2	5.2	5.2	5.2	5.2
1-953	Chgr BRA/B-108	150	A	1.0303	0.0	0.0	0.0	0.0	0.0
1.2	Auto Start Loads								
1-016	MOV RHR1A	4	HP	1.0303	3.4	0.0	0.0	0.0	0.0
1-132	Tb TG Oil Pump	50	HP	1.0303	42.4	43.7	43.7	43.7	43.7
1-205	MOV C13	4	HP	1.0303	3.4	0.0	0.0	0.0	0.0
1-978	Chg Pump C FCU	2	HP	1.0303	1.7	1.8	1.8	1.8	1.8
1-110	DG FO Xfer Pump	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66
1-419	MOV ICS5A	0.66	HP	1.0303					
1-420	MOV ICS6A	0.66	HP	1.0303					
1-207	RHR Sump Pump	2.5	kW	1.0303	2.5	0.0	0.0	0.0	0.0
1-107	ICS Pump 1A	250	HP	1.0303					
1-116	DG Vent Fan 1A	25	HP	1.0303	21.2	21.8	21.8	21.8	21.8
1-451	SH Exh Fan 1A	15	HP	1.0303	12.7	13.1	13.1	13.1	13.1
1-123	Trav Screen 1A1	2.25	HP	1.0303	1.9	2.0	2.0	2.0	2.0
1-291	TB HP Seal Oil	20	HP	1.0303	17.0	17.5	17.5	17.5	17.5
1-426	MOV BT2A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0
1-1112	DG1A Turbo Pmp	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66
1-258A	DG1A Circ Pmp	1	HP	1.0303	0.9	0.9	0.9	0.9	0.9
1-258B	DG1A Imm Htr	15	kW	1	15.0	0.0	0.0	0.0	0.0
1-104	MOV MS2A	0.5	HP	1.0303	0.4	0.0	0.0	0.0	0.0
1-410	Fire Jockey Pump	3	HP	1.0303	2.5	2.6	2.6	2.6	2.6
1-1013	SBV Hydr Pack	1.25	HP	1.0303	1.1	1.1	1.1	1.1	1.1
1-351	MOV CVC301	0.7	HP	1.0303	0.6	0.0	0.0	0.0	0.0
1-418	MOV CVC1	0.7	HP	1.0303	0.6	0.0	0.0	0.0	0.0
1-301	MOV RHR2A	4	HP	1.0303	3.4	0.0	0.0	0.0	0.0
1-869	DDT Emer Pump	15.5	kW	1.0303	15.5	0.0	0.0	0.0	0.0
1-353	MOV CVC212	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0
1-102	MOV CC653	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0
1-871	MOV MD(R) 323A	1.9	HP	1.0303	1.6	0.0	0.0	0.0	0.0
1.3	Manual Control Loads								
1-366	MOV SI4A	3	HP	1.0303	2.5	0.0	0.0	0.0	0.0

DIESEL GENERATOR A LOAD INFORMATION						SEQUENCE LOAD STEPS (kWe ELECTRICAL LOAD)											
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10	
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.	Notes
1-383	MOV SI15B	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-684	WR-6			1.0303	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-408	MOV SW10A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-361	MOV CC601A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-363	MOV CC612A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-381	MOV SI9A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-359	MOV CC600	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-444	MOV RHR11	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-365	MOV SW1400	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-445	MOV CC400A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-374	MOV SI351A	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-430	MOV RHR400A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-373	MOV SI350A	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-448	MOV CVC440	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-130	MOV SI209	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-387	MOV SI5A	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-379	MOV SI300A	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-415	MOV MS100A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-059	Batt Rm Ex Fan	3	HP	1.0303	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	
1-149	MOV RHR299A	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-401	MOV SW601A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-1225	Cntmt Vent Mon	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
1-1223	Aux Bldg Mon	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
1-1153	IA Dryer 1C	7.75	kW	1	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	
1-355	MOV PR1A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-631	MOV ICS2A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-670	MOV LOCA2A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-672	MOV SA7003A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-815	H2 Anal 1A	2.74	kW	1.0303	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	
1-368	MOV SI2A	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-321	MOV SI3	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-399	MOV SW1300A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1.4	SI Trip, Manual Reset																
1-117	IA Compr 1A	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-135	Waste Gas CP1B	25	HP	1.0303	21.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-137	TB Turning Gear	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-013	Fire Pump 1A	200	HP	1.0303	160.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
PRZR	Htr Backup Grp A	230.4	kW	1	230.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2.1	Step 0 SI Seq Loads																
1-371	MOV SI20A	12.8	HP	1.0303	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SI Open-N.O.
1-764	MOV CC6A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SI Open-N.O.
1-386	MOV SI11A	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SI Open-N.O.

DIESEL GENERATOR A LOAD INFORMATION										
Motor #	Name	Load	Units	Freq Mult.	kWe	30 Min.	60 Min	120 Min	240 Min	
1-383	MOV SI15B	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	
1-684	WR-6			1.0303	0.0	0.0	0.0	0.0	0.0	
1-408	MOV SW10A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	
1-361	MOV CC601A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	
1-363	MOV CC612A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	
1-381	MOV SI9A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	
1-359	MOV CC600	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	
1-444	MOV RHR11	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	
1-365	MOV SW1400	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	
1-445	MOV CC400A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	
1-374	MOV SI351A	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	
1-430	MOV RHR400A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	
1-373	MOV SI350A	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	
1-448	MOV CVC440	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	
1-130	MOV SI209	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	
1-387	MOV SI5A	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	
1-379	MOV SI300A	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	
1-415	MOV MS100A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	
1-059	Batt Rm Ex Fan	3	HP	1.0303	2.5	2.6	2.6	2.6	2.6	
1-149	MOV RHR299A	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	
1-401	MOV SW601A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	
1-1225	Cntmt Vent Mon	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	
1-1223	Aux Bldg Mon	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	
1-1153	IA Dryer 1C	7.75	kW	1	7.8	7.8	7.8	7.8	7.8	
1-355	MOV PR1A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	
1-631	MOV ICS2A	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	
1-670	MOV LOCA2A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	
1-672	MOV SA7003A	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	
1-815	H2 Anal 1A	2.74	kW	1.0303	2.7	2.8	2.8	2.8	2.8	
1-368	MOV SI2A	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	
1-321	MOV SI3	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	
1-399	MOV SW1300A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	
1.4	SI Trip, Manual Reset									
1-117	IA Compr 1A	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	
1-135	Waste Gas CP1B	25	HP	1.0303	21.2	0.0	0.0	0.0	0.0	
1-137	TB Turning Gear	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	
1-013	Fire Pump 1A	200	HP	1.0303	160.4	0.0	0.0	0.0	0.0	
PRZR	Htr Backup Grp A	230.4	kW	1	230.4	0.0	0.0	0.0	0.0	
2.1	Step 0 SI Seq Loads									
1-371	MOV SI20A	12.6	HP	1.0303	10.9	0.0	0.0	0.0	0.0	
1-764	MOV CC6A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	
1-386	MOV SI11A	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	

DIESEL GENERATOR A LOAD INFORMATION						SEQUENCE LOAD STEPS (kWe ELECTRICAL LOAD)											
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10	
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.	Notes
1-377	MOV SI302A	7.6	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SI Open-N.O.
1-232	MOV FW12A	5.3	HP	1.0303	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	
1-280	AFWP1A LO Pmp	2	HP	1.0303	1.7	1.8	1.8	1.8	1.8	1.8	1.8	0.0	0.0	0.0	0.0	0.0	
2.2	Step 1 SI Seq Loads																
1-020	SI Pump 1A	800	HP	1.0303	653.0	0.0	672.8	672.8	672.8	672.8	672.8	672.8	672.8	672.8	672.8	672.8	
2.3	Step 2 SI Seq Loads																
1-025	RHR Pump 1A	200	HP	1.0303	143	0.0	0.0	147.3	147.3	147.3	147.3	147.3	147.3	147.3	147.3	147.3	
1-298	RHR Pit FCU 1A	1.5	HP	1.0303	1.3	0.0	0.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
2.4	Step 3 SI Seq Loads																
1-107	ICS Pump 1A	250	HP	1.0303	174	0.0	0.0	0.0	179.3	179.3	179.3	179.3	179.3	179.3	179.3	179.3	
1-419	MOV ICS5A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0	
1-420	MOV ICS6A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0	
1-449	SV Fltr 1A Htr	36.8	kW	1	36.8	0.0	0.0	0.0	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	
1-126	SV Exh Fan 1A	25	HP	1.0303	21.2	0.0	0.0	0.0	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	
1-127	SBV Fan 1A	25	HP	1.0303	21.2	0.0	0.0	0.0	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	
1-238	SBV Fltr 1A Htr	27.6	kW	1	27.6	0.0	0.0	0.0	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	
2.5	Step 4 SI Seq Loads																
1-023	SW Pump 1A1	400	HP	1.0303	321	0.0	0.0	0.0	0.0	330.7	330.7	330.7	330.7	330.7	330.7	330.7	
1-242	SW Strainer 1A1	1.5	HP	1.0303	1.3	0.0	0.0	0.0	0.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	

DIESEL GENERATOR A LOAD INFORMATION										
Motor #	Name	Load	Units	Freq Mult.	kWe	30 Min.	60 Min	120 Min	240 Min	
1-377	MOV SI302A	7.6	HP	1.0303	6.4	0.0	0.0	0.0	0.0	
1-232	MOV FW12A	5.3	HP	1.0303	4.5	0.0	0.0	0.0	0.0	
1-280	AFWP1A LO Pmp	2	HP	1.0303	1.7	0.0	0.0	0.0	0.0	
2.2	Step 1 SI Seq Loads									
1-020	SI Pump 1A	800	HP	1.0303	653.0	672.8	672.8	0.0	0.0	OFF at RWST < 4%; > 60 min
2.3	Step 2 SI Seq Loads									
1-025	RHR Pump 1A	200	HP	1.0303	143	151.1	173.5	173.5	173.5	Change BHP at Recirc, RWST <10% assume at T=60 Min.
1-298	RHR Pit FCU 1A	1.5	HP	1.0303	1.3	1.3	1.3	1.3	1.3	
2.4	Step 3 SI Seq Loads									
1-107	ICS Pump 1A	250	HP	1.0303	174	181.7	0.0	0.0	0.0	OFF at RWST < 10%; assume at T=60 min
1-419	MOV ICS5A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	
1-420	MOV ICS6A	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	
1-449	SV Fltr 1A Htr	36.8	kW	1	36.8	36.8	36.8	36.8	36.8	
1-126	SV Exh Fan 1A	25	HP	1.0303	21.2	21.8	21.8	21.8	21.8	
1-127	SBV Fan 1A	25	HP	1.0303	21.2	21.8	21.8	21.8	21.8	
1-238	SBV Fltr 1A Htr	27.6	kW	1	27.6	27.6	27.6	27.6	27.6	
2.5	Step 4 SI Seq Loads									
1-023	SW Pump 1A1	400	HP	1.0303	321	330.7	330.7	330.7	330.7	
1-242	SW Strainer 1A1	1.5	HP	1.0303	1.3	1.3	1.3	1.3	1.3	

DIESEL GENERATOR A LOAD INFORMATION						SEQUENCE LOAD STEPS (kWe ELECTRICAL LOAD)											
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10	
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.	Notes
2.6	Step 5 SI Seq Loads																
1-120	Containment FCU 1A	125	HP	1.0303	113.5	0.0	0.0	0.0	0.0	0.0	116.9	116.9	116.9	116.9	116.9	116.9	
1-156	Containment FCU 1B	125	HP	1.0303	113.5	0.0	0.0	0.0	0.0	0.0	116.9	116.9	116.9	116.9	116.9	116.9	
1-583	Dome Fan 1A	20	HP	1.0303	16.9	0.0	0.0	0.0	0.0	0.0	17.4	17.4	17.4	17.4	17.4	17.4	
1-394	MOV SW903A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	
1-395	MOV SW903B	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	
2.7	Step 6 SI Seq Loads																
1-024	AFW Pump 1A	300	HP	1.0303	253	0.0	0.0	0.0	0.0	0.0	0.0	260.7	260.7	260.7	260.7	260.7	
1-982	AFWP1A FCU	3	HP	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.6	2.6	2.6	2.6	
1-426	MOV BT2A	0.33	HP	1.0303													See Seq #1.2
2.8	Step 7 SI Seq Loads																
1-021	CC Pump 1A	250	HP	1.0303	171	0.0	0.0	0.0	0.0	0.0	0.0	0.0	176.2	176.2	176.2	176.2	
2.9	Step 8 SI Seq Loads																
1-022	SW Pump 1A2	400	HP	1.0303	321	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	330.7	330.7	330.7	
1-243	SW Strainer 1A2	1.5	HP	1.0303	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.3	
2.10	Step 9 SI Seq Loads																
1-349	IA Compr 1C	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-411	Bat 1A Htr 1A1	4.5	kW	1	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-412	Bat 1B Htr 1B1	4.5	kW	1	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-667	Batt Rm FCU 1A	1.5	HP	1.0303	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3	
1-265	CRM Recirc Fan	7.5	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6	
1-315	CRM Chiller 1A	38.7	kW	1.0303	38.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.9	39.9	
1-317	CRM Fan 1A	20	HP	1.0303	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	17.5	
1-463	CRM Chiller Pump	3	HP	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.6	
1-201	TB FCU 1A	5	HP	1.0303	4.237	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.37	4.37	
1-298	RHR Pit FCU 1A	1.5	HP	1.0303													See Seq #2.3
1-131	AB Mezz FCU 1A	5	HP	1.0303	4.237	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.37	4.37	
1-164	AB Bsmt FCU 1A	7.5	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6	
1-601	CRDM Rm FCU 1A	5	HP	1.0303	4.237	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.37	4.37	
1-436	DG1A Start A/C	7.5	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6	
1-1009	Damper ACC3A	0.2	HP	1.0303	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	
1-1082	AB Fan Floor FCU	10	HP	1.0303	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8	8.8	
1-1084	AB Bsmt FCU 1C	7.5	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6	

DIESEL GENERATOR A LOAD INFORMATION										
Motor #	Name	Load	Units	Freq Mult.	kWe	30 Min.	60 Min	120 Min	240 Min	
2.6	Step 5 SI Seq Loads									
1-120	Containment FCU 1A	125	HP	1.0303	113.5	95.8	95.8	95.8	95.8	CAP042219
1-156	Containment FCU 1B	125	HP	1.0303	113.5	95.8	95.8	95.8	95.8	CAP042219
1-583	Dome Fan 1A	20	HP	1.0303	16.9	17.4	17.4	17.4	17.4	
1-394	MOV SW903A	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	
1-395	MOV SW903B	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	
2.7	Step 6 SI Seq Loads									
1-024	AFW Pump 1A	300	HP	1.0303	253	260.7	260.7	260.7	260.7	
1-982	AFWP1A FCU	3	HP	1.0303	2.5	2.6	2.6	2.6	2.6	
1-426	MOV BT2A	0.33	HP	1.0303						
2.8	Step 7 SI Seq Loads									
1-021	CC Pump 1A	250	HP	1.0303	171	219.5	219.5	219.5	219.5	BHP increase to flow 2 RHR heat exchangers, RWST < 37%; < 60 Min, assume at T=30 Min
2.9	Step 8 SI Seq Loads									
1-022	SW Pump 1A2	400	HP	1.0303	321	330.7	330.7	330.7	330.7	
1-243	SW Strainer 1A2	1.5	HP	1.0303	1.3	1.3	1.3	1.3	1.3	
2.10	Step 9 SI Seq Loads									
1-349	IA Compr 1C	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	
1-411	Bat 1A Htr 1A1	4.5	kW	1	4.5	0.0	0.0	0.0	0.0	
1-412	Bat 1B Htr 1B1	4.5	kW	1	4.5	0.0	0.0	0.0	0.0	
1-667	Batt Rm FCU 1A	1.5	HP	1.0303	1.3	1.3	1.3	1.3	1.3	
1-265	CRM Recirc Fan	7.5	HP	1.0303	6.4	6.6	6.6	6.6	6.6	
1-315	CRM Chiller 1A	38.7	kW	1.0303	38.7	39.9	39.9	39.9	39.9	
1-317	CRM Fan 1A	20	HP	1.0303	17.0	17.5	17.5	17.5	17.5	
1-463	CRM Chiller Pump	3	HP	1.0303	2.5	2.6	2.6	2.6	2.6	
1-201	TB FCU 1A	5	HP	1.0303	4.237	4.37	4.37	4.37	4.37	
1-298	RHR Pit FCU 1A	1.5	HP	1.0303						
1-131	AB Mezz FCU 1A	5	HP	1.0303	4.237	4.37	4.37	4.37	4.37	
1-164	AB Bsmt FCU 1A	7.5	HP	1.0303	6.4	6.6	6.6	6.6	6.6	
1-601	CRDM Rm FCU 1A	5	HP	1.0303	4.237	4.37	4.37	4.37	4.37	
1-436	DG1A Start A/C	7.5	HP	1.0303	6.4	6.6	0.0	0.0	0.0	
1-1009	Damper ACC3A	0.2	HP	1.0303	0.2	0.0	0.0	0.0	0.0	
1-1082	AB Fan Floor FCU	10	HP	1.0303	8.5	8.8	8.8	8.8	8.8	
1-1084	AB Bsmt FCU 1C	7.5	HP	1.0303	6.4	6.6	6.6	6.6	6.6	

DIESEL GENERATOR A LOAD INFORMATION						SEQUENCE LOAD STEPS (kWe ELECTRICAL LOAD)											
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10	
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.	Notes
2.11	Step 10 SI Seq Loads																
1-068	BA Xfer Pump 1A	15	HP	1.0303	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-067	Charging Pump 1A	100	HP	1.0303	80.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-133	Charging Pump 1C	127	HP	1.0303	101.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1-178	SFP Pump 1A	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	DCR 3089 Recorder Replacement			1	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
	Cable Losses & Overload Htr Losses			1	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	26.3	
	Txfrmr Load Losses			1	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	25.5	
	TOTAL KWe LOAD				3592.9	253.1	925.9	1074.5	1362.8	1691.4	1943.3	2204.8	2380.7	2712.7	2822.5	2821.2	

DIESEL GENERATOR A LOAD INFORMATION										
				Freq						
Motor #	Name	Load	Units	Mult.	kWe	30 Min.	60 Min	120 Min	240 Min	
2.11	Step 10 SI Seq Loads									
1-068	BA Xfer Pump 1A	15	HP	1.0303	12.7	0.0	0.0	0.0	0.0	
1-067	Charging Pump 1A	100	HP	1.0303	80.2	0.0	0.0	0.0	0.0	
1-133	Charging Pump 1C	127	HP	1.0303	101.8	0.0	0.0	0.0	0.0	
1-178	SFP Pump 1A	40	HP	1.0303	33.9	0.0	0.0	34.9	34.9	start pump aftet 2 hours
	DCR 3089 Recorder Replacement			1	0.6	0.6	0.6	0.6	0.6	
	Cable Losses & Overload Htr Losses			1	26.3	26.3	26.3	26.3	26.3	
	Txfmr Load Losses			1	25.5	25.5	25.5	25.5	25.5	
	TOTAL KWe LOAD				3592.9	2823.0	2657.0	2019.1	2019.1	

DIESEL GENERATOR B LOAD INFORMATION						SEQUENCE LOAD STEPS (KWe ELECTRICAL LOAD)										
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.
1.1	Maintained Contact Loads															
1-143	Chgr BRB-108	150	A	1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
1-153	XFMR BRB-106	75	kVA	1.0303	14.4	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
1-332	Inv BRB-111	7.5	kVA	1	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
1-357	Inv BRB-112	7.5	kVA	1	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
1-184	XFMR RPB-11	15	kVA	1	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
1-344	IA Dryer 1B	3	kW	1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
1-302	BAHTT 1B	37.5	kVA	1	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
1-166	H2 Anal Htd Ln	5.6	kW	1	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
1-350	Inv BRD-109	5	kVA	1	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
1-245	TAT Aux's	1.5	kVA	1.0303	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
1-669	Chgr BRD-108	150	A	1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1
1-860	Proprietary	25	kVA	1	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
1-953	Chgr BRA/B-108	150	A	1.0303	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.2	Auto Start Loads															
1-049	MOV RHR1B	4	HP	1.0303	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-205	MOV C13	4	HP	1.0303	3.4	3.5	3.5	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-979	CC Pump 1B FCU	2	HP	1.0303	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
1-139	DG FO Xfer Pump	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
1-421	MOV ICS5B	0.66	HP	1.0303												
1-422	MOV ICS6B	0.66	HP	1.0303												
1-208	RHR Sump Pump	2.5	kW	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-148	ICS Pump 1B	250	HP	1.0303												
1-118	DG Vent Fan 1B	25	HP	1.0303	21.2	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
1-452	SH Exh Fan 1B	15	HP	1.0303	12.7	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1
1-155	Trav Screen 1B2	2.25	HP	1.0303	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
1-291	TB HP Seal Oil	20	HP	1.0303	17.0	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
1-052	MOV BT2B	0.33	HP	1.0303	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0
1-1113	DG1B Turbo Pmp	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
1-259A	DG1B Circ Pmp	1	HP	1.0303	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
1-259B	DG1B Imm Htr	15	kW	1	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-122	MOV MS2B	0.5	HP	1.0303	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-1014	SBV Hydr Pack	1.25	HP	1.0303	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
1-342	MOV CVC211	0.33	HP	1.0303	0.3	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-630	CO2 Tank Compr	3	HP	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-050	MOV RHR2B	4	HP	1.0303	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-671	MOV LOCA2B	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-870	DDT Emer Pump	15.5	kW	1.0303	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-673	MOV SA7003B	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-872	MOV MD(R) 323B	1.9	HP	1.0303	1.61	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DIESEL GENERATOR B LOAD INFORMATION										
				Freq						
Motor #	Name	Load	Units	Mult.	kWe	Notes	30 Min.	60 Min	120 Min	240 Min
1.1	Maintained Contact Loads									
1-143	Chgr BRB-108	150	A	1	3.6		3.6	3.6	3.6	3.6
1-153	XFMR BRB-106	75	kVA	1.0303	14.4		14.8	14.8	14.8	14.8
1-332	Inv BRB-111	7.5	kVA	1	9.6		9.6	9.6	9.6	9.6
1-357	Inv BRB-112	7.5	kVA	1	6.4		6.4	6.4	6.4	6.4
1-184	XFMR RPB-11	15	kVA	1	10.5		10.5	10.5	10.5	10.5
1-344	IA Dryer 1B	3	kW	1	3.0		3.0	3.0	3.0	3.0
1-302	BAHTT 1B	37.5	kVA	1	5.4		5.4	5.4	5.4	5.4
1-166	H2 Anal Htd Ln	5.6	kW	1	5.6		5.6	5.6	5.6	5.6
1-350	Inv BRD-109	5	kVA	1	6.6		6.6	6.6	6.6	6.6
1-245	TAT Aux's	1.5	kVA	1.0303	1.2		1.2	1.2	1.2	1.2
1-669	Chgr BRD-108	150	A	1	34.1		34.1	34.1	34.1	34.1
1-860	Proprietary	25	kVA	1	14.7	Maint. Bypass	14.7	14.7	14.7	14.7
1-953	Chgr BRA/B-108	150	A	1.0303	0.0					
1.2	Auto Start Loads									
1-049	MOV RHR1B	4	HP	1.0303	3.4					
1-205	MOV C13	4	HP	1.0303	3.4					
1-979	CC Pump 1B FCU	2	HP	1.0303	1.7		1.8	1.8	1.8	1.8
1-139	DG FO Xfer Pump	0.75	HP	1.0303	0.636		0.66	0.66	0.66	0.66
1-421	MOV ICS5B	0.66	HP	1.0303		See Seq #2.4				
1-422	MOV ICS6B	0.66	HP	1.0303		See Seq #2.4				
1-208	RHR Sump Pump	2.5	kW	1.0303	2.5					
1-148	ICS Pump 1B	250	HP	1.0303		See Seq #2.4				
1-118	DG Vent Fan 1B	25	HP	1.0303	21.2		21.8	21.8	21.8	21.8
1-452	SH Exh Fan 1B	15	HP	1.0303	12.7		13.1	13.1	13.1	13.1
1-155	Trav Screen 1B2	2.25	HP	1.0303	1.9		2.0	2.0	2.0	2.0
1-291	TB HP Seal Oil	20	HP	1.0303	17.0		17.5	17.5	17.5	17.5
1-052	MOV BT2B	0.33	HP	1.0303	0.3	CI Close-N.O.				
1-1113	DG1B Turbo Pmp	0.75	HP	1.0303	0.636		0.66	0.66	0.66	0.66
1-259A	DG1B Circ Pmp	1	HP	1.0303	0.9		0.9	0.9	0.9	0.9
1-259B	DG1B Imm Htr	15	kW	1	15.0					
1-122	MOV MS2B	0.5	HP	1.0303	0.4					
1-1014	SBV Hydr Pack	1.25	HP	1.0303	1.1		1.1	1.1	1.1	1.1
1-342	MOV CVC211	0.33	HP	1.0303	0.3	CI Close-N.O.				
1-630	CO2 Tank Compr	3	HP	1.0303	2.5					
1-050	MOV RHR2B	4	HP	1.0303	3.4					
1-671	MOV LOCA2B	0.13	HP	1.0303	0.1	CI Close-N.C.				
1-870	DDT Emer Pump	15.5	kW	1.0303	15.5					
1-673	MOV SA7003B	0.13	HP	1.0303	0.1	CI Close-N.C.				
1-872	MOV MD(R) 323B	1.9	HP	1.0303	1.61	CI Close-N.C.				

DIESEL GENERATOR B LOAD INFORMATION						SEQUENCE LOAD STEPS (KWe ELECTRICAL LOAD)										
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.
1.3	Manual Control Loads															
1-367	MOV SI4B	3	HP	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-356	MOV PR1B	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-683	WR-5			1.0303	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-715	WR-19			1.0303	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-686	WR-9			1.0303	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-409	MOV SW10B	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-362	MOV CC601B	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-364	MOV CC612B	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-382	MOV SI9B	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-385	MOV SI15A	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-516	MOV LD60	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-446	MOV CC400B	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-375	MOV SI350B	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-433	MOV RHR400B	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-376	MOV SI351B	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-140	MOV SI208	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-388	MOV SI5B	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-380	MOV SI300B	2.6	HP	1.0303	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-416	MOV MS100B	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-215	Batt Rm Ex Fan	3	HP	1.0303	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
1-150	MOV RHR299B	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-402	MOV SW601B	0.13	HP	1.0303	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-1227	Cntmt Vent Mon	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
1-1224	Aux Bldg Mon	0.75	HP	1.0303	0.636	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
1-941	MOV ICS2B	1	HP	1.0303	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-923	H2 Anal 1B	2.74	kW	1.0303	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
1-370	MOV SI2B	1.4	HP	1.0303	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-403	MOV SW1300B	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.4	SI Trip, Manual Reset															
1-117	IA Compr 1A	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-135	Waste Gas CP1B	25	HP	1.0303	21.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-137	TB Turning Gear	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-234	Fire Pump 1B	200	HP	1.0303	160.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRZR	Htr Backup Grp B	192	kW	1	179.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DIESEL GENERATOR B LOAD INFORMATION										
				Freq						
Motor #	Name	Load	Units	Mult.	kWe	Notes	30 Min.	60 Min	120 Min	240 Min
1.3	Manual Control Loads									
1-367	MOV SI4B	3	HP	1.0303	2.5					
1-356	MOV PR1B	1	HP	1.0303	0.9					
1-683	WR-5			1.0303	0.0					
1-715	WR-19			1.0303	0.0					
1-686	WR-9			1.0303	0.0					
1-409	MOV SW10B	0.13	HP	1.0303	0.1					
1-362	MOV CC601B	0.33	HP	1.0303	0.3					
1-364	MOV CC612B	0.33	HP	1.0303	0.3					
1-382	MOV SI9B	1	HP	1.0303	0.9					
1-385	MOV SI15A	1.6	HP	1.0303	1.4					
1-516	MOV LD60	1.6	HP	1.0303	1.4					
1-446	MOV CC400B	1	HP	1.0303	0.9					
1-375	MOV SI350B	2.6	HP	1.0303	2.2					
1-433	MOV RHR400B	0.66	HP	1.0303	0.6					
1-376	MOV SI351B	2.6	HP	1.0303	2.2					
1-140	MOV SI208	1.6	HP	1.0303	1.4					
1-388	MOV SI5B	1.4	HP	1.0303	1.2					
1-380	MOV SI300B	2.6	HP	1.0303	2.2					
1-416	MOV MS100B	0.33	HP	1.0303	0.3					
1-215	Batt Rm Ex Fan	3	HP	1.0303	2.5		2.6	2.6	2.6	2.6
1-150	MOV RHR299B	1.6	HP	1.0303	1.4					
1-402	MOV SW601B	0.13	HP	1.0303	0.1					
1-1227	Cntmt Vent Mon	0.75	HP	1.0303	0.636		0.66	0.66	0.66	0.66
1-1224	Aux Bldg Mon	0.75	HP	1.0303	0.636		0.66	0.66	0.66	0.66
1-941	MOV ICS2B	1	HP	1.0303	0.9					
1-923	H2 Anal 1B	2.74	kW	1.0303	2.7		2.8	2.8	2.8	2.8
1-370	MOV SI2B	1.4	HP	1.0303	1.2					
1-403	MOV SW1300B	0.66	HP	1.0303	0.6					
1.4	SI Trip, Manual Reset									
1-117	IA Compr 1A	40	HP	1.0303	33.9					
1-135	Waste Gas CP1B	25	HP	1.0303	21.2					
1-137	TB Turning Gear	40	HP	1.0303	33.9					
1-234	Fire Pump 1B	200	HP	1.0303	160.4					
PRZR	Htr Backup Grp B	192	kW	1	179.2	1Heater O.O.S.				

DIESEL GENERATOR B LOAD INFORMATION						SEQUENCE LOAD STEPS (KWe ELECTRICAL LOAD)										
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.
2.1	Step 0 SI Seq Loads															
1-372	MOV SI20B	12.8	HP	1.0303	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-763	MOV CC6B	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-384	MOV SI11B	1.6	HP	1.0303	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-378	MOV SI302B	7.6	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-236	MOV FW12B	5.3	HP	1.0303	4.5	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
1-281	AFWP1B LO Pmp	2	HP	1.0303	1.7	1.8	1.8	1.8	1.8	1.8	1.8	0.0	0.0	0.0	0.0	0.0
2.2	Step 1 SI Seq Loads															
1-027	SI Pump 1B	800	HP	1.0303	653	0.0	672.8	672.8	672.8	672.8	672.8	672.8	672.8	672.8	672.8	672.8
1-183	AB Bsmt FCU 1B	7.5	HP	1.0303	6.4	0.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
2.3	Step 2 SI Seq Loads															
1-032	RHR Pump 1B	200	HP	1.0303	143	0.0	0.0	147.3	147.3	147.3	147.3	147.3	147.3	147.3	147.3	147.3
1-299	RHR Pit FCU 1B	1.5	HP	1.0303	1.3	0.0	0.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
2.4	Step 3 SI Seq Loads															
1-148	ICS Pump 1B	250	HP	1.0303	174	0.0	0.0	0.0	179.3	179.3	179.3	179.3	179.3	179.3	179.3	179.3
1-421	MOV ICS5B	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0
1-422	MOV ICS6B	0.66	HP	1.0303	0.6	0.0	0.0	0.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0
1-450	SV Fltr 1B Htr	36.8	kW	1	36.8	0.0	0.0	0.0	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8
1-144	SV Exh Fan 1B	25	HP	1.0303	21.2	0.0	0.0	0.0	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
1-145	SBV Fan 1B	25	HP	1.0303	21.2	0.0	0.0	0.0	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
1-239	SBV Fltr 1B Htr	27.6	kW	1	27.6	0.0	0.0	0.0	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6
2.5	Step 4 SI Seq Loads															
1-030	SW Pump 1B1	400	HP	1.0303	321	0.0	0.0	0.0	0.0	330.7	330.7	330.7	330.7	330.7	330.7	330.7
1-294	SW Strainer 1B1	1.5	HP	1.0303	1.3	0.0	0.0	0.0	0.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3
2.6	Step 5 SI Seq Loads															
1-121	Containment FCU 1C	125	HP	1.0303	113.5	0.0	0.0	0.0	0.0	0.0	116.9	116.9	116.9	116.9	116.9	116.9
1-157	Containment FCU 1D	125	HP	1.0303	113.5	0.0	0.0	0.0	0.0	0.0	116.9	116.9	116.9	116.9	116.9	116.9
1-584	Dome Fan 1B	20	HP	1.0303	16.95	0.0	0.0	0.0	0.0	0.0	17.46	17.46	17.46	17.46	17.46	17.46
1-396	MOV SW903C	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3
1-397	MOV SW903D	0.33	HP	1.0303	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3

DIESEL GENERATOR B LOAD INFORMATION											
Motor #	Name	Load	Units	Freq Mult.	kWe	Notes	30 Min.	60 Min	120 Min	240 Min	
2.1	Step 0 SI Seq Loads										
1-372	MOV SI20B	12.8	HP	1.0303	10.9	SI Open-N.O.					
1-763	MOV CC6B	0.66	HP	1.0303	0.6	SI Open-N.O.					
1-384	MOV SI11B	1.6	HP	1.0303	1.4	SI Open-N.O.					
1-378	MOV SI302B	7.6	HP	1.0303	6.4	SI Open-N.O.					
1-236	MOV FW12B	5.3	HP	1.0303	4.5		0.0	0.0	0.0	0.0	
1-281	AFWP1B LO Pmp	2	HP	1.0303	1.7						
2.2	Step 1 SI Seq Loads										
1-027	SI Pump 1B	800	HP	1.0303	653		672.8	672.8	0.0	0.0	OFF at RWST < 4%; > 60 min
1-183	AB Bsmt FCU 1B	7.5	HP	1.0303	6.4		6.6	6.6	6.6	6.6	
2.3	Step 2 SI Seq Loads										
1-032	RHR Pump 1B	200	HP	1.0303	143		151.1	173.5	173.5	173.5	Change BHP at Recirc, RWST <10% assume at T=60 Min.
1-299	RHR Pit FCU 1B	1.5	HP	1.0303	1.3		1.3	1.3	1.3	1.3	
2.4	Step 3 SI Seq Loads										
1-148	ICS Pump 1B	250	HP	1.0303	174		181.7	0.0	0.0	0.0	OFF at RWST < 10%; assume at T=60 min
1-421	MOV ICS5B	0.66	HP	1.0303	0.6		0.0	0.0	0.0	0.0	
1-422	MOV ICS6B	0.66	HP	1.0303	0.6		0.0	0.0	0.0	0.0	
1-450	SV Fltr 1B Htr	36.8	kW	1	36.8		36.8	36.8	36.8	36.8	
1-144	SV Exh Fan 1B	25	HP	1.0303	21.2		21.8	21.8	21.8	21.8	
1-145	SBV Fan 1B	25	HP	1.0303	21.2		21.8	21.8	21.8	21.8	
1-239	SBV Fltr 1B Htr	27.6	kW	1	27.6		27.6	27.6	27.6	27.6	
2.5	Step 4 SI Seq Loads										
1-030	SW Pump 1B1	400	HP	1.0303	321		330.7	330.7	330.7	330.7	
1-294	SW Strainer 1B1	1.5	HP	1.0303	1.3		1.3	1.3	1.3	1.3	
2.6	Step 5 SI Seq Loads										
1-121	Containment FCU 1C	125	HP	1.0303	113.5		95.8	95.8	95.8	95.8	CAP042219
1-157	Containment FCU 1D	125	HP	1.0303	113.5		95.8	95.8	95.8	95.8	CAP042219
1-584	Dome Fan 1B	20	HP	1.0303	16.95		17.46	17.46	17.46	17.46	
1-396	MOV SW903C	0.33	HP	1.0303	0.3		0.0	0.0	0.0	0.0	
1-397	MOV SW903D	0.33	HP	1.0303	0.3		0.0	0.0	0.0	0.0	

DIESEL GENERATOR B LOAD INFORMATION						SEQUENCE LOAD STEPS (KWe ELECTRICAL LOAD)										
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.
2.7	Step 6 SI Seq Loads															
1-031	AFW Pump 1B	300	HP	1.0303	253	0.0	0.0	0.0	0.0	0.0	0.0	260.7	260.7	260.7	260.7	260.7
1-052	MOV BT2B	0.33	HP	1.0303												
1-211	TB Bsmt FCU 1B	5	HP	1.0303	4.237	0.0	0.0	0.0	0.0	0.0	0.0	4.37	4.37	4.37	4.37	4.37
2.8	Step 7 SI Seq Loads															
1-028	CC Pump 1B	250	HP	1.0303	171	0.0	0.0	0.0	0.0	0.0	0.0	0.0	176.2	176.2	176.2	176.2
2.9	Step 8 SI Seq Loads															
1-029	SW Pump 1B2	400	HP	1.0303	321	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	330.7	330.7	330.7
1-252	SW Strainer 1B2	1.5	HP	1.0303	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.3
2.10	Step 9 SI Seq Loads															
1-151	IA Compr 1B	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.9	34.9
1-439	Bat 1A Htr 1A2	4.5	kW	1	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-440	Bat 1B Htr 1B2	4.5	kW	1	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-668	Batt Rm FCU 1B	1.5	HP	1.0303	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
1-266	CRM Recirc Fan	7.5	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6
1-316	CRM Chiller 1B	38.7	kW	1.0303	38.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.9	39.9
1-318	CRM Fan 1B	20	HP	1.0303	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	17.5
1-464	CRM Chiller Pump	3	HP	1.0303	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	2.6
1-211	TB FCU 1B	5	HP	1.0303												
1-299	RHR Pit FCU 1B	1.5	HP	1.0303												
1-136	AB Mezz FCU 1B	5	HP	1.0303	4.237	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.37	4.37
1-183	AB Bsmt FCU 1B	7.5	HP	1.0303												
1-602	CRDM Rm FCU 1B	5	HP	1.0303	4.237	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.37	4.37
1-141	DG1B Start A/C	7.5	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6
1-1083	AB Fan Floor FCU	10	HP	1.0303	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8	8.8
1-1085	AB Bsmt FCU 1D	7.5	HP	1.0303	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6
2.11	Step 10 SI Seq Loads															
1-134	BA Xfer Pump 1B	15	HP	1.0303	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-106	Charging Pump 1B	100	HP	1.0303	80.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-248	SFP Pump 1B	40	HP	1.0303	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
	DCR 3089, Recorder Replacement			1	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323	1.323
	Cable Losses & Overload Htr Losse			1	23.16	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2
	SS Txfmr Load Losses			1	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4

DIESEL GENERATOR B LOAD INFORMATION											
				Freq							
Motor #	Name	Load	Units	Mult.	kWe	Notes	30 Min.	60 Min	120 Min	240 Min	
2.7	Step 6 SI Seq Loads										
1-031	AFW Pump 1B	300	HP	1.0303	253		260.7	260.7	260.7	260.7	
1-052	MOV BT2B	0.33	HP	1.0303		See Seq #1.2					
1-211	TB Bsmt FCU 1B	5	HP	1.0303	4.237		4.37	4.37	4.37	4.37	
2.8	Step 7 SI Seq Loads										
1-028	CC Pump 1B	250	HP	1.0303	171		219.5	219.5	219.5	219.5	BHP increase to flow 2 RHR heat exchangers, RWST < 37%; < 60 Min, assume at T=30 Min
2.9	Step 8 SI Seq Loads										
1-029	SW Pump 1B2	400	HP	1.0303	321		330.7	330.7	330.7	330.7	
1-252	SW Strainer 1B2	1.5	HP	1.0303	1.3		1.3	1.3	1.3	1.3	
2.10	Step 9 SI Seq Loads										
1-151	IA Compr 1B	40	HP	1.0303	33.9		34.9	34.9	34.9	34.9	
1-439	Bat 1A Htr 1A2	4.5	kW	1	4.5						
1-440	Bat 1B Htr 1B2	4.5	kW	1	4.5						
1-668	Batt Rm FCU 1B	1.5	HP	1.0303	1.3		1.3	1.3	1.3	1.3	
1-266	CRM Recirc Fan	7.5	HP	1.0303	6.4		6.6	6.6	6.6	6.6	
1-316	CRM Chiller 1B	38.7	kW	1.0303	38.7		39.9	39.9	39.9	39.9	
1-318	CRM Fan 1B	20	HP	1.0303	17.0		17.5	17.5	17.5	17.5	
1-464	CRM Chiller Pump	3	HP	1.0303	2.5		2.6	2.6	2.6	2.6	
1-211	TB FCU 1B	5	HP	1.0303		See Seq #2.7					
1-299	RHR Pit FCU 1B	1.5	HP	1.0303		See Seq #2.3					
1-136	AB Mezz FCU 1B	5	HP	1.0303	4.237		4.37	4.37	4.37	4.37	
1-183	AB Bsmt FCU 1B	7.5	HP	1.0303		See Seq #2.2					
1-602	CRDM Rm FCU 1B	5	HP	1.0303	4.237		4.37	4.37	4.37	4.37	
1-141	DG1B Start A/C	7.5	HP	1.0303	6.4		6.6	0.0	0.0	0.0	
1-1083	AB Fan Floor FCU	10	HP	1.0303	8.5		8.8	8.8	8.8	8.8	
1-1085	AB Bsmt FCU 1D	7.5	HP	1.0303	6.4		6.6	6.6	6.6	6.6	
2.11	Step 10 SI Seq Loads										
1-134	BA Xfer Pump 1B	15	HP	1.0303	12.7						
1-106	Charging Pump 1B	100	HP	1.0303	80.2		0.0	0.0	0.0	0.0	
1-248	SFP Pump 1B	40	HP	1.0303	33.9		0	0	34.9	34.9	start pump after 2 hrs
	DCR 3089, Recorder Replacement			1	1.323		1.3	1.3	1.3	1.3	
	Cable Losses & Overload Htr Losse			1	23.16		23.2	23.2	23.2	23.2	
	SS Txfmr Load Losses			1	20.4		20.4	20.4	20.4	20.4	

DIESEL GENERATOR B LOAD INFORMATION						SEQUENCE LOAD STEPS (KWe ELECTRICAL LOAD)										
				Freq		Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Motor #	Name	Load	Units	Mult.	kWe	0 Sec.	5 Sec.	10 Sec.	15 Sec.	20 Sec.	25 Sec.	30 Sec.	35 Sec.	40 Sec.	50 Sec.	60 Sec.
	TOTAL KWe LOAD				3418.3	237.1	916.5	1065.2	1353.5	1682.0	1934.0	2197.3	2373.2	2705.2	2836.7	2837.5

DIESEL GENERATOR B LOAD INFORMATION											
				Freq							
Motor #	Name	Load	Units	Mult.	kWe	Notes	30 Min.	60 Min	120 Min	240 Min	
	TOTAL KWe LOAD				3418.3		2839.6	2673.6	2035.7	2035.7	

DIESEL GENERATOR A LOAD INFORMATION								
Motor #	Name	Load	Units	kWe	kWe @ 60 Sec.	Load PF	kVA @ 60 Sec.	kVAR @ 60 sec
1.1	Maintained Contact Loads							
1-125	Chgr BRA-108	150	A	36.0	3.6	1.0	3.6	0.0
1-119	XFMR BRA-106	113	kVA	90.0	17.4	0.8	21.75	13.1
1-331	Inv BRA-111	7.5	kVA	16.0	9.6	1.0	9.6	0.0
1-358	Inv BRA-112	7.5	kVA	16.0	6.4	1.0	6.4	0.0
1-103	XFMR RPA-13	15	kVA	12.0	10.0	0.8	12.5	7.5
1-398	IA Dryer 1A	3	kW	3.0	3.0	1.0	3.0	0.0
1-138	BAHTT 1A	37.5	kVA	30.0	14.6	0.8	18.3	11.0
1-813	H2 Anal Htd Ln	5.2	kW	5.2	5.2	1.0	5.2	0.0
1-953	Chgr BRA/B-108	150	A	0.0	0.0			0.0
1.2	Auto Start Loads							
1-016	MOV RHR1A	4	HP	3.4	0.0			0.0
1-132	Tb TG Oil Pump	50	HP	42.4	43.7	0.8	54.6	32.8
1-205	MOV C13	4	HP	3.4	0.0			0.0
1-978	Chg Pump C FCU	2	HP	1.7	1.8	0.8	2.3	1.4
1-110	DG FO Xfer Pump	0.75	HP	0.636	0.7	0.8	0.8	0.5
1-419	MOV ICS5A	0.66	HP					0.0
1-420	MOV ICS6A	0.66	HP					0.0
1-207	RHR Sump Pump	2.5	kW	2.5	0.0			0.0
1-107	ICS Pump 1A	250	HP					0.0
1-116	DG Vent Fan 1A	25	HP	21.2	21.8	0.8	27.3	16.4
1-451	SH Exh Fan 1A	15	HP	12.7	13.1	0.8	16.4	9.8
1-123	Trav Screen 1A1	2.25	HP	1.9	2.0	0.8	2.5	1.5
1-291	TB HP Seal Oil	20	HP	17.0	17.5	0.8	21.9	13.1
1-426	MOV BT2A	0.33	HP	0.3	0.0			0.0
1-1112	DG1A Turbo Pmp	0.75	HP	0.636	0.66	0.8	0.8	0.5
1-258A	DG1A Circ Pmp	1	HP	0.9	0.9	0.8	1.1	0.7
1-258B	DG1A Imm Htr	15	kW	15.0	0.0			0.0
1-104	MOV MS2A	0.5	HP	0.4	0.0			0.0
1-410	Fire Jockey Pump	3	HP	2.5	2.6	0.8	3.3	2.0
1-1013	SBV Hydr Pack	1.25	HP	1.1	1.1	0.8	1.4	0.8
1-351	MOV CVC301	0.7	HP	0.6	0.0			0.0
1-418	MOV CVC1	0.7	HP	0.6	0.0			0.0
1-301	MOV RHR2A	4	HP	3.4	0.0			0.0
1-869	DDT Emer Pump	15.5	kW	15.5	0.0			0.0
1-353	MOV CVC212	0.33	HP	0.3	0.0			0.0
1-102	MOV CC653	0.13	HP	0.1	0.1	0.8	0.1	0.1
1-871	MOV MD(R) 323A	1.9	HP	1.6 *	0.0			0.0
1.3	Manual Control Loads							
1-366	MOV SI4A	3	HP	2.5	0.0			0.0
1-383	MOV SI15B	1.6	HP	1.4	0.0			0.0
1-684	WR-6			0.0	0.0			0.0
1-408	MOV SW10A	0.13	HP	0.1	0.0			0.0
1-361	MOV CC601A	0.33	HP	0.3	0.0			0.0
1-363	MOV CC612A	0.33	HP	0.3	0.0			0.0
1-381	MOV SI9A	1	HP	0.9	0.0			0.0
1-359	MOV CC600	1	HP	0.9	0.0			0.0
1-444	MOV RHR11	2.6	HP	2.2	0.0			0.0
1-365	MOV SW1400	1.6	HP	1.4	0.0			0.0
1-445	MOV CC400A	1	HP	0.9	0.0			0.0
1-374	MOV SI351A	2.6	HP	2.2	0.0			0.0

DIESEL GENERATOR A LOAD INFORMATION								
Motor #	Name	Load	Units	kWe	kWe @ 60 Sec.	Load PF	kVA @ 60 Sec.	kVAR @ 60 sec
1-430	MOV RHR400A	0.66	HP	0.6	0.0			0.0
1-373	MOV SI350A	2.6	HP	2.2	0.0			0.0
1-448	MOV CVC440	1.6	HP	1.4	0.0			0.0
1-130	MOV SI209	1.6	HP	1.4	0.0			0.0
1-387	MOV SI5A	1.4	HP	1.2	0.0			0.0
1-379	MOV SI300A	2.6	HP	2.2	0.0			0.0
1-415	MOV MS100A	0.33	HP	0.3	0.0			0.0
1-059	Batt Rm Ex Fan	3	HP	2.5	2.6	0.8	3.3	2.0
1-149	MOV RHR299A	1.6	HP	1.4	0.0			0.0
1-401	MOV SW601A	0.13	HP	0.1	0.0			0.0
1-1225	Cntmt Vent Mon	0.75	HP	0.636	0.66	0.8	0.8	0.5
1-1223	Aux Bldg Mon	0.75	HP	0.636	0.66	0.8	0.8	0.5
1-1153	IA Dryer 1C	7.75	kW	7.8	7.8	1.0	7.8	0.0
1-355	MOV PR1A	1	HP	0.9	0.0			0.0
1-631	MOV ICS2A	1	HP	0.9	0.0			0.0
1-670	MOV LOCA2A	0.13	HP	0.1	0.0			0.0
1-672	MOV SA7003A	0.13	HP	0.1	0.0			0.0
1-815	H2 Anal 1A	2.74	kW	2.7	2.8	1.0	2.8	0.0
1-368	MOV SI2A	1.4	HP	1.2	0.0			0.0
1-321	MOV SI3	1.4	HP	1.2	0.0			0.0
1-399	MOV SW1300A	0.66	HP	0.6	0.0			0.0
1.4	SI Trip, Manual Reset							
1-117	IA Compr 1A	40	HP	33.9	0.0			0.0
1-135	Waste Gas CP1B	25	HP	21.2	0.0			0.0
1-137	TB Turning Gear	40	HP	33.9	0.0			0.0
1-013	Fire Pump 1A	200	HP	160.4	0.0			0.0
PRZR	Htr Backup Grp A	230.4	kW	230.4	0.0			0.0
2.1	Step 0 SI Seq Loads							
1-371	MOV SI20A	12.8	HP	10.9	0.0			0.0
1-764	MOV CC6A	0.66	HP	0.6	0.0			0.0
1-386	MOV SI11A	1.6	HP	1.4	0.0			0.0
1-377	MOV SI302A	7.6	HP	6.4	0.0			0.0
1-232	MOV FW12A	5.3	HP	4.5	4.6	0.8	5.8	3.5
1-280	AFWP1A LO Pmp	2	HP	1.7	0.0			0.0
2.2	Step 1 SI Seq Loads							
1-020	SI Pump 1A	800	HP	641.5	687.2	0.9	763.6	332.8
2.3	Step 2 SI Seq Loads							
1-025	RHR Pump 1A	200	HP	160.4	147.3	0.9	163.7	71.3
1-298	RHR Pit FCU 1A	1.5	HP	1.3	1.3	0.8	1.6	1.0
2.4	Step 3 SI Seq Loads							
1-107	ICS Pump 1A	250	HP	200.5	179.3	0.9	199.2	86.8
1-419	MOV ICS5A	0.66	HP	0.6	0.0			0.0
1-420	MOV ICS6A	0.66	HP	0.6	0.0			0.0
1-449	SV Fltr 1A Htr	36.8	kW	36.8	36.8	1.0	36.8	0.0
1-126	SV Exh Fan 1A	25	HP	21.2	21.8	0.8	27.3	16.4
1-127	SBV Fan 1A	25	HP	21.2	21.8	0.8	27.3	16.4
1-238	SBV Fltr 1A Htr	27.6	kW	27.6	27.6	1.0	27.6	0.0

DIESEL GENERATOR A LOAD INFORMATION								
Motor #	Name	Load	Units	kWe	kWe @ 60 Sec.	Load PF	kVA @ 60 Sec.	kVAR @ 60 sec
2.5	Step 4 SI Seq Loads							
1-023	SW Pump 1A1	400	HP	320.7	330.7	0.9	367.4	160.2
1-242	SW Strainer 1A1	1.5	HP	1.3	1.3	0.8	1.6	1.0
2.6	Step 5 SI Seq Loads							
1-120	Containment FCU 1A	125	HP	100.2	116.9	0.9	129.9	56.6
1-156	Containment FCU 1B	125	HP	100.2	116.9	0.9	129.9	56.6
1-583	Dome Fan 1A	20	HP	16.9	17.4	0.8	21.8	13.1
1-394	MOV SW903A	0.33	HP	0.3	0.3	0.8	0.4	0.2
1-395	MOV SW903B	0.33	HP	0.3	0.3	0.8	0.4	0.2
2.7	Step 6 SI Seq Loads							
1-024	AFW Pump 1A	300	HP	240.6	260.7	0.9	289.7	126.3
1-982	AFWP1A FCU	3	HP	2.5	2.6	0.8	3.3	2.0
1-426	MOV BT2A	0.33	HP					0.0
2.8	Step 7 SI Seq Loads							
1-021	CC Pump 1A	250	HP	200.5	176.2	0.9	195.8	85.3
2.9	Step 8 SI Seq Loads							
1-022	SW Pump 1A2	400	HP	320.7	330.7	0.9	367.4	160.2
1-243	SW Strainer 1A2	1.5	HP	1.3	1.3	0.8	1.6	1.0
2.10	Step 9 SI Seq Loads							
1-349	IA Compr 1C	40	HP	33.9	0	0.8	0.0	0.0
1-411	Bat 1A Htr 1A1	4.5	kW	4.5	0.0	1.0	0.0	0.0
1-412	Bat 1B Htr 1B1	4.5	kW	4.5	0.0	1.0	0.0	0.0
1-667	Batt Rm FCU 1A	1.5	HP	1.3	1.3	0.8	1.6	1.0
1-265	CRM Recirc Fan	7.5	HP	6.4	6.6	0.8	8.3	5.0
1-315	CRM Chiller 1A	38.7	kW	38.7	39.9	0.8	49.9	29.9
1-317	CRM Fan 1A	20	HP	17.0	17.5	0.8	21.9	13.1
1-463	CRM Chiller Pump	3	HP	2.5	2.6	0.8	3.3	2.0
1-201	TB FCU 1A	5	HP	4.237	4.37	0.8	5.5	3.3
1-298	RHR Pit FCU 1A	1.5	HP					0.0
1-131	AB Mezz FCU 1A	5	HP	4.237	4.37	0.8	5.5	3.3
1-164	AB Bsmt FCU 1A	7.5	HP	6.4	6.6	0.8	8.3	5.0
1-601	CRDM Rm FCU 1A	5	HP	4.237	4.37	0.8	5.5	3.3
1-436	DG1A Start A/C	7.5	HP	6.4	6.6	0.8	8.3	5.0
1-1009	Damper ACC3A	0.2	HP	0.2	0.2	0.8	0.3	0.2
1-1082	AB Fan Floor FCU	10	HP	8.5	8.8	0.8	11.0	6.6
1-1084	AB Bsmt FCU 1C	7.5	HP	6.4	6.6	0.8	8.3	5.0
2.11	Step 10 SI Seq Loads							
1-068	BA Xfer Pump 1A	15	HP	12.7	0.0			0.0
1-067	Charging Pump 1A	100	HP	80.2	0.0			0.0
1-133	Charging Pump 1C	127	HP	101.8	0.0			0.0
1-178	SFP Pump 1A	40	HP	33.9	0	0.8	0.0	0.0
	DCR 3089, Recorder Replacement			0.6	0.6	1.0	0.6	0.0
	Cable Losses & Overload Htr Losses			26.3	23.16	1.0	23.2	0.0

DIESEL GENERATOR A LOAD INFORMATION								
Motor #	Name	Load	Units	kWe	kWe @ 60 Sec.	Load PF	kVA @ 60 Sec.	kVAR @ 60 sec
	SS Txfmr Load Losses			25.5	20.4	1.0	20.4	0.0
	TOTAL LOAD			3754.1	2827.2	0.8915	3171.5	1386.9
							3149.1	

DIESEL GENERATOR B LOAD INFORMATION							
Motor #	Name	Load	Units	kWe	kWe @ 60 Sec.	Load PF	kVA @ 60 Sec.
1.1	Maintained Contact Loads						
1-143	Chgr BRB-108	150	A	36.0	3.6	1.0	3.6
1-153	XFMR BRB-106	75	kVA	60.0	14.8	0.8	18.5
1-332	Inv BRB-111	7.5	kVA	16.0	9.6	1.0	9.6
1-357	Inv BRB-112	7.5	kVA	16.0	6.4	1.0	6.4
1-184	XFMR RPB-11	15	kVA	12.0	10.5	0.8	13.1
1-344	IA Dryer 1B	3	kW	3.0	3.0	1.0	3.0
1-302	BAHTT 1B	37.5	kVA	30.0	5.4	0.8	6.8
1-166	H2 Anal Htd Ln	5.6	kW	5.6	5.6	1.0	5.6
1-350	Inv BRD-109	5	kVA	9.1	6.6	1.0	6.6
1-245	TAT Aux's	1.5	kVA	1.2	1.2	0.8	1.5
1-669	Chgr BRD-108	150	A	34.1	34.1	1.0	34.1
1-860	Proprietary	25	kVA	20.0	14.7	0.8	18.4
1-953	Chgr BRA/B-108	150	A	0.0	0.0		
1.2	Auto Start Loads						
1-049	MOV RHR1B	4	HP	3.4	0.0		
1-205	MOV C13	4	HP	3.4	0.0		
1-979	CC Pump 1B FCU	2	HP	1.7	1.8	0.8	2.3
1-139	DG FO Xfer Pump	0.75	HP	0.636	0.66	0.8	0.8
1-421	MOV ICS5B	0.66	HP				
1-422	MOV ICS6B	0.66	HP				
1-208	RHR Sump Pump	2.5	kW	2.5	0.0		
1-148	ICS Pump 1B	250	HP				
1-118	DG Vent Fan 1B	25	HP	21.2	21.8	0.8	27.3
1-452	SH Exh Fan 1B	15	HP	12.7	13.1	0.8	16.4
1-155	Trav Screen 1B2	2.25	HP	1.9	2	0.8	2.5
1-291	TB HP Seal Oil	20	HP	17.0	17.5	0.8	21.9
1-052	MOV BT2B	0.33	HP	0.3	0.0		
1-1113	DG1B Turbo Pmp	0.75	HP	0.636	0.66	0.8	0.8
1-259A	DG1B Circ Pmp	1	HP	0.9	0.9	0.8	1.1
1-259B	DG1B Imm Htr	15	kW	15.0	0.0		
1-122	MOV MS2B	0.5	HP	0.4	0.0		
1-1014	SBV Hydr Pack	1.25	HP	1.1	1.1	0.8	1.4
1-342	MOV CVC211	0.33	HP	0.3	0.0		
1-630	CO2 Tank Compr	3	HP	2.5	0.0		
1-050	MOV RHR2B	4	HP	3.4	0.0		
1-671	MOV LOCA2B	0.13	HP	0.1	0.0		
1-870	DDT Emer Pump	15.5	kW	15.5	0.0		
1-673	MOV SA7003B	0.13	HP	0.1	0.0		
1-872	MOV MD(R) 323B	1.9	HP	1.61	0.0		
1.3	Manual Control Loads						
1-367	MOV SI4B	3	HP	2.5	0.0		
1-356	MOV PR1B	1	HP	0.9	0.0		
1-683	WR-5			0.0	0.0		
1-715	WR-19			0.0	0.0		
1-686	WR-9			0.0	0.0		
1-409	MOV SW10B	0.13	HP	0.1	0.0		
1-362	MOV CC601B	0.33	HP	0.3	0.0		
1-364	MOV CC612B	0.33	HP	0.3	0.0		
1-382	MOV SI9B	1	HP	0.9	0.0		
1-385	MOV SI15A	1.6	HP	1.4	0.0		
1-516	MOV LD60	1.6	HP	1.4	0.0		

DIESEL GENERATOR B LOAD INFORMATION							
Motor #	Name	Load	Units	kWe	kWe @ 60 Sec.	Load PF	kVA @ 60 Sec.
1-446	MOV CC400B	1	HP	0.9	0.0		
1-375	MOV SI350B	2.6	HP	2.2	0.0		
1-433	MOV RHR400B	0.66	HP	0.6	0.0		
1-376	MOV SI351B	2.6	HP	2.2	0.0		
1-140	MOV SI208	1.6	HP	1.4	0.0		
1-388	MOV SI5B	1.4	HP	1.2	0.0		
1-380	MOV SI300B	2.6	HP	2.2	0.0		
1-416	MOV MS100B	0.33	HP	0.3	0.0		
1-215	Batt Rm Ex Fan	3	HP	2.5	2.6	0.8	3.3
1-150	MOV RHR299B	1.6	HP	1.4	0.0		
1-402	MOV SW601B	0.13	HP	0.1	0.0		
1-1227	Cntmt Vent Mon	0.75	HP	0.636	0.66	0.8	0.8
1-1224	Aux Bldg Mon	0.75	HP	0.636	0.66	0.8	0.8
1-941	MOV ICS2B	1	HP	0.9	0.0		
1-923	H2 Anal 1B	2.74	kW	2.7	2.8	1.0	2.7
1-370	MOV SI2B	1.4	HP	1.2	0.0		
1-403	MOV SW1300B	0.66	HP	0.6	0.0		
1.4	SI Trip, Manual Reset						
1-117	IA Compr 1A	40	HP	33.9	0.0		
1-135	Waste Gas CP1B	25	HP	21.2	0.0		
1-137	TB Turning Gear	40	HP	33.9	0.0		
1-234	Fire Pump 1B	200	HP	160.4	0.0		
PRZR	Htr Backup Grp B	192	kW	179.2	0.0		
2.1	Step 0 SI Seq Loads						
1-372	MOV SI20B	12.8	HP	10.9	0.0		
1-763	MOV CC6B	0.66	HP	0.6	0.0		
1-384	MOV SI11B	1.6	HP	1.4	0.0		
1-378	MOV SI302B	7.6	HP	6.4	0.0		
1-236	MOV FW12B	5.3	HP	4.5	4.6	0.8	5.8
1-281	AFWP1B LO Pmp	2	HP	1.7	0.0		
2.2	Step 1 SI Seq Loads						
1-027	SI Pump 1B	800	HP	641.5	687.2	0.9	763.6
1-183	AB Bsmt FCU 1B	7.5	HP	6.4	6.6	0.8	8.3
2.3	Step 2 SI Seq Loads						
1-032	RHR Pump 1B	200	HP	160.4	147.3	0.9	163.7
1-299	RHR Pit FCU 1B	1.5	HP	1.3	1.3	0.8	1.6
2.4	Step 3 SI Seq Loads						
1-148	ICS Pump 1B	250	HP	200.5	179.3	0.9	199.2
1-421	MOV ICS5B	0.66	HP	0.6	0.0		
1-422	MOV ICS6B	0.66	HP	0.6	0.0		
1-450	SV Fltr 1B Htr	36.8	kW	36.8	36.8	1.0	36.8
1-144	SV Exh Fan 1B	25	HP	21.2	21.8	0.8	27.3
1-145	SBV Fan 1B	25	HP	21.2	21.8	0.8	27.3
1-239	SBV Fltr 1B Htr	27.6	kW	27.6	27.6	1.0	27.6

DIESEL GENERATOR B LOAD INFORMATION							
Motor #	Name	Load	Units	kWe	kWe @ 60 Sec.	Load PF	kVA @ 60 Sec.
2.5	Step 4 SI Seq Loads						
1-030	SW Pump 1B1	400	HP	320.7	330.7	0.9	367.4
1-294	SW Strainer 1B1	1.5	HP	1.3	1.3	0.8	1.6
2.6	Step 5 SI Seq Loads						
1-121	Containment FCU 1C	125	HP	100.2	116.9	0.9	129.9
1-157	Containment FCU 1D	125	HP	100.2	116.9	0.9	129.9
1-584	Dome Fan 1B	20	HP	16.95	17.46	0.8	21.8
1-396	MOV SW903C	0.33	HP	0.3	0.3	0.8	0.4
1-397	MOV SW903D	0.33	HP	0.3	0.3	0.8	0.4
2.7	Step 6 SI Seq Loads						
1-031	AFW Pump 1B	300	HP	240.6	260.7	0.9	289.7
1-052	MOV BT2B	0.33	HP				
1-211	TB Bsmt FCU 1B	5	HP	4.237	4.37	0.8	5.5
2.8	Step 7 SI Seq Loads						
1-028	CC Pump 1B	250	HP	200.5	176.2	0.9	195.8
2.9	Step 8 SI Seq Loads						
1-029	SW Pump 1B2	400	HP	320.7	330.7	0.9	367.4
1-252	SW Strainer 1B2	1.5	HP	1.3	1.3	0.8	1.6
2.10	Step 9 SI Seq Loads						
1-151	IA Compr 1B	40	HP	33.9	34.9	0.8	43.6
1-439	Bat 1A Htr 1A2	4.5	kW	4.5	0.0	1.0	0.0
1-440	Bat 1B Htr 1B2	4.5	kW	4.5	0.0	1.0	0.0
1-668	Batt Rm FCU 1B	1.5	HP	1.3	1.3	0.8	1.6
1-266	CRM Recirc Fan	7.5	HP	6.4	6.6	0.8	8.3
1-316	CRM Chiller 1B	38.7	kW	38.7	39.9	0.8	49.9
1-318	CRM Fan 1B	20	HP	17.0	17.5	0.8	21.9
1-464	CRM Chiller Pump	3	HP	2.5	2.6	0.8	3.3
1-211	TB FCU 1B	5	HP				
1-299	RHR Pit FCU 1B	1.5	HP				
1-136	AB Mezz FCU 1B	5	HP	4.237	4.37	0.8	5.5
1-183	AB Bsmt FCU 1B	7.5	HP				
1-602	CRDM Rm FCU 1B	5	HP	4.237	4.37	0.8	5.5
1-141	DG1B Start A/C	7.5	HP	6.4	6.6	0.8	8.3
1-1083	AB Fan Floor FCU	10	HP	8.5	8.8	0.8	11.0
1-1085	AB Bsmt FCU 1D	7.5	HP	6.4	6.6	0.8	8.3
2.11	Step 10 SI Seq Loads						
1-134	BA Xfer Pump 1B	15	HP	12.7	0.0		
1-106	Charging Pump 1B	100	HP	80.2	0.0		
1-248	SFP Pump 1B	40	HP	33.9	0	0.8	0.0
	DCR 3089, Recorder Replacement			1.323	1.323	1.0	1.3
	Cable Losses & Overload Htr Losses			23.16	23.16	1.0	23.2
	SS Txfmr Load Losses			20.4	20.4	1.0	20.4
	TOTAL LOAD			3568.5	2851.6	0.8930	3193.3

NUCLEAR PRODUCTS OPERATION
FLOWSERVE PUMP DIVISION

FLOWSERVE

Paul Kasztejna
Flowserve Engineering
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Kewaunee Nuclear Plant
Run Out Flow Conditions
8SE pumps, s/n's 0600-9, -10

May 23, 2006

Attn.: Mr. James Brandtjen

Based on extrapolation of test curves for referenced pumps and serial numbers listed, the expected BHP requirement at 4671 gpm is 265 BHP, when operating at 1780 rpm with 1.0 sg. The NPSHR at that point will be approximately 30 ft.

I trust this is enough to resolve your inquiry.

Paul J. Kasztejna

Paul Kasztejna
Supervising Design Engineer
Flowserve Aftermarket Engineering

Flowserve Corporation Proprietary Information

BRA106 / BRB106 DG Load Reductions based On Load Measurements

The BRA/B106 load measurements taken in 2006, 2004 and 2000 were taken with the plant at Hot Shutdown (2006) or at normal operation with the plant on line. The BRA/B106 loads measured are assumed to be at or above the loads that would be present on BRA/B106 during the large break LOCA for which Safeguards DG loads are evaluated in calculations C-042-001 and C10915.

This assumption is based on the following:

1) The largest load changes seen during the measurements were due to Service Water pump motor space heater status. There are space heaters for SW, RHR and ICS motors on BRA/B106 (ref. E-843). During the LOCA, all such heaters that are not on during normal operation will also be off, since all three motors are assumed on in calculations C-042-001 and C10915.
2) The highest of the loads measured on these three dates is used to calculate the load reduction. A margin of 5% is added to the 4/1/04 (BRA106) load and the 3/9/04 (BRB106) load for additional conservatism.

In general, these transformers feed equipment in fuse panels or racks, which contain safeguards equipment such as solenoid valves which fail safe on loss of power, therefore in LOCA they would be deenergized, where during normal operation they are energized.

BRA106

Transformer BRA-106 loading is shown in Safeguard Diesel Generator Loading calculation C-042-001 Rev. 6 Addendum A (Addendum B only applies to DG rating references). Step 3.2.1 notes that kVA rated transformer loads will be calculated at a power factor of 0.8 per the USAR, Chapter 8. Therefore Appendix 1 of C-042-001 shows the load on the 112.5 kVA transformer BRA-106 (motor # 1-119 under Maintained Contact Loads) as 90.0 kW starting at Step 0 of the SI sequence (112.5 kW x 0.80 = 90.0 kW).

The loading shown in calculation C-042-001 is for loads operating at 60 Hertz. Calculation C10915 Rev. 4 - "Safeguard Diesel Generator Loading Adjustments for Operation at Frequencies Other Than 60 Hertz" adjusts DG loading for operation above 60 Hz. Calculation C10915 Rev. 4 Addendum A has a conservative impact in that it increases DG B margin and Addendum B only applies to DG rating references. Table 3 of C10915 is used here to ensure that load reductions already used are not taken credit for again. The C10915 Table 3 shows that the C-042-001 load of 90.0 kW has been reduced to 36.6 kW for XFMR BRA-106.

Actual load measurements were taken (see Results for 2006, 2004 and 2000 at the end of the BRA106 & BRB106 discussion and Attachment 10) for BRA-106 and panels BRA-105, BRA-127 (Safeguards 120/208V) and Emergency Lighting, Gaitronics, Phone manual transfer switch BRA-115 on 5/21/06 (plant at hot shutdown). Actual load measurements were previously taken for BRA-106 and panels BRA-105, BRA-127 (Safeguards 120/208V) on 4/1/04. The only significant difference was that the BRA-105 phase A load on 5/21/06 was 5.2 Amps, versus 10.98 Amps on 4/1/04. Based on loads shown on E-843, the difference is assumed to be due to SWP motor heater status. The heater on each motor is rated 600 Watts at 120V, or 5 Amp draw at 120V.

The load measurements taken in 2006, 2004 and 2000 were taken with the plant at Hot Shutdown (2006) or at normal, at power operation.

The 4/1/04 BRA-106 load will therefore be conservatively used. A margin of 5% will be added to the 4/1/04 load for additional conservatism. The total BRA-106 load will be 20.16 kVA x 1.05 = 21.17 kVA, or 18.82% of the transformer rating (21.17 kVA/ 112.5 kVA = 0.1882). Reducing transformer load to 18.82% of 90 kW results in a load of 16.9 kW, an additional 19.7 kW (36.6 kW - 16.9 kW = 19.7 kW) reduction in DG A load.
Total reduction in load based on field measurements is 19.7 kW for BRA-106.

BRB106

Transformer BRB-106 loading is shown in Safeguard Diesel Generator Loading calculation C-042-001 Rev. 6 Addendum A (Addendum B only applies to DG rating references). Step 3.2.1 notes that kVA rated transformer loads will be calculated at a power factor of 0.8 per the USAR, Chapter 8. Therefore Appendix 2 of C-042-001 shows the load on the 75 kVA transformer BRA-106 (motor # 1-153 under Maintained Contact Loads) as 60.0 kW starting at Step 0 of the SI sequence (75 kW x 0.80 = 60.0 kW).

The loading shown in calculation C-042-001 is for loads operating at 60 Hertz. Calculation C10915 Rev. 4 - "Safeguard Diesel Generator Loading Adjustments for Operation at Frequencies Other Than 60 Hertz" adjusts DG loading for operation above 60 Hz. Calculation C10915 Rev. 4 Addendum A has a conservative impact in that it increases DG B margin and Addendum B only applies to DG rating references. Table 4 of C10915 is used here to ensure that load reductions already used are not taken credit for. The C10915 Table 4 shows that the C-042-001 load of 60.0 kW has been reduced to 24.2 kW for XFMR BRB-106.

Actual load measurements were taken (see Results for 2006, 2004 and 2000 at the end of the BRA106 & BRB106 discussion and Attachment 10) for BRB-106 and panels BRB-105, BRB-127 (Safeguards 120/208V) on 5/21/06 (plant at hot shutdown). Actual load measurements were previously taken for BRB-106 and panels BRB-105, BRB-127 (Safeguards 120/208V) on 3/9/04 and on 11/22/00. The only significant differences were in two areas:
First that the BRB-105 phase A load on 5/21/06 was 0.1 Amps, versus 5.46 Amps on 3/9/04 and 0.08 Amps on 11/22/00. Based on loads shown on E-843, the difference is assumed to be due to SWP motor heater status. The heater on each motor is rated 600 Watts at 120V, or 5 Amp draw at 120V.
Second that the BRB-127 load on 5/21/06 was 8.57 kVA, versus 11.43 kVA on 3/9/04 and 11.38 kVA on 11/22/00. Based on loads shown on E-233, the difference is assumed to be due to IRPI status, due to the plant being shutdown (RPI Rack RR149).

The 3/9/04 BRB-106 load will therefore be conservatively used. A margin of 5% will be added to the 3/9/04 load for additional conservatism. The total BRB-106 load will be 17.09 kVA x 1.05 = 17.94 kVA, or 23.92% of the transformer rating (17.94 kVA/ 75 kVA = 0.2392). Reducing transformer load to 23.92% of 60 kW results in a load of 14.4 kW, an additional 9.8 kW (24.2 kW - 14.4 kW = 9.8 kW) reduction in DG B load.
Total reduction in load based on field measurements is 9.8 kW for BRB-106.

Results (2006):

BRA106 Primary Load

Transformer is three phase delta-wye grounded, rated at 112.5 KVA (ref. E233). Voltage and current were measured at MCC 52C Unit B4. Transformer power input (assuming negligible voltage drop from MCC to transformer) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 2309 on 5/21/06 will be used, therefore;

volts = (V(T1/T2) + V(T1/T3) + V(T2/T3)/3 = (484.2 + 484.6 + 484.2)/3 = 484.3

amps = (I(T1) + I(T2) + I(T3))/3 = (21.0 + 27.8 + 21.5)/3 = 23.43

KVA = 484.3 x 23.43 x 1.732/1000 = 19.65 KVA

19.65 KVA/ 112.5 KVA = 0.1747

BRA106 was operating at about 18% of it's rated capacity at 2309 on 5/21/06.

As a check, BRA106 primary load should be greater than BRA105 + BRA127 load.

BRA106 = 19.65 KVA and BRA105 + BRA127 = 2.45 + 16.25 = 18.70 KVA, which checks out.

BRA106 load should be rounded up to 18% or 0.18 demand factor in Bus Load Matrix 1.

BRA105 Load

Distribution cabinet power input is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 2311 on 5/21/06 will be used, therefore;

volts = (V(AB) + V(AC) + V(BC)/3 = (208.9 + 208.5 + 208.4)/3 = 208.6

amps = (I(A) + I(B) + I(C))/3 = (5.2 + 11.0 + 4.1)/3 = 6.77

KVA = 208.6 x 6.77 x 1.732/1000 = 2.45 KVA at 2311 on 5/21/06.

BRA127 Load

Distribution cabinet power input (assuming negligible voltage drop on cable 1NP0670) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 2318 on 5/21/06 will be used, with BRA126 voltage therefore;

volts = (V(AB) + V(AC) + V(BC)/3 = (208.8 + 208.5 + 208.5)/3 = 208.6

amps = (I(A) + I(B) + I(C))/3 = (36.2 + 53.3 + 45.4)/3 = 44.97

KVA = 208.6 x 44.97 x 1.732/1000 = 16.25 KVA at 2318 on 5/21/06.

BRA115 Load

Manual transfer switch power input is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 5/21/06 will be used therefore;

volts = (V(AB) + V(AC) + V(BC)/3 = (208.4 + 208.2 + 207.8)/3 = 208.1

amps = (I(A) + I(B) + I(C))/3 = (33.8 + 52.5 + 12.0)/3 = 32.8

KVA = 208.1 x 32.8 x 1.732/1000 = 11.82 KVA at an unrecorded time (about 23:00) on 5/21/06.

BRB106 Primary Load

Transformer is three phase delta-wye grounded, rated at 75 KVA (ref. E233). Voltage and current were measured at MCC 62C Unit B4. Transformer power input (assuming negligible voltage drop from MCC to transformer) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 2042 on 5/21/06 will be used, therefore;

volts = (V(T1/T2) + V(T1/T3) + V(T2/T3)/3 = (475.6 + 477.2 + 475.9)/3 = 476.2

amps = (I(T1) + I(T2) + I(T3))/3 = (5.6 + 20.1 + 19.9)/3 = 15.2

KVA = 476.2 x 15.2 x 1.732/1000 = 12.54 KVA
12.54 KVA/ 75 KVA = 0.167
BRA106 was operating at about 17% of it's rated capacity at 2042 on 5/21/06.
As a check, BRB106 primary load should be greater than BRB105 + BRB127 load.
BRB106 = 12.54 KVA and BRB105 + BRB127 = 1.56 + 8.57 = 10.13 KVA, which checks out.
BRA106 load should be rounded up to 17% or 0.17 demand factor in Bus Load Matrix 1.

BRB105 Load
Distribution cabinet power input is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 2052 on 5/21/06 will be used, therefore;
volts = (V(AB) + V(AC) + V(BC)/3 = (205.4 + 204.2 + 203.9)/3 = 204.5
amps = (I(A) + I(B) + I(C))/3 = (0.1 + 0.6 + 12.5)/3 = 4.4
KVA = 204.5 x 4.4 x 1.732/1000 = 1.56 KVA at 2052 on 5/21/06.

BRB127 Load
Distribution cabinet power input (assuming negligible voltage drop on cable 1NP0671) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 2046 on 5/21/06 will be used, with BRA105 cable voltage therefore;
volts = (V(AB) + V(AC) + V(BC)/3 = (206.0 + 204.7 + 204.3)/3 = 205.0
amps = (I(A) + I(B) + I(C))/3 = (14.1 + 12.7 + 45.6)/3 = 24.13
KVA = 205.0 x 24.13 x 1.732/1000 = 8.57 KVA at 2046 on 5/21/06.

Results (2004):

BRA106 Primary Load
Transformer is three phase delta-wye grounded, rated at 112.5 KVA (ref. E233). Voltage and current were measured at MCC 52C Unit B4. Transformer power input (assuming negligible voltage drop from MCC to transformer) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 1545 on 4/1/04 will be used, therefore;
volts = (V(T1/T2) + V(T1/T3) + V(T2/T3)/3 = (486.5 + 486.5 + 486.1)/3 = 486.4
amps = (I(T1) + I(T2) + I(T3))/3 = (22.54 + 27.60 + 21.65)/3 = 23.93
KVA = 486.4 x 23.93 x 1.732/1000 = 20.16 KVA
20.16 KVA/ 112.5 KVA = 0.1792
BRA106 was operating at about 18% of it's rated capacity at 1545 on 4/1/04.
As a check, BRA106 primary load should be greater than BRA105 + BRA127 load.
BRA106 = 20.16 KVA and BRA105 + BRA127 = 3.26 + 16.05 = 19.31 KVA, which checks out.
BRA106 load should be rounded up to 18% or 0.18 demand factor in Bus Load Matrix 1.

BRA105 Load
Distribution cabinet power input (assuming negligible voltage drop on cable 1S5P001) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 4/1/04 will be used, therefore;
volts = (V(AB) + V(AC) + V(BC)/3 = (214.2 + 213.9 + 213.8)/3 = 214.0
amps = (I(A) + I(B) + I(C))/3 = (10.98 + 11.35 + 4.04)/3 = 8.79
KVA = 214.0 x 8.79 x 1.732/1000 = 3.26 KVA

BRA127 Load

Distribution cabinet power input (assuming negligible voltage drop on cable 1NP0670) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 4/1/04 will be used, with BRA105 cable voltage (assuming negligible voltage drop on cable 1S5P060) therefore;

volts = (V(AB) + V(AC) + V(BC)/3 = (214.2 + 213.9 + 213.8)/3 = 214.0
amps = (I(A) + I(B) + I(C))/3 = (33.63 + 53.41 + 42.82)/3 = 43.29
KVA = 214.0 x 43.29 x 1.732/1000 = 16.05 KVA

BRB106 Primary Load

Transformer is three phase delta-wye grounded, rated at 75 KVA (ref. E233). Voltage and current were measured at MCC 62C Unit B4. Transformer power input (assuming negligible voltage drop from MCC to transformer) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured at 1030 on 3/9/04 will be used, therefore;

volts = (V(T1/T2) + V(T1/T3) + V(T2/T3)/3 = (496 + 496 + 495)/3 = 495.7
amps = (I(T1) + I(T2) + I(T3))/3 = (12.8 + 23.6 + 23.3)/3 = 19.9
KVA = 495.7 x 19.9 x 1.732/1000 = 17.09 KVA
17.09 KVA/ 75 KVA = 0.228
BRA106 was operating at about 23% of it's rated capacity at 1030 on 3/9/04.
As a check, BRB106 primary load should be greater than BRB105 + BRB127 load.
BRB106 = 17.09 KVA and BRB105 + BRB127 = 2.35 + 11.43 = 13.78 KVA, which checks out.
BRB106 load should be rounded up to 23% or 0.23 demand factor in Bus Load Matrix 1.

BRB105 Load

Distribution cabinet power input (assuming negligible voltage drop on cable 1S6P001) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 3/9/04 will be used, therefore;

volts = (V(AB) + V(AC) + V(BC)/3 = (214.3 + 212.7 + 213.3)/3 = 213.4
amps = (I(A) + I(B) + I(C))/3 = (5.46 + 0.54 + 13.06)/3 = 6.35
KVA = 213.4 x 6.35 x 1.732/1000 = 2.35 KVA

BRB127 Load

Distribution cabinet power input (assuming negligible voltage drop on cable 1NP0671) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 3/9/04 will be used, with BRA105 cable voltage (assuming negligible voltage drop on cable 1S6P086) therefore;

volts = (V(AB) + V(AC) + V(BC)/3 = (214.3 + 212.7 + 213.3)/3 = 213.4
amps = (I(A) + I(B) + I(C))/3 = (15.58 + 22.20 + 55.0)/3 = 30.93
KVA = 213.4 x 30.93 x 1.732/1000 = 11.43 KVA

Results (2000):

BRA106 Primary Load

No data taken in 2000.

BRA105 Load
No data taken in 2000.

BRA127 Load
No data taken in 2000.

BRB106 Primary Load
Transformer is three phase delta-wye grounded, rated at 75 KVA (ref. E233). Voltage and current were measured at MCC 62C Unit B4. Transformer power input (assuming negligible voltage drop from MCC to transformer) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 11/22/00 will be used, therefore;
volts = (V(T1/T2) + V(T1/T3) + V(T2/T3)/3 = (492 + 490 + 491)/3 = 491.0
amps = (I(T1) + I(T2) + I(T3))/3 = (11.2 + 23.9 + 23.6)/3 = 19.57
KVA = 491.0 x 19.57 x 1.732/1000 = 16.64 KVA
16.64 KVA/ 75 KVA = 0.222
BRA106 was operating at about 22% of it's rated capacity on 11/22/00.
As a check, BRB106 primary load should be greater than BRB105 + BRB127 load.
BRB106 = 16.64 KVA and BRB105 + BRB127 = 1.66 + 11.38 = 13.04 KVA, which checks out.
BRB106 load should be rounded up to 23% or 0.23 demand factor in Bus Load Matrix 1.

BRB105 Load
Distribution cabinet power input (assuming negligible voltage drop on cable 1S6P001) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 11/22/00 will be used, therefore;
volts = (V(AB) + V(AC) + V(BC)/3 = (212.7 + 211.3 + 212.2)/3 = 212.1
amps = (I(A) + I(B) + I(C))/3 = (0.08 + 0.48 + 12.98)/3 = 4.51
KVA = 212.1 x 4.51 x 1.732/1000 = 1.66 KVA

BRB127 Load
Distribution cabinet power input (assuming negligible voltage drop on cable 1NP0671) is calculated as KVA = volts x amps x 1.732/1000. The average of the three phase volts and amps measured on 11/22/00 will be used, with BRA105 cable voltage (assuming negligible voltage drop on cable 1S6P086) therefore;
volts = (V(AB) + V(AC) + V(BC)/3 = (212.7 + 211.3 + 212.2)/3 = 212.1 (using voltage at BRB105)
amps = (I(A) + I(B) + I(C))/3 = (14.4 + 21.8 + 56.7)/3 = 30.97
KVA = 212.1 x 30.97 x 1.732/1000 = 11.38 KVA

S&L DESIGN INFORMATION TRANSMITTAL (DIT)

☒ SAFETY RELATED ☐ NON-SAFETY RELATED

DIT No: DIT-KPS-005-00

Client: Dominion Project No:: 11862-011

Station: Kewaunee Unit(s) 1

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To: William C Stallings (Dominion)

Subject: Cable losses during steady-state EDG operation concurrent with SI

Jason D. Smith Preparer	NPT Process Group	Preparer's Signature	03/05/2007 Date
John H. Gelston Reviewer	NPT Process Group	Reviewer's Signature	Mar. 5, 2007 Date

Status of Information: ☒ Approved For Use ☐ Unverified

Description of Information:

This DIT transmits the expected cable and overload heater losses for EDG operation concurrent with an SI at Kewaunee Power Station.

Assuming nominal terminal voltage for each load (this is acceptable because of high system voltages during EDG operation), EDG A will have 26.3kW of cable and overload heater losses. EDG B will have 23.16kW of cable and overload heater losses.

Purpose of Issuance: (Include any Precautions or Limitations)

This DIT supports the revision of the KPS EDG loading calculation

Source of Information: See page 2 of this DIT.

Engineering Judgement Used?: ☐ Yes ☒ No

Distribution: David J Will (Dominion)
John E. Plonrde (Dominion)
John H. Gelston (S&L)
File

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Cable Data

Cable sizes, lengths and routing (conduit vs cable tray) are taken from KPS cable pull cards (pull card numbers are the same as the cable numbers).

Cable impedance are take from the ETAP provided ICEA and NEC libraries (etaplib503.lib). These values have been verified by OTI.

Overload Heater Data

Overload heater types are taken from KPS schematic drawings. Heater resistances are taken from tables included in KPS procedure NEP-14-14.

Load Data

Load data is taken from the spreadsheets verified by the KPS Design Verification Assessment Form "Bus Load Data" dated 10/7/03 (the Bus Load Matrix). This data is confirmed against single line drawings and motor vendor data (see below).

Motor Vendor Data

Westinghouse Data Sheet 68F15103 (CCW Pumps)
Howden-Buffalo Motor Data (CFCU Fans)
Siemens Data Sheet 40774 (Feedwater Pumps)
Westinghouse Data Sheet 69C39181 (Fire Pumps)
Letter WPS-06-54, Westinghouse to KPS (RCP Pumps)
Westinghouse Data Sheet 68F21735 (RHR Pumps)
Westinghouse Data Sheet 72F44696 (SI Pumps)
Siemens Data Sheet 40363 (AFW Pumps)
Siemens Data Sheet 30819 (SW Pumps)
Siemens Data Sheet 37735 (ICS Pumps)
Siemens Data Sheet 40322 (CW Pumps)
Siemens Data Sheet 40522 (Condensate Pumps)
Siemens Data Sheet 51956 (HD Pumps)

EDG A

ID	kV	Bus	Equipment	Size	L	phase	R	OL R	Total R	IFL	%Load	Amps	Loss
15P04	0.48	4160V Bus 1-5	SST 1-52	1/0	91	1	0.128		0.0116	81.384	100	81.38	0.23
15P05	0.48	4160V Bus 1-5	SST 1-51	1/0	86	1	0.128		0.0084	99.574	100	99.57	0.25
15P06	4.16	4160V Bus 1-5	023 Service Water PP 1A1	6	261	1	0.5347173		0.1396	51.5	101	52.02	1.13
15P07	4.16	4160V Bus 1-5	022 Service Water PP 1A2	6	282	1	0.5347173		0.1508	51.5	101	52.02	1.22
15P08	4.16	4160V Bus 1-5	020 Safety Inject PP 1A	2	420	1	0.21179		0.089	99	104	102.96	2.83
15P09	0.48	4160V Bus 1-5	EDG 1A	750	125	1	0.02128385		0.0027	496.2	110	545.82	2.38
15P11	0.48	4160V Bus 1-5	EDG 1A	750	40	1	0.02338078		0.0009	496.2	110	545.82	0.84
15P12	4.16	4160V Bus 1-5	024 Aux Feedwater PP 1A	6	220	1	0.5347173		0.1176	38.8	105	40.74	0.59
15P13	4.16	4160V Bus 1-5	025 Resid Heat Rmvl PP 1A	6	480	1	0.5347173		0.2567	26	89	23.14	0.41
151P03	0.48	480V Bus 1-51	107 Contain Spray PP 1A	750	407	1	0.02264685		0.0092	262	87	227.94	1.44
151P05	0.48	480V Bus 1-51	156 Contain FC Unit 1B	4/0	475	1	0.06636785		0.0315	145	107	155.15	2.28
151P05R	0.48	480V Bus 1-51	156 Contain FC Unit 1B	4/0	95	1	0.06710178		0.0064	145	107	155.15	0.46
151P06	0.48	480V Bus 1-51	120 Contain FC Unit 1A	4/0	475	1	0.06636785		0.0315	145	107	155.15	2.28
151P06R	0.48	480V Bus 1-51	120 Contain FC Unit 1A	4/0	118	1	0.06710178		0.0079	145	107	155.15	0.57
151P08	0.48	480V Bus 1-51	021 Comp Cool PP 1A	750	337	1	0.02065477		0.007	286	106	303.16	1.92
152P01	0.48	480V Bus 1-52	MCC 52A/D	350	60	1	0.03858352		0.0023	201.93	100	201.93	0.28
152P07	0.48	480V Bus 1-52	MCC 52F	500	490	1	0.03082488		0.0151	267.33	100	267.33	3.24
152P08	0.48	480V Bus 1-52	MCC 52E	750	271	1	0.0197		0.0053	42.44	100	42.44	0.03
152P09	0.48	480V Bus 1-52	MCC 52B	500	380	1	0.03082488		0.0117	91.593	100	91.59	0.29
152P10	0.48	480V Bus 1-52	MCC 52C	500	262	1	0.0294		0.0077	59.901	100	59.90	0.08
1NP0308	0.48	480V Bus 1-52	MCC 5262	350	113	1	0.03963199		0.0045	24.5	100	24.50	0.01
1NP0075	0.48	480V Bus 52 or 62	MCC 5262	350	30	1	0.03963199		0.0012	24.5	100	24.50	0.00
n/a	0.48	480V MCC 1-5262	291 THP H2 SI Oil Bkup PP			1		0.00436	0.0044	24.5	100	24.50	0.01
152AP02	0.48	480V MCC 1-52A	MCC 52D	350	290	1	0.03858352		0.0112	33.87	100	33.87	0.04
152AP03	0.48	480V MCC 1-52A	110 DG Oil Xfer PP A	12	252	1	2.096931	1.34	1.8684	1.3	100	1.30	0.01
152AP04	0.48	480V MCC 1-52A	398 Inst Air Dryer A	12	95	1	2.096931	0	0.1892	3.94	100	3.94	0.01
152AP05	0.48	480V MCC 1-52A	116 DG Vent Supply Fan A	6	119	1	0.5347173	0.00383	0.0675	33	100	33.00	0.22
152AP08	0.48	480V MCC 1-52A	201 Turb Bldg Fan Coil A	12	100	1	2.096931	0.037	0.2467	7.1	100	7.10	0.04
152AP08	0.48	480V MCC 1-52A	258A DG LO Warm Clns PP A	6	110	1	0.5347173	0	0.0588	1.6	100		0.00
152AP09	0.48	480V MCC 1-52A	1112 DG LO Warm PP A	6	110	1	0.5347173	0	0.0588	1.4	100		0.00
152AP09	0.48	480V MCC 1-52A	258A/1112	6	110	1	0.5347173	0	0.0588	3.3	100	3.30	0.00
152AP13	0.48	480V MCC 1-52A	982 AFW Pump A Fan Coil	12	0	1	2.096931	0.054	0.054	4.6	100	4.60	0.00
1NP0302	0.48	480V MCC 1-52A	132 Turb Turn Gear Oil PP	1	175	1	0.1677544	0.00173	0.0311	59	100	59.00	0.32
1NP0510	0.48	480V MCC 1-52A	349 Sta Inst Air Comp C	1	115	1	0.1677544	0.00231	0.0216	46.5	100	46.50	0.14
1NP0633	0.48	480V MCC 1-52A	1153 Inst Air Dryer C	10	152	1	1.258158	0	0.1912	9.32	100	9.32	0.05
152BP12	0.48	480V MCC 1-52B	138 BA Heat Trace 1A	4	237	1	0.3365574	0	0.0798	45.11	39	17.59	0.07
152BP22,152BP22R	0.48	480V MCC 1-52B	583 Ctnmt Dome Vent Fan A	6	171	1	0.5347173	0.00383	0.0953	29	100	29.00	0.24
1NP0304	0.48	480V MCC 1-52B	178 Spent Fuel Pool PP A	1	222	1	0.1677544	0.00309	0.0403	45	100	45.00	0.25
152CP01	0.48	480V MCC 1-52C	125 Batt Charger BRA-108	4	59	1	0.3365574		0.0199	41.06	11	4.52	0.00
152CP05	0.48	480V MCC 1-52C	BRA-105 (480)	2/0	39	1	0.1069435		0.0042	135.65	4		0.00
152CP05	0.48	480V MCC 1-52C	BRA-127 (480)	2/0	39	1	0.1069435		0.0042	75.169	30		0.00
152CP05	0.48	480V MCC 1-52C	BRA-105/127 (480)	2/0	39	1	0.1069435		0.0042	28.995	100	28.99	0.01

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EDG A

ID	kV	Bus	Equipment	Size	L	phase	R	OL R	Total R	IFL	%Load	Amps	Loss
152CP08	0.48	480V MCC 1-52C	331 Inv. BRA-111 Int Bus1	12	60	1	2.096931		0.1258	19	61	11.59	0.05
152CP09	0.48	480V MCC 1-52C	358 Inv. BRA-112 Int Bus4	12	55	1	2.096931		0.1153	19	40	7.60	0.02
152CP10	0.48	480V MCC 1-52C	059 Batt Room Exh Fan A	12	57	1	2.096931	0.054	0.1735	5	100	5.00	0.01
152CP11	0.48	480V MCC 1-52C	667 Batt Rm A FC Unit	12	75	1	2.096931	0.518	0.6753	2.2	100	2.20	0.01
1NP0670	0.208	480V MCC 1-52C	BRA 127	350	73	1	0.03963199		0.0029	180.4	30	54.12	0.03
1S5P001	0.208	480V MCC 1-52C	BRA 105	500	110	1	0.02893764		0.0032	320	4	12.80	0.00
1S5P007	0.48	480V MCC 1-52C	BRA-105 (480)	2/0	22	1	0.1069435		0.0024	138.85	4		0.00
1S5P007	0.48	480V MCC 1-52C	BRA-127 (480)	2/0	22	1	0.1069435		0.0024	73.153	30		0.00
1S5P007	**0.48**	**480V MCC 1-52C**	**BRA-105/127 (480)**	**2/0**	**22**	**1**	**0.1069435**		**0.0024**	**28.995**	**100**	**28.99**	**0.01**
1S5P060	0.208	480V MCC 1-52C	BRA 127	350	10	1	0.03963199		0.0004	180.4	30	54.12	0.00
152DP04	0.48	480V MCC 1-52D	451 Screen Hse Exh Fan A	6	32	1	0.5347173	0.00596	0.0231	23	100	23.00	0.04
1NP0305/1NP0306	0.48	480V MCC 1-52D	123 Trvl Water Screen A1	12	56	2	2.096931	0.084	0.1427	1.47	100	1.47	0.00
1NP0340	0.48	480V MCC 1-52D	242 Service Wtr Strain A1	12	60	1	2.096931	0.294	0.4198	2.8	100	2.80	0.01
1NP0341	0.48	480V MCC 1-52D	243 Service Wtr Strain A2	12	99	1	2.096931	0.294	0.5016	2.8	100	2.80	0.01
1NP0493+1NP0494	0.48	480V MCC 1-52D	410 Fire Prot Sys Jock PP	12	220	1	2.096931	0.084	0.5453	3.8	100	3.80	0.02
152EP10	0.48	480V MCC 1-52E	298 RHR PP Pit Fan Coil A	12	111	1	2.096931	0.428	0.6608	2.5	100	2.50	0.01
152EP12	0.48	480V MCC 1-52E	131 Ax Bdg Mez Fan Coil A	12	45	1	2.096931	0.037	0.1314	7.1	100	7.10	0.02
152EP18	0.48	480V MCC 1-52E	164 Aux Bldg Bsmt FC A	12	246	1	2.096931	0.0175	0.5333	10.5	100	10.50	0.18
152EP32	0.48	480V MCC 1-52E	815 H2 Analyzer A	12	75	1	2.096931		0.1573	3.62	100	3.62	0.01
152EP33	0.48	480V MCC 1-52E	813 Htd Line A H2 Analyz	10	44	1	1.258158		0.0554	6.22	100	6.22	0.01
152EP37	0.48	480V MCC 1-52E	1084 Aux Bldg Bsmt FC C	10	200	1	1.258158	0.0175	0.2691	9.6	100	9.60	0.07
1NP0511	0.48	480V MCC 1-52E	978 Charg PP C Fan Coil	12	105	1	2.096931	0.294	0.5142	2.9	100	2.90	0.01
152FP02	0.48	480V MCC 1-52F	126 Zone SV Exh Fan A	4	105	1	0.3365574	0.00336	0.0387	31	100	31.00	0.11
152FP03	0.48	480V MCC 1-52F	127 Sheld Bldg Vent Fan A	4	195	1	0.3365574	0.00427	0.0699	31	100	31.00	0.20
152FP04	0.48	480V MCC 1-52F	265 CR Post Acc RF A	10	45	1	1.258158	0.0175	0.0741	10.5	100	10.50	0.02
152FP05	0.48	480V MCC 1-52F	315 CRAC 52F	1	70	1	0.1677544		0.0117	63	100	63.00	0.14
152FP06	0.48	480V MCC 1-52F	317 Control Room AC Fan A	8	85	1	0.8503053	0.00336	0.0756	24.4	100	24.40	0.14
152FP08	0.48	480V MCC 1-52F	463 CRAC Chiller	12	58	1	2.096931		0.1216	4.24	100	4.24	0.01
152FP13	0.48	480V MCC 1-52F	449 Zn SV Flt As A Htg Cl	4	96	1	0.3365574		0.0323	46.19	100	46.19	0.21
152FP14	0.48	480V MCC 1-52F	601 CRD Equip Rm FC A	12	220	1	2.096931	0.037	0.4983	7.1	100	7.10	0.08
152FP23	0.48	480V MCC 1-52F	1013 SBV Damp Hyd Pack A	10	194	1	1.258158	0.626	0.8701	1.8	100	1.80	0.01
152FP25	0.48	480V MCC 1-52F	1082 Aux Bldg Floor FC A	10	240	1	1.258158	0.0122	0.3142	12.4	100	12.40	0.14
152FP26	0.48	480V MCC 1-52F	1223 RMS ChR13 AB Vent PP	12	78	1	2.096931	1.34	1.5036	1.25	100	1.25	0.01
152FP27	0.48	480V MCC 1-52F	1225 RMS ChR21 Cnt Vnt PP	12	197	1	2.096931	1.34	1.7531	1.25	100	1.25	0.01
152FP07	0.48	480V MCC 1-52F Ext	238 Shld Bdg Flt As A Htr	4	500	1	0.3365574		0.1683	33.2	100	33.20	0.56
152FP21	0.48	480V MCC 1-52F Ext	238 Shld Bdg Flt As A Htr	350	40	1	0.0375		0.0015	33.2	100	33.20	0.00
												Total Losses In kW	26.33

Note: Cables that are grayed out supply two separate loads. Their total current values are summed in the subsequent bolded line to find the loss value.

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EDG B

ID	kV	Bus	Equipment	Size	L	phase	R	OL R	Total R	IFL	%Load	Amps	Loss
16P04	0.48	4160V Bus 1-6	SST 1-61	1/0	136	1	0.128		0.0174	93.093	100	93.09	0.45
16P05	0.48	4160V Bus 1-6	SST 1-62	1/0	160	1	0.128		0.0205	74.728	100	74.73	0.34
16P06	4.16	4160V Bus 1-6	027 Safety Inject PP 1B	2	440	1	0.21179		0.0932	99	104	102.96	2.96
16P07	4.16	4160V Bus 1-6	032 Resid Heat Rmvl PP 1B	8	504	1	0.8503053		0.4286	26	89	23.14	0.69
16P08	4.16	4160V Bus 1-6	031 Aux Feedwater PP 1B	6	248	1	0.5347173		0.1326	38.8	105	40.74	0.66
16P09	0.48	4160V Bus 1-6	EDG 1B	750	120	1	0.02128385		0.0026	496.2	110	545.82	2.28
16P10	0.48	4160V Bus 1-6	EDG 1B	750	37	1	0.02338078		0.0009	496.2	110	545.82	0.77
16P11	4.16	4160V Bus 1-6	030 Service Water PP 1B1	6	275	1	0.5347173		0.147	51.5	96	49.44	1.08
16P12	4.16	4160V Bus 1-6	029 Service Water PP 1B2	6	247	1	0.5347173		0.1321	51.5	96	49.44	0.97
161P01	0.48	480V Bus 1-61	028 Comp Cool PP 1B	750	303	1	0.02264685		0.0069	270	92	248.40	1.27
161P02	0.48	480V Bus 1-61	148 Contain Spray PP 1B	750	225	1	0.02264685		0.0051	262	87	227.94	0.79
161P03+161P03R	0.48	480V Bus 1-61	121 Contain FC Unit 1C	4/0	445	1	0.06710178		0.0299	145	107	155.15	2.16
161P04+161P04R	0.48	480V Bus 1-61	157 Contain FC Unit 1D	4/0	473	1	0.06710178		0.0317	145	107	155.15	2.29
162P01	0.48	480V Bus 1-62	MCC 62A/D	500	198	1	0.02893764		0.0057	129.79	100	129.79	0.29
162P02	0.48	480V Bus 1-62	MCC 62B	250	353	1	0.05787528		0.0204	29	100	29.00	0.05
162P03	0.48	480V Bus 1-62	MCC 62C	250	125	1	0.05672197		0.0071	42.274	100	42.27	0.04
162P05	0.48	480V Bus 1-62	MCC 62H/E	750	100	1	0.02055477		0.0021	139.99	100	139.99	0.12
162P07	0.48	480V Bus 1-62	MCC 62J	750	420	1	0.0197		0.0083	265.9	100	265.90	1.75
1NP0325	0.48	480V Bus 1-62	MCC 5262	350	61	1	0.03963199		0.0024	24.5	100	24.50	0.00
1NP0075	0.48	480V Bus 1-62	MCC 5262	350	30	1	0.03963199		0.0012	24.5	100	24.50	0.00
n/a	0.48	480V MCC 1-5262	291 THP H2 Sl Oil Bkup PP			1		0.00436	0.0044	24.5	100	24.50	0.01
162AP03	0.48	480V MCC 1-62A	139 DG Oil Xfer PP B	12	80	1	2.096931	1.34	1.5078	1.3	100	1.30	0.01
162AP04	0.48	480V MCC 1-62A	141 DG Start Up Comp B	10	115	1	1.258158	0.015	0.1597	9.96	100	9.96	0.05
162AP05	0.48	480V MCC 1-62A	344 Inst Air Dryer Assy B	12	220	1	2.096931		0.4613	3.61	100	3.61	0.02
162AP08	0.48	480V MCC 1-62A	118 DG Vent Supply Fan B	6	131	1	0.5347173	0.00336	0.0734	33	100	33.00	0.24
162AP12	0.48	480V MCC 1-62A	259A/1113	10	117	1	1.258158		0.1472	3.45	100	3.45	0.01
162AP13	0.48	480V MCC 1-62A	MCC 62D	4/0	263	2	0.064		0.0084	30.17	100	30.17	0.02
162AP15	0.48	480V MCC 1-62A	MCC 62A/D	500	20	1	0.03082488		0.0008	129.79	100	129.79	0.03
1NP0203	0.48	480V MCC 1-62A	151 Sta Instr Air Comp B	1	200	1	0.1677544	0.00231	0.0359	46.5	100	46.50	0.23
1NP0313	0.48	480V MCC 1-62A	245 TAT Auxiliary Loads	12	310	1	2.096931		0.65	1.8	100	1.80	0.01
162BP10+162BP10R	0.48	480V MCC 1-62B	584 Ctnmt Dome Vent Fan B	6	240	1	0.5347173	0.00383	0.1322	29	100	29.00	0.33
162CP01	0.48	480V MCC 1-62C	143 Batt Chrg BRB-108	4	39	1	0.3365574		0.0131	43	8	3.44	0.00
162CP05	0.48	480V MCC 1-62C	BRB-105 (480)	2/0	39	1	0.1069435		0.0042	48.855	7		0.00
162CP05	0.48	480V MCC 1-62C	BRB-127 (480)	2/0	39	1	0.1069435		0.0042	78.163	25		0.00
162CP05	0.48	480V MCC 1-62C	BRB-105/127 (480)	2/0	39	1	0.1069435		0.0042	25.607	100	25.61	0.01
162CP09	0.48	480V MCC 1-62C	332 Inv BRB-111 Int Bus 2	12	49	1	2.096931		0.1027	19	61	11.59	0.04
162CP10	0.48	480V MCC 1-62C	357 Inv BRB-112 Int Bus 3	12	46	1	2.096931		0.0965	19	43	8.17	0.02
162CP11	0.48	480V MCC 1-62C	215 Batt Room Exh Fan B	12	35	1	2.096931	0.054	0.1274	5	100	5.00	0.01
162CP12	0.48	480V MCC 1-62C	668 Batt Rm B FC Unit	12	53	1	2.096931	0.518	0.6291	2.2	100	2.20	0.01
1NP0654	0.48	480V MCC 1-62C	669 Batt Chrg BRD-108	4	130	1	0.3365574		0.0438	38.43	8	3.07	0.00
1NP0671	0.208	480V MCC 1-62C	BRB-127	350	48	1	0.03963199		0.0019	180.4	25	45.10	0.01
1NP0742	0.48	480V MCC 1-62C	350 Inv BRD-109 Non-inter	10	58	1	1.258158		0.073	11	80	8.80	0.02
1S6P001	0.208	480V MCC 1-62C	BRB-105	350	63	1	0.03858352		0.0024	200	7	14.00	0.00
1S6P086	0.208	480V MCC 1-62C	BRB-127	350	10	1	0.03858352		0.0004	180.4	25	45.10	0.00
162DP04	0.48	480V MCC 1-62D	452 Screen Hse Exh Fan B	6	35	1	0.5347173	0.0057	0.0244	23	100	23.00	0.04
1NP0319/1NP0320	0.48	480V MCC 1-62D	155 Trvl Water Screen B2	12	73	2	2.096931	0.084	0.1605	1.57	100	1.57	0.00
1NP0342	0.48	480V MCC 1-62D	294 Service Wtr Strain B1	12	92	1	2.096931	0.294	0.4869	2.8	100	2.80	0.01

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EDG B

ID	kV	Bus	Equipment	Size	L	phase	R	OL R	Total R	IFL	%Load	Amps	Loss
1NP0343	0.48	480V MCC 1-62D	252 Service Wtr Strain B2	12	72	1	2.096931	0.294	0.445	2.8	100	2.80	0.01
162EP05	0.48	480V MCC 1-62E	299 RHR PP Pit Fan Coil B	12	208	1	2.096931	0.428	0.8642	2.5	100	2.50	0.02
162EP06	0.48	480V MCC 1-62E	183 Aux Bldg Bsmt FC B	12	110	1	2.096931	0.0175	0.2482	10.5	100	10.50	0.08
162EP07	0.48	480V MCC 1-62E	136 Aux Bldg Mezz FC B	12	245	1	2.096931	0.037	0.5507	7.1	100	7.10	0.08
162EP12	0.48	480V MCC 1-62E	211 Turb Bldg Fan Coil B	12	132	1	2.096931	0.037	0.3138	7.1	100	7.10	0.05
162EP22	0.48	480V MCC 1-62E	302 BA Ht Trace BAHTT 1B	4	149	1	0.3365574		0.0501	45.11	100	45.11	0.31
162EP40	0.48	480V MCC 1-62E	MCC 62E	750	67	1	0.0197		0.0013	133.65	100	133.65	0.07
162EP41	0.48	480V MCC 1-62E	166 Hld Line B H2 Analyze	10	215	1	1.258158		0.2705	6.74	100	6.74	0.04
162EP44	0.48	480V MCC 1-62E	1085 Aux Bldg Bsmt FC D	10	40	1	1.258158	0.0175	0.0578	9.6	100	9.60	0.02
1NP0321	0.48	480V MCC 1-62E	248 Spent Fuel Pool PP B	1	377	1	0.1677544	0.00309	0.0663	45	100	45.00	0.40
162HP13	0.48	480V MCC 1-62H	923 H2 Analyzer Panel B	12	235	1	2.096931		0.4928	3.44	100	3.44	0.02
1NP0512	0.48	480V MCC 1-62H	979 Charg PP B Fan Coil	12	260	1	2.096931		0.5452	2.9	100	2.90	0.01
162JP01	0.48	480V MCC 1-62J	266 2CR Post Acc RF B	10	160	1	1.258158	0.05	0.2513	10.5	100	10.50	0.08
162JP02	0.48	480V MCC 1-62J	464 CRAC Chiller	12	176	1	2.096931		0.3691	4.24	100	4.24	0.02
162JP04	0.48	480V MCC 1-62J	318 Control Room AC Fan B	8	155	1	0.8503053	0.05	0.1818	24.4	100	24.40	0.32
162JP10	0.48	480V MCC 1-62J	239 SBV Flt As B Htg Coil	6	165	1	0.5347173		0.0882	33.2	100	33.20	0.29
162JP11	0.48	480V MCC 1-62J	450 Zone SV Flt As B Coil	4	156	1	0.3365574		0.0525	44.26	100	44.26	0.31
162JP12	0.48	480V MCC 1-62J	144 Zone SV Exh Fan B	4	157	1	0.3365574	0.000981	0.0536	31.5	100	31.50	0.16
162JP15	0.48	480V MCC 1-62J	602 CRD Eq Rm Fan Coil B	12	203	1	2.096931	0.019289	0.445	7.1	100	7.10	0.07
162JP16	0.48	480V MCC 1-62J	145 Shld Bldg Vent Fan B	6	193	1	0.5347173		0.1032	31	100	31.00	0.30
162JP19	0.48	480V MCC 1-62J	1014 SBV Damp Hyd Pack B	10	215	1	1.258158		0.2705	1.8	100	1.80	0.00
162JP20	0.48	480V MCC 1-62J	1083 Aux Bldg Floor FC B	10	230	1	1.258158		0.2894	12.4	100	12.40	0.13
162JP21	0.48	480V MCC 1-62J	1224 RMS ChR14 AB Vent PP	12	110	1	2.096931		0.2307	1.25	100	1.25	0.00
162JP22	0.48	480V MCC 1-62J	1227 RMS Chs R11/R12	12	270	1	2.096931		0.5662	1.25	100	1.25	0.00
1NP0712	0.48	480V MCC 1-62J	316 CRAC 62J	1	125	1	0.1677544		0.021	63	100	63.00	0.25
												Total Losses in kW	23.16

Note: Cables that are grayed out supply two separate loads. Their total current values are summed in the subsequent bolded line to find the loss value.

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ESI-EMD Owners Group Guidance Document
EMD 645 E4 Nuclear Service Diesel Engine Ratings at Elevated Temperatures

Introduction / Purpose

Since originally made available to the ESI-EMD Owners Group in 1992, the "EMD 645 E4 Diesel Engine Ratings at Elevated Temperatures" have been somewhat of a source of confusion to the group as to their application. The purpose of this document is to clarify the intent and application of these ratings and their associated engine performance curves.

Discussion

All EMD 645E4 diesels load ratings are based on 90F air intake (combustion air) and coolant temperatures of less than 190F. The kilowatt load ratings are typically continuous, 2000 hour, 200 hour, 4 hour, and ½ hour ratings. For example, for a 20 cylinder 645E4 EMD 999 generator-set the ratings at 90F and coolant temperatures of less than 190F are as follows:

- 2600 kW - continuous
- 2850 kW - 2000 hours / year
- 2963 kW - 200 hours / year
- 3000 kW - 4 hours / year
- 3050 kW - 30 minutes / year

Each of these ratings accumulates the equivalent amount of wear on the diesel. For example, operating at 2600 KW for a year is equivalent to operating at 3050 KW for half an hour. It is recommended at the conclusion of operating at or above any of the ratings for the specified time, the diesel needs to be inspected (air box inspection to include pistons, rings, liners, and further inspections if required including piston/head clearance, and gross visual crankcase inspection) at the next convenient opportunity based on plant operating conditions. These ratings are not cumulative, in other words it is not acceptable to operate the diesel at 3050 KW for half an hour and then for 2850 KW for 2000 hours without inspecting the diesel in between. However, if these ratings are exceeded the diesel MAY will not fail, but the amount of wear maybe greater than normal as operating above the specified loads and durations will accelerate wear.
CAN

The curve provided by EMD entitled, "EMD 645 Engines – Nuclear Service Engine Rating at Elevated Temperatures" and MKW Power Systems, Inter Office Correspondence, dated June 9, 1992, outlines the effect of elevated air intake temperatures on EMD diesels (see attached). The purpose of these curves is to determine the maintenance interval at higher air intake temperature at the various load ratings. If the air intake temperature exceeds 90 F, then load ratings may be reduced to account for the increase in wear due to the higher temperatures in order to maintain the original maintenance interval. The air intake temperature and load is an average for the period of time the diesel is operating, therefore a slight variation (approximately 1/2 % over) in load is acceptable. However, the half hour rating of the diesel should not be exceeded given the already higher temperatures when operating at this load. If any of the other ratings are exceeded the diesel will not fail, however the amount of wear maybe greater
IS EXPECTED TO FAIL

than normal and the diesel should be inspected at the next available convenient opportunity based on plant operating conditions.

The curve is based on two general conditions, operation when the engine coolant temperature out of the engine is less than 190F and when it is above 190F. Most diesels used in the nuclear industry have heat exchangers sized such that the maximum expected engine outlet temperature is less than 190F. However, a calculation or operating experience should be used to ensure the temperature does not exceed 190F when operating at design basis conditions. If the coolant outlet temperature does exceed 190F during operation when the air intake temperature is greater than 90F then the applicable curve needs to be referenced.

For EMD's with the coolant out of the engine less than 190F at air intake temperatures greater than 90F the following applies:

- Use Curve B when operating close to the continuous ratings, and 2000 hour ratings. This curve is also used for "short time rating" which is defined as 110% of continuous ratings for 2 hours out of 24 hours.
- Use Curve A when operating close to the 200 hour and 4 hour ratings
- Use Curve C when operating close to the 30 minute rating.

If the coolant outlet temperature out of the engine exceeds 190F the following applies:

- Use Curve A for all ratings except the 30 minute rating
- Use Curve C when operating closest to the 30 minute rating.

Below are some examples of how to use the curves using the following example ratings:

2600 KW continuous for one year
2850 KW for 2000 hours
2963 KW for 200 hours
3000 KW for 4 hours
3050 for ½ hour

Example A:
The load on the diesel is 2800 KW and the coolant out is less than 190F

Referring to the 2000 hour rating of the diesel, the diesel is operating at 98% of the 2000 hour. Therefore using curve B for the 2000 hour rating, the average temperature the diesel can operate at for 2000 hours and not exceed the expected amount of wear is approximately 122F. At the conclusion of operating for 2000 hours with an average air intake temperature of 122F and average load of 2800KW, the diesel would need to be inspected (air box inspection to include pistons, rings, liners, and further inspections if

required including piston/head clearance, and gross visual crankcase inspection) at the next convenient opportunity.

Example B
The load on the diesel is 2925 KW for 100 hours and the coolant outlet is less than 190F.

Using the 200 hour rating of the diesel, the percentage of the rating is determined to be approximately 99%. Therefore referring to curve A for the 200 hour rating, the average temperature the diesel can operate at is 94 F. At the conclusion of operating at 2925 KW for 100 hours at 94F, half of the maintenance interval is consumed. Therefore the diesel could operate for 1000 hours at 2850 KW with air intake temperatures less than 115F before the diesel would accumulate the equivalent amount of wear when operating at 2600 KW for a year. At the conclusion of the operation, the diesel would need to be inspected at the next convenient opportunity.

Summary / Conclusion
The purpose of the Diesel Engine Ratings at Elevated Temperature curves are to determine when additional maintenance should be performed to ensure the EDG will be able to perform its design function, if the EDG should be operated at loads and air intake temperatures greater than its continuous rating and 90°F air intake temperature. Their intent is not to determine whether the engine will operate at that temperature or not, as in most cases, other than the ½ hour rating, the EDG is expected to run and operate even at an elevated temperature condition.

It is recommended however, as a conservative measure, that for design purposes, these curves be used as guidelines to establish loading conditions for the engine at elevated temperature and cooling water conditions.

Jim Golding
ESI-EMD Owners Group
Mechanical Subcommittee Co-Chairman

Jack Murray / Brad Abernathy
Engine Systems, Incorporated

NPC 99-048862

MKW POWER SYSTEMS, Inc.

INTER-OFFICE CORRESPONDENCE CONTROL # 00367A

TO: David Strickland DATE: June 9, 1992

LOCATION: Sales FROM: Don Galeazzi

SUBJECT: EMD engine derating for elevated temperatures LOCATION: Engineering

After discussing engine derating with EMD on 6/4/92 and based on our own analysis and experience with the EMD engine, the following engine derating criteria is provided. Please pass this information along to the EMD Owner's Group.

THE EMD 645 DIESEL ENGINE RATINGS ARE BASED ON 90 °F ENGINE INTAKE AIR TEMPERATURE. FOR HIGHER INTAKE AIR TEMPERATURES THE ENGINE MUST BE DERATED IN ACCORDANCE WITH THE ATTACHED CURVE(S) AS DESCRIBED BELOW:

1. FOR OPERATION WHERE THE ENGINE COOLANT TEMPERATURE OUT OF THE ENGINE IS LIMITED TO 190 °F:

   A. USE CURVE "B" FOR THE "CONTINUOUS", "SHORT-TIME", AND "2000 HR" RATINGS.
   * B. USE CURVE "A" FOR THE "200 HR", AND "4 HR" RATINGS.
   C. USE CURVE "C" FOR THE "30 MIN" RATING.

   * Where these curves intersect the 2000 hr rating curve, the 2000 hr rating curve will apply.

2. FOR OPERATION WHERE THE ENGINE COOLANT TEMPERATURE OUT OF THE ENGINE IS ABOVE 190 °F:

   A. USE CURVE "A" FOR ALL RATINGS EXCEPT THE "30 MIN" RATING.
   B. USE CURVE "C" FOR THE "30 MIN" RATING.

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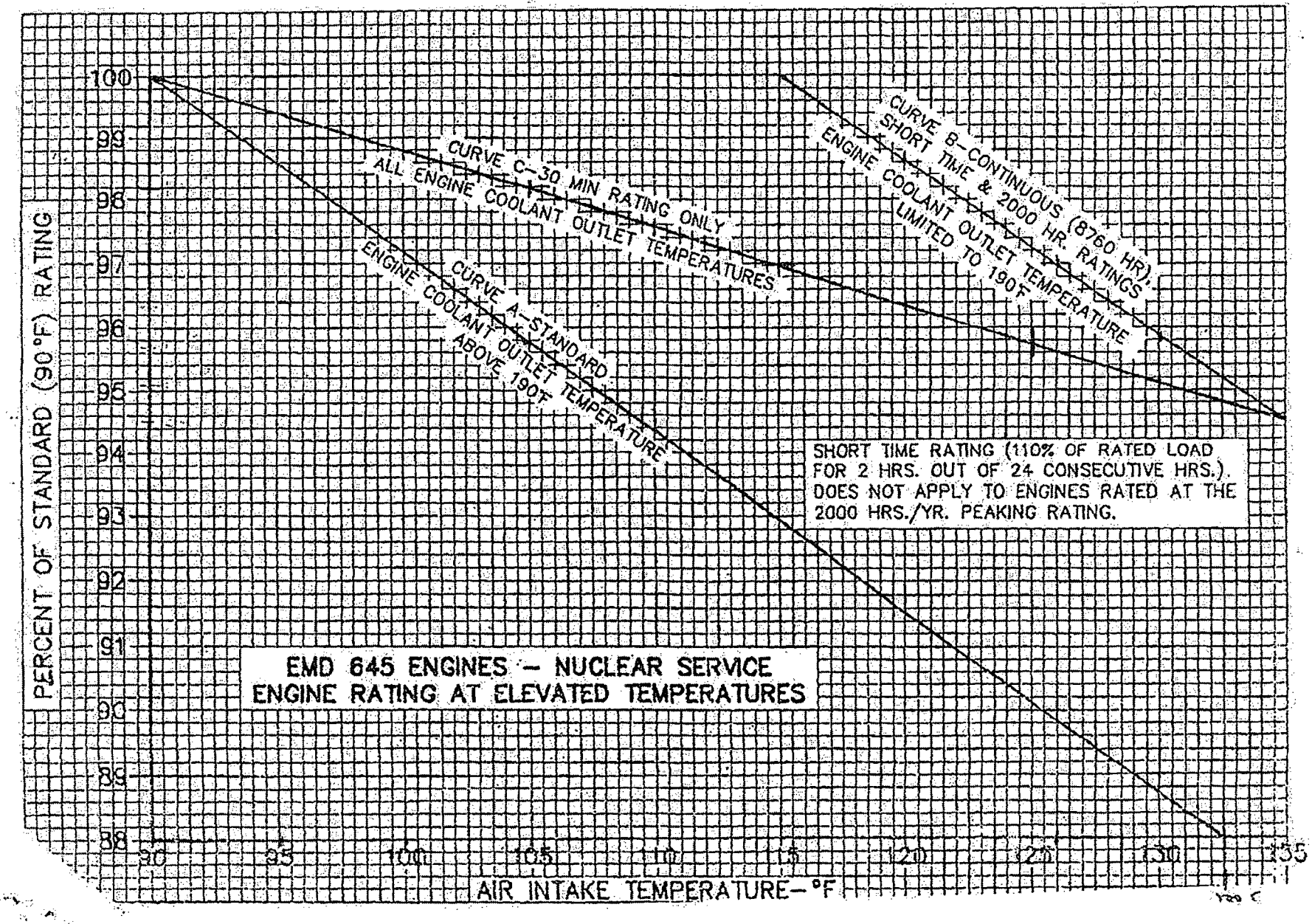
PERCENT OF STANDARD (90°F) RATING
100
99
98
97
96
95
94
93
92
91
90
89
88
90
95
100
105
110
115
120
125
130
135
AIR INTAKE TEMPERATURE—°F
CURVE C—30 MIN RATING ONLY
ALL ENGINE COOLANT OUTLET TEMPERATURES
CURVE B—CONTINUOUS (8760 HR). SHORT TIME & 2000 HR. RATINGS
ENGINE COOLANT OUTLET TEMPERATURE LIMITED TO 190F
CURVE A—STANDARD
ENGINE COOLANT OUTLET TEMPERATURE ABOVE 190F
SHORT TIME RATING (110% OF RATED LOAD FOR 2 HRS. OUT OF 24 CONSECUTIVE HRS.). DOES NOT APPLY TO ENGINES RATED AT THE 2000 HRS./YR. PEAKING RATING.
EMD 645 ENGINES — NUCLEAR SERVICE
ENGINE RATING AT ELEVATED TEMPERATURES

Calculation C-042-001 Rev. 6 Add. C
Attachment 5 Page 1 of 2

Engine Systems, Inc.

Nuclear Parts & Service

Friday, May 19, 2006 Revision 1

Dominion Energy
Kewaunee Power Station
Attn: Paul DeTemple

Reference: 20-645E4 Engine Ratings with EMD A20 Generator

Gentlemen:

The June 11, 1992 letter from MKW Power Systems regarding "EMD 645E4 Diesel Engine Ratings at Elevated Temperatures" applies to your diesel generators. Therefore your diesels are subject to derating based upon the instructions in the letter and the engine horsepower and generator KW ratings listed below.

Altitude derating is not required for the 20-645E4 engine below 7000 feet above sea level. We do not have any other factors of derating, and therefore air inlet temperature appears to be the only derating factor in your case.

The following ratings are based upon 90°F intake air temperature:

1. Continuous Operation Published Rating:
   - 3600 Brake Horsepower
   - 2600 KW

Note: All KW ratings are based upon an A20 generator efficiency of rating 97.2%

KW = HP x 0.746 x .972

Note: (1) Unit will operate at the Continuous Rating 24 hours with 10% overload for any 2 hours per 24 hours without additional maintenance.

Note: (2 – 5) If operated under the following conditions yearly maintenance must be preformed in accordance with EMD guidelines.

2. Overload Operation for 2000 Hr. Rating per year
   - 3950 Brake Horsepower
   - 2864 KW
3. Overload Operation for 200 Hr. Rating per year
   - 4100 brake Horsepower
   - 2973 KW
4. Overload Operation for 4 Hr. Rating per year
   - 4150 brake Horsepower
   - 3009 KW

175 Freight Road, Rocky Mount, NC 27804 / Telephone (252-977-2720) / Fax (252-446-3830)

Calculation C-042-001 Rev. 6 Add. C
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Engine Systems, Inc.
Nuclear Parts & Service

5. Overload Operation for 30 Minutes per year
   - 4225 Brake Horsepower
   - 3050 KW

The above ratings are not cumulative and (2-5) are not subject to overload.

Operating outside of the limits specified above will subject the diesel generator to stresses beyond its design capability. The diesel generator is designed to operate reliably at the ratings specified above.

Although operations within these ratings are not detrimental to the diesel generator, regularly subjecting the diesel generator to these overload operations will accelerate wear. Accelerated component wear may negatively impact the machine's reliability and will result in more frequent teardown inspections in accordance with the manufacturer's recommendations.

Regular testing of the diesel generator at its continuous rating is sufficient to demonstrate functionality of the diesel generator while minimizing wear.

IEEE 387-1995 Specifies load testing at 90-100% of the continuous rating.

Should you have any questions or need additional information, please don't hesitate to call me @ 252-407-3517 or by email at robin.weeks@kirbycorp.com.

Sincerely,

Robin L. Weeks
Applications Engineer
Engine Systems, Inc.
(252) 407-8517
fax (252) 446-1134

50.59 APPLICABILITY REVIEW

(Is the activity excluded from 50.59 review?)

1. Document/Activity number: C-042-001, Rev. 6, Addendum C

2. Brief description of proposed activity (what is being changed and why):
The Safeguards Diesel Generator Loading calculation is being addended to show that loading is within the short-time rating, which is the limiting rating for the Diesel Generator per Regulatory Guide 1.9, Rev. 2 requirements.

3. Does the proposed activity involve or change any of the following documents or processes? Check YES or NO for EACH applicability review item. Explain in comments if necessary. [Ref. 50.59 Resource Manual, Section 4]

NOTE: If you are unsure if a document or process may be affected, contact the process owner.

	Yes ✓	No ✓	Document or Process	Applicable Regulation	Contact/Action
a	☐	☒	Technical Specifications or Operating License	10CFR50.92	Process change per NAD-05.14. Contact Licensing.
b	☐	☒	Activity/change previously approved by NRC in license amendment or NRC SER	10CFR50.90	Identify NRC letter in comments below. Process change. Contact Licensing for assistance.
c	☒	☐	Activity/change covered by an existing approved 10CFR50.59 review, screening, or evaluation.	10CFR50 Appendix B	Identify screening or evaluation in comments below. Process change.
d	☐	☒	Dominion Quality Assurance Program Description (DOM-QA-1)	10CFR50.54(a)	Contact QA. Refer to NO-AA-101.
e	☐	☒	Emergency Plan	10CFR50.54(q)	Contact EP. Refer to FP-R-EP-02.
f	☐	☒	Security Plan	10CFR50.54(p)	Contact Security. Refer to FP-S-SPE-01.
g	☐	☒	IST Plan	10CFR50.55a(f)	Contact IST process owner. Refer to NAD-01.24.
h	☐	☒	ISI Plan	10CFR50.55a(g)	Contact ISI process owner. Refer to NADs 01.03, 01.05, and 05.11.
i	☐	☒	ECCS Acceptance Criteria	10CFR50.46	Contact Licensing.
j	☐	☒	USAR or any document incorporated by reference - Check YES only if change is editorial (see Attachment A).	10CFR50.71	Process USAR change per NEP-05.02. Contact USAR process owner for assistance.
k	☐	☒	Commitment - Commitment changes associated with a response to Generic Letters and Bulletins, or if described in the USAR require a pre-screening.	10CFR50 Appendix B	Contact Licensing. Refer to NAD-05.25.
l	☐	☒	Maintenance activity or new/revised maintenance procedure - Check YES only if clearly maintenance and equipment will be restored to its as-designed condition within 90 days (see Attachment C).	10CFR50.65	Evaluate under Maintenance Rule. Refer to NAD-08.20 and NAD-08.21.
m	☐	☒	New/revised administrative or managerial directive/procedure (e.g., NAD, GNP, Fleet Procedure) or a change to any procedure or other controlled document (e.g., plant drawing) which is clearly editorial/administrative. See Attachments A and B.	10CFR50 Appendix B	Process procedure/document revision.

4. Conclusion. Check one of the following:

☐ All documents/processes listed above are checked NO. 10CFR50.59 applies to the proposed activity. A 50.59 pre-screening shall be performed.

☐ One or more of the documents/processes listed above are checked YES, AND controls all aspects of the proposed activity. 10CFR50.59 does NOT apply. Process the change under the applicable program/process/procedure.

☒ One or more of the documents/processes listed above are checked YES, however, some portion of the proposed activity is not controlled by any of the above processes. 10CFR50.59 applies to that portion. A 50.59 pre-screening shall be performed.

5. Comments:
Existing applicable 10CFR50.59 activities that partially cover the changes include SCRN 06-044-00, Pre-screening for C11409, Rev. 0, Addendum A dated 7/22/05, Pre-screening for C11582, Rev. 0, Addendum A dated 5/27/04, SCRN 03-164-00, SCRN 03-163-00, SCRN 04-092-00, SCRN 03-144-00.

6. Print name followed by signature. Attach completed form to document/activity/change package.

Prepared by: (print/sign) William A. Hennig — Date: 03/14/2007

Reviewed by: (print/sign) Eric Streich — Date: 3-16-07

50.59 PRE-SCREENING

(Is a 50.59 screening required?)

1. Document/Activity number: C-042-001, Rev. 6, Addendum C
2. Brief description of proposed activity (what is being changed and why):

   The Safeguards Diesel Generator Loading calculation is being addended to show that loading is within the short-time rating, which is the limiting rating for the Diesel Generator per Regulatory Guide 1.9, Rev. 2 requirements.
3. Does the proposed activity involve or change any of the following documents or processes? Explain in Comments if necessary.

   Check YES or NO for EACH pre-screening item. [Ref. NMC 50.59 Resource Manual, Section 5.1]

   NOTE: If you are unsure if a document or process may be affected, contact the process owner.

   NOTE: An asterisk (*) indicates that the document is incorporated by reference in the USAR or is implicitly considered part of the USAR.

   NOTE: Check NO if activity/change is considered editorial, administrative, or maintenance as defined in Attachments A, B, and C. Explain in Comments if necessary.

	Yes ✓	No ✓	Document/Process	Directive/ Procedure
a	☒	☐	Updated Safety Analysis Report (USAR)	NEP-05.02
b	☐	☒	* Technical Specifications Bases or Technical Requirements Manual (TRM)	NAD-05.14, NAD-03.25
c	☐	☒	* Commitments made in response to NRC Generic Letters and Bulletins, and those described in the USAR	NAD-05.25
d	☐	☒	* Environmental Qualification (EQ) Plan	NAD-01.08
e	☐	☒	* Regulatory Guide 1.97 (RG 1.97) Accident Monitoring Instrumentation Plan	NAD-05.22
f	☐	☒	* Fire Plan	NAD-01.02
g	☐	☒	* Appendix R Design Description	NAD-01.02
h	☐	☒	* Fire Protection Program Analysis (FPPA)	NAD-01.02
i	☐	☒	* Offsite Dose Calculation Manual (ODCM)	NAD-05.13
j	☐	☒	* Radiological Environmental Monitoring Manual (REMM)	NAD-05.13
k	☐	☒	* Station Blackout Design Description	
l	☐	☒	* Control Room Habitability Study	
m	☐	☒	Plant Drawing Changes/Discrepancies	NAD-05.01
n	☐	☒	Calculations/Evaluations/Analyses/Computer Software - Check YES only if: 1) It affects a method of evaluation described in the USAR, or 2) It independently (i.e., not part of a modification) affects the licensing or design basis.	Various
o	☐	☒	Permanent Plant Physical Changes - All require a screening.	NAD-04.03
p	☐	☒	Temporary Plant Physical Changes (TCRs) - Check No only if installed for maintenance AND in effect for less than 90 days at power conditions.	NAD-04.03
q	☐	☒	QA Typing Determinations - Check YES only if reduction in classification, or affects design function as described in USAR.	NAD-01.01
r	☐	☒	Setpoint or Acceptance Criteria - Check YES only if change affects plant monitoring, performance, or operation.	Various
s	☐	☒	Plant Procedures/Revisions - Check YES only if the change directly or indirectly involves operating, controlling or configuring an SSC differently than described or credited in USAR.	NAD-03.01
t	☐	☒	Engineering Specifications - Check YES only if a design function or design requirement may be affected.	NAD-05.03
u	☐	☒	Operations Night Orders or Operator Work Arounds - Check YES only if SSCs are operated or configured differently than described in USAR.	NAD-12.08
v	☐	☒	Temporary plant alterations (e.g., jumpers, scaffolding, shielding, barriers) - Check YES only if installed (or in effect) for maintenance for longer than 90 days at power conditions.	NAD-08.14, GMP-127, HP-04.002, FPP-08-09
w	☐	☒	Temporary plant alterations - Check YES only if not associated with maintenance.	
x	☐	☒	Corrective/Compensatory Actions - Check YES only if degraded/non-conforming plant condition accepted "as-is" or compensatory action taken.	GNP-11.08.03

4. Conclusion. Check one of the following:

   ☐ All of the documents or processes listed above are checked NO. A 50.59 screening is NOT required. Process change in accordance with the applicable program/process/procedure.

   ☒ One or more of the documents or processes listed above are checked YES. A 50.59 screening shall be performed.
5. Comments:

   Requires USAR update to Table 8.2-1 and Figure 8.2-7, to become more restrictive. Calculation changes per licensing and design basis of diesel generators.
6. Print name followed by signature. Either the preparer or reviewer shall be 50.59 screening qualified. Attach completed form to document/activity/change package.

Prepared by: (print/sign) William A. Hennig / Will A. Hennig Date: 03/15/2007

Reviewed by: (print/sign) Eric Streich / E. Streich Date: 3-16-07

10CFR50.59 SCREENING

Document/Activity Number: C-042-001, Rev. 6, Addendum C **SCRN#** 07-029-00

PART I: **Describe the Proposed Activity and Search the KPS USAR**
(Refer to 50.59 Resource Manual Section 5.3.1)

I.1. Describe the proposed activity, and scope of the activity covered by this screening. Appropriate descriptive materials may be attached.

Calculation C-042-001, Rev. 6, Addendum C, is written to incorporate loading change corrections and evaluations performed that show the Emergency Diesel Generator loading to be in compliance with the limiting rating for the Diesel Generators as specified in Regulatory Guide 1.9, Rev. 2. That limiting rating will be the short-term rating, interpreted to be 2860kW for the KPS Emergency Diesel Generators.

Additionally, the sequential loading for the diesel generators has been reevaluated to show that it also is in compliance with the criteria specified by Regulatory Guide 1.9, Rev. 2.

I.2. Search the Updated Safety Analysis Report (USAR) including those documents incorporated by reference. Describe relevant function(s), performance requirements, and methods of evaluation of the affected SSCs, and where this information is described in the USAR. In general, any USAR information potentially affected by the activity should be identified (consider both support functions and indirect affects). It is acceptable to attach and highlight applicable portions of the USAR.

See Attachment A to SCRN 07-029-00 (3 pages).

I.3. Does the activity involve a change to the Technical Specifications?
(Changes to the Technical Specifications require a License Amendment request.)

☐ Yes ☒ No

10CFR50.59 SCREENING

SCRN# 07-029-00

PART II: **Determine if the Activity Involves a Design Function**
(Refer to NMC 50.59 Resource Manual Section 5.3.2)

Compare the proposed activity to the relevant portions of the USAR and answer the following questions:

	YES	NO	QUESTION
1.	☒	☐	Does the proposed activity involve Safety Analyses or an SSC(s) credited in the Safety Analyses?
2.	☒	☐	Does the proposed activity involve SSCs that support SSC(s) credited in the Safety Analyses?
3.	☒	☐	Does the proposed activity involve SSCs whose failure could initiate a transient (e.g., reactor trip, loss of feedwater, etc) or accident?
4.	☒	☐	Does the proposed activity involve SSCs whose failure could impact SSC(s) credited in the Safety Analyses?
5.	☒	☐	Does the proposed activity involve USAR-described SSCs or procedural controls that perform functions that are required by, or otherwise necessary to comply with, regulations, license conditions, orders, or Technical Specifications?
6.	☐	☒	Does the activity involve a method of evaluation described in the USAR?
7.	☐	☒	Is the activity a test or experiment? (i.e., a non-passive activity which gathers data)
8.	☐	☒	Does the activity exceed or potentially affect a design basis limit for a fission product barrier (DBLFPB)? If this question is answered **YES,** this activity requires a 10CFR50.59 Evaluation.

If the answer to all of these questions is **NO**, answer PART III as Not Applicable, and proceed to PART IV. A 10CFR50.59 evaluation is not required.

If any of the above questions are checked **YES**, identify the specific design function, method of evaluation, or DBLFPB involved:

Since this calculation is associated with the emergency diesel generators (EDG) and the safeguard loading (and associated safeguard components) of the EDGs, it involves SSCs credited in the Safety Analyses, that support SSC(s) credited in the Safety Analyses, whose failure could initiate a transient or accident, whose failure could impact SSC(s) credited in the Safety Analyses, and that perform functions that are required by, or otherwise necessary to comply with, regulations, license conditions, orders, or Technical Specifications. Therefore, the answers to questions 1-5 are answered YES.
This calculation does not involve a method of evaluation described in the USAR, is not a test or experiment, and does not exceed or potentially affect a design basis limit for a fission product barrier (DBLFPB). Thus, the answers to questions 6-8 are answered NO.

The specific design function as described in the calculation addendum is for the loading of the EDGs to not exceed the short-term rating of the diesels, which is being interpreted as 2860kW, under all accident loading conditions, which includes a concurrent Loss of Offsite Power (DF-1)

SCRN# 07-029-00

PART III: Determine Whether the Activity Involves Adverse Effects
(Refer to NMC 50.59 Resource Manual Section 5.3.3)

If all the questions in Part II were answered NO, then Part III is:

☐ **Not Applicable**

Answer the following questions to determine if the activity has an adverse effect on a design function. Any **YES** answer means that a 10CFR50.59 Evaluation is required, except where noted in Question III.3.

III.1. Changes to the Facility or Procedures

	YES	NO	QUESTION
a.	☐	☒	Does the activity adversely affect the design function(s) identified in Part II?
b.	☐	☒	Does the activity introduce an accident of a different type than previously described in the USAR? (see RM Section 6.2.5)
c.	☐	☒	Does the activity introduce new type of malfunction directly or indirectly affecting an SSC having a design function identified in Part II? (See definition in GNP-04.04.02, Section 3.0)
d.	☐	☒	Does the activity adversely affect the method of performing or controlling the design function(s) identified in Part II?

If any answer is **YES**, a 10CFR50.59 Evaluation is required. For each answer given, describe the basis for the conclusion (attach additional discussion, as necessary):

a. With the known loading change corrections and evaluations performed within the calculation addendum, the EDG loading will be maintained below the short-term rating of the diesels. This will ensure that the EDG loading will remain in compliance with Regulatory Guide (RG) 1.9, Rev. 2. Thus the calculation addendum will not adversely affect the design function identified in Part II.

b. EDG loading, in itself, is not an accident initiator. Since the EDG loading is actually being reduced it would not introduce an accident of a different type. Additionally, since the components loaded onto the EDGs remain the same, and are operated in the same manner, they would not introduce an accident of a different type.

c. With the analysis of reduced loading in the calculation addendum, the potential for EDG overload is reduced. Similarly, this analysis would not introduce a new type of malfunction directly or indirectly affecting an SSC having a design function identified in Part II. Those components that are loaded onto the EDGs could initiate a potential malfunction (e.g., AFW Pump inadvertent start, or two safeguards motors starting simultaneously during sequence), but those malfunctions are or have already been established and analyzed in the accident analysis. Thus, none of the associated components loaded onto the EDGs could introduce a new type of malfunction directly or indirectly affecting an SSC having a design function identified in Part II.

d. The analyzed loading on the EDGs is within the expected engineering analyses for establishing loading within the auxiliary electrical system, including the diesel generators. Established engineering standards have been applied to determine sequential and maximum loading, using analyzed component and system configurations under accident conditions. Therefore, the application of the analysis as applied in the calculation addendum does not adversely affect the method of performing or controlling the design function identified in Part II.

III.2. Changes to a Method of Evaluation

If the activity does not involve a method of evaluation, these questions are:

☒ **Not Applicable**

YES	NO	QUESTION
☐	☐	Does the activity use a revised or different method of evaluation for performing safety analyses than that described in the USAR?
☐	☐	Does the activity use a revised or different method of evaluation for evaluating SSCs credited in safety analyses than that described in the USAR?

If either answer is **YES**, a 10CFR50.59 Evaluation is required. For each answer given, describe the basis for the conclusion (attach additional discussion, as necessary):

III.3. Tests or Experiments

If the activity is not a test or experiment, the questions in III.3.a and III.3.b are:
☒ **Not Applicable**

a. Answer these two questions first:

YES	NO	QUESTION
☐	☐	Is the proposed test or experiment bounded by other tests or experiments that are described in the USAR?
☐	☐	Are the SSCs affected by the proposed test or experiment isolated from the facility?

If the answer to both questions is **NO**, continue to III.3.b. For each answer given, describe the basis for the conclusion (attach additional discussion, as necessary):

b. Answer these additional questions only for tests or experiments which do not meet the criteria given above. If the answer to either question in III.3.a is **YES**, then these three questions are:
☐ **Not Applicable**

YES	NO	QUESTION
☐	☐	Does the activity use or control an SSC in a manner that is outside the reference bounds of the design bases as described in the USAR?
☐	☐	Does the activity use or control an SSC in a manner that is inconsistent with the analyses or descriptions in the USAR?
☐	☐	Does the activity place the facility in a condition not previously evaluated or that could affect the capability of an SSC to perform its intended functions?

If any answer in III.3.b is **YES**, a 10CFR50.59 Evaluation is required. For each answer given, describe the basis for the conclusion (attach additional discussion, as necessary):

10CFR50.59 SCREENING

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PART IV: **Conclusion**
(Refer to NMC 50.59 Resource Manual Section 5.3.4)

Check all that apply:

1. A 10CFR50.59 Evaluation is

   ☐ required,

   OR

   ☒ **NOT** required

2. A change to the USAR and/or any document incorporated by reference is

   ☒ required (Process change in accordance with applicable plant program/process/procedure.),

   OR

   ☐ **NOT** required

Additional comments:

An update to USAR Table 8.2-1 and USAR Figure 8.2-7 will be required to reflect the more limiting diesel loading and sequence.

CAP42914 is tracking USAR change.

Print name followed by signature. The preparer and reviewer shall be 50.59 screening or evaluation qualified. The completed screening is part of the document/activity/change package. Provide a copy of 50.59 screening to the 50.59 Process Owner/Program Coordinator.

Prepared By: (print/sign) William A. Hennig / Will A Hy Date: 03/15/2007

Reviewed By: (print/sign) Eric Streich / Eric Streich Date: 3-16-07

USAR

1.2.8 ENGINEERED SAFETY FEATURES

The systems provided are summarized below:

g) Two quick-start diesel generators are provided to supply adequate power to the safeguards emergency buses for plant safety in the event of loss of station and off-site a-c power. Each generator is capable of supplying the power requirements of one complete set of engineered safety features.

1.3.7 ENGINEERED SAFETY FEATURES (GDC 37 - GDC 65)

The plant is supplied with normal, auxiliary, standby and emergency power sources as follows:

2) Two diesel generators are connected to the emergency buses to supply power in the event of loss of all other a-c auxiliary power. Each of the two diesel generators is capable of supplying automatically the engineered safety features load required for an acceptable post-blowdown containment pressure transient for any loss-of-coolant accident.

These functional tests provide information to confirm valve operating times, pump motor starting times, the proper automatic sequencing of load addition to the diesel generators, and delivery rates of injection water to the Reactor Coolant System.

1.5.6 EMERGENCY POWER

In addition to the multiple ties to off-site power sources, two diesel generators are provided as backup power supplies for the case of loss of all off-site power. Each generator is capable of operating sufficient safety injection and containment cooling equipment to limit the consequences of a post-accident pressure transient to acceptable levels.

8.2.3 EMERGENCY POWER

Sources Description

If all other power sources should fail, two diesel generators are provided, one connected to 4160-V Bus 1-5 and one connected to 4160-V Bus 1-6. Each of these is a General Motors Corporation, Electro-Motive Division, Model A-20-C1, diesel engine-generator unit rated at 2600-kW, (2860-kW, 110% Overload, two thousand hours per year) 0.8 pf, 900 rpm, 4160-V, 3 phase, 60 Hertz. The generator has emergency ratings of 2950-kW for seven days continuous and 3050-kW for thirty minutes per year.

Load Evaluation – Diesel Generators

Compliance to Regulatory Guide 1.9

2. Generating load ratings:

Continuous	3250 kVA	100.0%
Continuous	2600 kW at 0.8 P.F.	100.0%
Overload, 2000 hours per year	2860 kW at 0.8 P.F.	110.0%
Overload, 7 days per year	2950 kW at 0.8 P.F.	113.5%
Overload, 30 minutes per year	3050 kW at 0.8 P.F.	117.3%

3. Generator rating criteria:

Regulatory Guide 1.9, dated December 1979 states that:

"Conformance with the requirements of IEEE Std 387-1977, "IEEE Standard criteria for Diesel Generator Units applied as Standby Power Supplies for Nuclear Power Generating Stations", dated June 17, 1977 is acceptable for meeting the requirements of the principle design criteria and qualification testing of diesel generator units used as on-site electric power systems for nuclear power plants".

The IEEE Standard 387-1977 states that:

"5.2.3 Operation Application Rule (see 3.7.1 and 3.7.2). The diesel generator units may be utilized to the limit of their power capabilities as defined by the continuous and short time ratings".

"3.7.2 Short Time Rating - The electric power output capability that the diesel generator unit can maintain in the service environment for 2 h in any 24 h period, without exceeding the manufacturer's design limits and without reducing the maintenance interval established for the continuous rating".

NOTE: "Operation at this rating does not limit the use of the diesel generator unit at its continuous rating".

Table 8.2-1 lists the diesel-generator loads and the times that they will sequence on if required. The maximum connected loads are 3701.4 kW for DG 1A and 3518.0 kW for DG 1B. Table 8.2-1 also gives a time dependent load list, which shows that the highest estimated loads are 2919.8 and 2893.8 kW for each respective diesel generator, which occurs from one to sixty minute into the loading sequence. After adding safeguard station service transformer loss loads of 25.5 kW and 20.4 kW the maximum diesel generator loads are 2945.3 kW for DG 1A and 2914.2 kW for DG 1B. These loads are both less than the seven-day per year overload rating of 2950 kW for the diesel generators.

Operation of the safeguard diesel generators at frequencies other than 60 hertz, as allowed by the governor speed setting, have been shown by calculation to be within the various generator ratings.

The diesel generator ratings given in Item 2 above do not match the Short Time Rating definition of IEEE Std. 387-1977, as they were determined before 1977. We do, however, meet the intent of the Standard in that the diesel generators do not exceed the defined (by the manufacturer) load ratings. Therefore, the requirements of Regulatory Guide 1.9 are met.

4. Generator loading and sequence on safety injection signal is shown in Figure 8.2-7. The time sequence is after the closing of the diesel generator breaker. The maximum allowable time lapse for the load to come on was originally specified by Westinghouse and is used to support transient analysis. The normal time to pick up the load is the automatic timer setting. Table 8.2-1 lists the specific loads.

TABLE 8.2-1 Diesel Generator Load (Max.) for DBA

FIGURE 8.2-7 Generator Loading Sequence on Safety Injection Load Signal

TABLE 13.1-2 OBJECTIVES OF SYSTEM TEST PRIOR TO INITIAL REACTOR FUELING

SYSTEM TESTS	TEST OBJECTIVES
19. Emergency Power System	Demonstrated that the system was capable of providing power for operation of vital equipment under failure of normal power supply. In particular, the tests were designed to verify that: (b) Each diesel generator functioned according to the design specification under emergency conditions. (c) The diesel generators were capable of supplying the power to vital equipment as required under emergency conditions.

TECHNICAL SPECIFICATIONS

BASIS – Auxiliary Electrical Systems (TS 3.7)

Each diesel generator is connected to one 4160-V safety features bus and has sufficient capacity to start sequentially and operate the engineered safety features equipment supplied by that bus.

4.6 PERIODIC TESTING OF EMERGENCY POWER SYSTEM

The following tests and surveillance shall be performed:

a. Diesel Generators

2. Automatic start of each diesel generator, load shedding, and restoration to operation of particular vital equipment, all initiated by a simulated loss of all normal a-c station service power supplies together with a simulated safety injection signal. This test will be conducted at each REFUELING interval to

assure that each diesel generator will start and assume required loads to the extent possible within 1 minute, and operate for ≥ 5 minutes while loaded with the emergency loads.

BASIS – Periodic Testing of Emergency Power Systems (TS 4.6)

REFUELING Interval Diesel Generator Surveillance (TS 4.6.a.2)

The REFUELING interval diesel generator surveillance demonstrates that the Emergency Power System, and its control system, will function automatically to provide engineered safety equipment power in the event of loss of off-site power coincident with a safety injection signal. This test demonstrates proper tripping of motor feeder breakers, main supply and tie breakers on the affected bus, and sequential starting of essential equipment to demonstrate OPERABILITY of the diesel generators. This test is initiated by simultaneously unblocking safety injection and simulating a loss-of-voltage signal. This surveillance is performed to meet the intent of IEEE 387-1977 paragraph 6.6.2. (Note also that Reg. Guide 1.108 addresses diesel generator surveillance.)

ATTACHMENT 3

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING KEWAUNEE LICENSE AMENDMENT REQUEST 230

KPS OPERABILITY DETERMINATION (OD)-151, REVISION 1, DIESEL GENERATOR ROOM TEMPERATURE EVALUATION

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

Dominion®

Operability Determination Documentation

OP-AA-102 - Attachment 5

Condition Report Number	Revision Number	Initial Due Date	OD Number
CAP034030, CAP041345, CAP038847, CAP042219	1		151 Rev 1 (formerly OPR 151)

Discussion

A. SSC Affected by the Degraded or Non-conforming Condition
See Attachment 1

B. Extent of Condition
See Attachment 1

C. CLB Requirements or Commitments
See Attachment 1

D. SSC Specified Safety Function
See Attachment 1

E. Impact on SSC Ability to Perform Specified Safety Function
See Attachment 1

F. Operability Statement, including Basis for Determination
See Attachment 1

G. Required Compensatory Measures and How They result in an Accepted Condition
See Attachment 1

H. References (e.g., FSAR, TS, TS Bases), if applicable
See Attachment 1

OD Evaluation Extension

Approved By: Manager Nuclear Operations / Director Nuclear Station O & M	Date	Extension Due Date

Conclusions

The Affected TS SSC Is: [X] OPERABLE [ ] INOPERABLE [ ] N/A	Non-Tech Spec / SSC Functional? [ ] YES [ ] NO [X] N/A
Compensatory Measures Required? [X] YES [ ] NO	SSC Fully Qualified? [ ] YES [X] NO

Signatures

Prepared By: Paul DeTemple Paul D. Temple		Date 3/26/07
Independent Engineering/STA Review: (only if Compensatory measures required) Paul Snyder Paul Snyder		Date 3/26/07
Supervisor Review: Paul Snyder Paul Snyder		Date 3/26/07
Facility Safety Review Committee Chairperson: (only if Compensatory measures required) No change to comp. measures PES 3/26/07	Meeting No. N/A	Date N/A
Shift Manager Approval: Irbeck David Irbeck		Date 3-26-7 3-26

Key: OD-Operability Determination; SSC-Systems, Structures, and Components; FSAR-Final Safety Analysis Report; TS-Technical Specifications; O & M-Operations and Maintenance; CLB-Current Licensing Basis

Attachment 1 – OD 151 - Revision 1

A. SSC Affected by the Degraded or Non-conforming Condition

Emergency Diesel Generators 1A (134-031) and 1B (134-032)

B. Extent of Condition

This condition applies to both Emergency Diesel Generators (EDGs) due to the similar design of the combustion air intake system and the fact that both EDGs require the use of the short time engine ratings during the first hour of the Design Basis Accident (DBA). The condition does not apply to the Technical Support Center Diesel Generator because this DG is not loaded beyond its continuous rating in addition to the differences in the design of the combustion air intake system. This condition does not impact any other plant equipment.

C. CLB Requirements or Commitments

Each EDG is capable of supplying the power requirements of one complete set of engineered safety feature (ESF) equipment. These safety features can adequately cool the core for any loss-of-coolant (LOCA) incident, and maintain the containment pressure within the design value. Safeguard Diesel Generator loading varies in magnitude for the different design basis accidents. The single large break LOCA DBA assumed in the Updated Safety Analysis Report (USAR) Chapter 8 as the basis of calculation C-042-001 is bounding for the electrical load imposed by other design basis accidents, since it loads all large safeguards motors. USAR Table 8.2-1 provides a list of the EDG maximum loads for a design basis accident. Included in this table is the maximum EDG load (KW) as a function of time. Calculation C-042-001 revision 6 provides the basis for this table and Addendum C to C-042-001 provides an updated evaluation of the expected maximum loads on each of the EDGs. The condition described is not related to the ability of the EDGs to start. The condition is related to the ability of the EDGs to remain capable of carrying the required load for the required mission time. The following paragraphs identify the licensing basis functions and performance requirements.

USAR Chapter 8, section 8.1 (Reference 4) describes the design criteria of electrical emergency power systems as follows (excerpted from):

Emergency Power

Criterion: An emergency power source shall be provided and designed with adequate independency, redundancy, capacity, and testability to permit the functioning of the engineered safety features and protection systems required to avoid undue risk to the health and safety of the public. This power source shall provide this capacity assuming a failure of a single active component (GDC 39).

The above Criterion 39, as with others cited throughout this license application as a basis for design, is as suggested by AIF in its October 2, 1967 comments on the then-proposed AEC Criteria. As noted in Section 1.8 the design also meets Wisconsin Public Service Company's understanding of the intent of the Criteria as originally proposed by AEC in July, 1967. In the case of Criterion 39, where a difference existed, the more stringent AEC criterion was followed. As a result, in our opinion the emergency power systems as designed also meet the intent of the General Design Criterion 17 adopted February 20, 1971, as amended July 7, 1971, the text of which follows:

Criterion 17 - Electric Power Systems

An on-site electric power system and an off-site electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that:

1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences, and

2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

The on-site electric power supplies, including the batteries, and the on-site electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.

Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights-of-way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in sufficient time following a loss of all on-site alternating current power supplies and the other off-site electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. 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.

Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the on-site electric power supplies.

Independent alternate power systems are provided with adequate capacity and testability to supply the required engineered safety features and protection systems.

The plant is supplied with normal, standby and emergency power sources as follows:

a. The main source of auxiliary power during plant operation is the plant's generator. Power is supplied via the Main Auxiliary Transformer, which is connected to the main leads of the generator.

b. Standby power required during startup, shutdown and after reactor trip is supplied from the American Transmission Company's 138-kV and 345-kV transmission systems. The Reserve Auxiliary and Tertiary Auxiliary Transformers can both be powered from either transmission system through the interconnecting auto transformer.

c. Two diesel generators are connected to the engineered safety features buses to supply emergency shutdown power in the event of loss of all other a-c auxiliary power.

d. Emergency power for vital instruments and for control is supplied from two safeguard 125-V d-c station batteries and two non-safeguard 125-V d-c station batteries. Emergency power for selected turbine and generator backup pumps is supplied from a non-safeguard 250-V d-c station battery.

The diesel generators are located in the Class I section of the Administration Building and are connected to separate 4160-V auxiliary system buses. Each diesel generator will be started automatically on a safety injection signal or upon the occurrence of undervoltage on either of its corresponding 4160-V auxiliary buses. Each diesel generator has adequate capacity to supply one set of the engineered safety features for the Design Basis Accident.

Design and Safety Functions

USAR Chapter 1, section 1.2.7 Electrical Systems, describes the EDGs as follows (excerpted from):

Emergency power, supplied by alternate sources including two diesel generators, is capable of operating post-accident containment cooling equipment as well as both high head and low head safety injection pumps to ensure an acceptable post loss-of-coolant containment pressure transient.

USAR Section 1.2.8 Engineered Safety Features discusses the EDG capability (excerpted from):

Two quick-start diesel generators are provided to supply adequate power to the safeguards emergency buses for plant safety in the event of loss of station and off-

site a-c power. Each generator is capable of supplying the power requirements of one complete set of engineered safety features

USAR Section 1.5.6 Emergency Power states (excerpted from):

In addition to the multiple ties to off-site power sources, two diesel generators are provided as backup power supplies for the case of loss of all off-site power. Each generator is capable of operating sufficient safety injection and containment cooling equipment to limit the consequences of a post-accident pressure transient to acceptable levels.

USAR Chapter 8, section 8.2 describes the diesel generators as follows (excerpted from):

If all other power sources should fail, two diesel generators are provided, one connected to 4160-V Bus 1-5 and one connected to 4160-V Bus 1-6. Each of these is a General Motors Corporation, Electro-Motive Division, Model A-20-C1, diesel engine-generator unit rated at 2600-kW, (2860-kW, 110% Overload, two thousand hours per year) 0.8 pf, 900 rpm, 4160-V, 3 phase, 60 Hertz. The generator has emergency ratings of 2950-kW for seven days continuous and 3050-kW for thirty minutes per year.

Each diesel generator is sized to start and carry the engineered safety features required for a post-blowdown containment pressure transient.

Selected generator nameplate data is as follows:

- Electro-Motive Division of General Motors Corporation
- Model A-20-C1, Serial Nos. 70-J1-1029 and 1039
- 2400/4160-V, 60 Hertz, Amps 782/452, 3 phase
- 3250-kVA, Temperature rise 85°C Stator-Thermometer
- Temperature rise 60°C, Rotor-Resistance
- 900 RPM, Power Factor 0.8
- 3575-kVA Peak, 2000 hours per year
- Temperature rise 105°C, Stator-Thermometer
- Temperature rise 70°C, Rotor-Resistance.
- Insulation Class, H-Stator and F-Rotor

Additional operating characteristics of the generator follow:

Capable of being started and ready to accept load in ten seconds and capable of being fully loaded within twenty seconds.

Capable of operating continuously at rated kVA output at any power factor between rated lagging and unity, at any voltage within ±5% of rated voltage.

Capable of tolerating for thirty seconds without injury a three-phase short circuit at its terminals when operating at rated kVA and power factor, 5% overvoltage and fixed excitation.

Compliance to Regulatory Guide 1.9

1. Sizing of generator power requirements.

   Motors - All motors are the standard rating above the normal load. The service factor is added to the motor to cover fan and pump run-out. Checks have been made to assure the run-out is within the service factor. Motor power requirements were calculated as follows:

   100 hp and larger, at 93% efficiency from manufacturers certified test data and handbooks. Less than 100 hp, at 88% efficiency from handbook data.

   Brake hp was used for larger motors where certified test data was available.

   KVA - Loads for transformers, etc., were calculated at 80% power factor.

   Heater- Loads were taken at rated kW.

2. Generating load ratings:

Continuous	3250 kVA	100.0%
Continuous	2600 kW at 0.8 P.F.	100.0%
Overload, 2000 hours per year	2860 kW at 0.8 P.F.	110.0%
Overload, 7 days per year	2950 kW at 0.8 P.F.	113.5%
Overload, 30 minutes per year	3050 kW at 0.8 P.F.	117.3%

3. Generator rating criteria:

   Regulatory Guide 1.9, dated December 1979 states that:

   "Conformance with the requirements of IEEE Std 387-1977, "IEEE Standard criteria for Diesel Generator Units applied as Standby Power Supplies for Nuclear Power Generating Stations", dated June 17, 1977 is acceptable for meeting the requirements of the principle design criteria and qualification testing of diesel generator units used as on-site electric power systems for nuclear power plants".

The IEEE Standard 387-1977 states that:

"5.2.3 Operation Application Rule (see 3.7.1 and 3.7.2). The diesel generator units may be utilized to the limit of their power capabilities as defined by the continuous and short time ratings".

"3.7.1 Continuous Rating - The electric power output capability that the diesel generator unit can maintain in the service environment for 8760 h of operation per (common) year with only scheduled outages for maintenance".

"3.7.2 Short Time Rating - The electric power output capability that the diesel generator unit can maintain in the service environment for 2 h in any 24 h period, without exceeding the manufacturer's design limits and without reducing the maintenance interval established for the continuous rating".

NOTE: "Operation at this rating does not limit the use of the diesel generator unit at its continuous rating".

Table 8.2-1 lists the diesel-generator loads and the times that they will sequence on if required. The maximum connected loads are 3701.4 kW for DG 1A and 3518.0 kW for DG 1B. Table 8.2-1 also gives a time dependent load list, which shows that the highest estimated loads are 2919.8 and 2893.8 kW for each respective diesel generator, which occurs from one to sixty minute into the loading sequence. After adding safeguard station service transformer loss loads of 25.5 kW and 20.4 kW the maximum diesel generator loads are 2945.3 kW for DG 1A and 2914.2 kW for DG 1B. These loads are both less than the seven-day per year overload rating of 2950 kW for the diesel generators.

Operation of the safeguard diesel generators at frequencies other than 60 hertz, as allowed by the governor speed setting, have been shown by calculation to be within the various generator ratings.

The diesel generator ratings given in Item 2 above do not match the Short Time Rating definition of IEEE Std. 387-1977, as they were determined before 1977. We do, however, meet the intent of the Standard in that the diesel generators do not exceed the defined (by the manufacturer) load ratings. Therefore, the requirements of Regulatory Guide 1.9 are met.

4. Generator loading and sequence on safety injection signal is shown in Figure 8.2-7. The time sequence is after the closing of the diesel generator breaker. The maximum allowable time lapse for the load to come on was originally specified by Westinghouse and is used to support transient analysis. The normal time to pick up the load is the automatic timer setting. Table 8.2-1 lists the specific loads.

The criteria used in determining the a-c loads assigned to the emergency buses were:

a. Those loads, which are essential to safety-related functions and which if the power source failed, could affect public health and safety.

b. Those loads which if the power source failed would cause severe economic loss or cause the plant to experience an extended outage.

Each diesel generator, as a backup to the normal standby a-c power supply, is capable of sequentially starting and supplying the power requirements of one complete set of engineered safety features equipment. These safety features can adequately cool the core for any loss-of-coolant incident, and maintain the containment pressure within the design value. The generator is capable of being started and ready to accept load in ten seconds. On loss of voltage of a safety features equipment bus, and provided no other source of power is available to the bus, the diesel generator is automatically started and connected to the bus.

Once started, the diesel continues to run even though voltage may be restored from an off-site source of power. Manual shutdown of the diesels by the Control Room operator is always required (except for engine protection shutdowns).

Service water for the Diesel Engine Cooling Water Heat Exchanger is supplied from separate service water headers for Diesel Generator 1A and 1B. The Cooling Water Heat Exchanger is an engine mounted water-to-water heat exchanger providing cooling for the engine jacket water and for the engine oil heat exchanger. Vent fans for each room provide a supply of combustion air into the Diesel Room. Separate startup air receivers and compressors are located just external to the rooms. Primary and reserve tanks of the air receivers supply compressed air to the dual Air Start System, the DG cooling water isolation valve actuators, and the Diesel Room Ventilation and combustion air dampers.

Buses 1-5 and 1-6 are connected via bus main breakers to the Main Auxiliary, Reserve Auxiliary, and Tertiary Auxiliary Transformers. In addition, each bus is directly fed via a main breaker by a diesel generator.

The bus tie breakers between Bus 1-5 and Bus 1-6 can only be manually closed, but are interlocked so that the diesel generators cannot be operated in parallel.

MCC 1-5262 may be fed from either 480-V switchgear bus 1-52 or 480-V switchgear bus 1-62 through breakers 15209 or 16209 respectively, via a manually operated transfer switch. 480-V switchgear bus 1-52 may ultimately be fed from on-site power source Diesel Generator 1A and 480-V switchgear bus 1-62 may ultimately be fed from on-site power source Diesel Generator 1B.

The only potential for an explosion in the diesel generator rooms exists within a diesel engine crankcase. The rooms have sufficient volume and are vented to preclude a pressure rise that would endanger the integrity of the room walls.

Surveillance Requirements

The monthly tests specified for the diesel generators will demonstrate their continued capability to start and carry rated load. The fuel supplies and starting circuits and controls are continuously monitored, and abnormal conditions in these systems would be indicated by an alarm without need for test startup (Reference 2).

The less frequent overall system test demonstrates that the emergency power system and the control system for the engineered safety features equipment function automatically in the event of loss of all other sources of a-c power, and that the diesel generators start automatically in the event of a loss-of-coolant accident. This test demonstrates proper tripping of motor feeder breakers, main supply and tie breakers on the affected bus, and sequential starting of essential equipment, to the extent possible, as well as the operability of the diesel generators.

The specified test frequencies provide reasonable assurance that any mechanical or electrical deficiency is detected and corrected before it can result in failure of one emergency power supply to respond when called upon to function.

EDG Reliability Program

The EDG reliability program, including the TSC diesel generator, meets the intent and guidance provided in RG 1.155, Section 1.2.

USAR Chapter 10

This section discusses the combustion air and its protection from HELB events in the Turbine Building. Intake for combustion and cooling air for the Diesel Generators is obtained from outside the Turbine Building.

Event Mitigation

Chapter 14 of the USAR describes those events where the EDGs are credited with a mitigating function.

USAR Section 14.1 The following accidents in section 14.1 were analyzed assuming offsite power was unavailable and the diesels are the source of power to safeguards equipment. In all events the function of the diesel is the same, supply power to emergency loads:

- Loss of Normal Feedwater section 14.1.10
- Anticipated Transients without Scram section 14.1.11

- Loss of AC Power to Plant Auxiliaries Section 14.1.12

USAR section 14.2 The following events were analyzed assuming offsite power was unavailable and the diesels are the source of power to safeguards equipment. In all events the function of the diesel is the same, supply power to emergency loads.

- Steam Generator Tube Rupture, section 14.2.4
- Main Steam Line Break, section 14.2.5

USAR Section 14.3 Reactor Coolant System Pipe Ruptures (Loss of Coolant Accident) was also analyzed assuming offsite power was unavailable and the diesels are the source of power to safeguards equipment. In all scenarios the function of the diesel is the same, supply power to emergency loads. In addition this section explicitly discusses the loss of a single diesel train and the impact on the accident.

Other Licensing Functions

Appendix R (Reference 5) The 1A EDG is the credited dedicated shutdown power source for Appendix R events. The 1B EDG is the credited alternate shutdown power source for Appendix R events. The function of the diesels is to supply power to respective dedicated or alternate components necessary to mitigate the events discussed in Appendix R.

Technical Specifications (Reference 6)

3.7 AUXILIARY ELECTRICAL SYSTEMS

Section 3.7.a.7 states that the reactor shall not be made critical unless "both diesel generators are OPERABLE. The two underground storage tanks combine to supply at least 35,000 gallons of fuel oil for either diesel generator and the day tanks for each diesel generator contain at least 1,000 gallons of fuel oil."
Section 3.7.b.2 states that during power operation or recovery from inadvertent trip, "One diesel generator may be inoperable for a period not exceeding 7 days provided the other diesel generator is tested daily to ensure OPERABILITY and the engineered safety features associated with this diesel generator are OPERABLE." If OPERABILITY is not restored within the time specified, then within 1 hour action shall be initiated to achieve HOT STANDBY within the next 6 hours.

Section 3.7.c states that when its normal or emergency power source is inoperable, a system, train or component may be considered OPERABLE for the purpose of satisfying the requirements of its applicable LIMITING CONDITION FOR OPERATION, provided:

1. Its corresponding normal or emergency power source is OPERABLE; and

2. Its redundant system, train, or component is OPERABLE.

4.6 PERIODIC TESTING OF EMERGENCY POWER SYSTEM

The following tests and surveillance shall be performed:

a. Diesel Generators

1. Manually-initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly, loading the diesel generator to at least 2600 KW (nominal) for a period of at least 1 hour.

2. Automatic start of each diesel generator, load shedding, and restoration to operation of particular vital equipment, all initiated by a simulated loss of all normal a-c station service power supplies together with a simulated safety injection signal. This test will be conducted at each REFUELING interval to assure that each diesel generator will start and assume required loads to the extent possible within 1 minute, and operate for ≥ 5 minutes while loaded with the emergency loads.

3. Each diesel generator shall be inspected at each major REFUELING outage.

4. Diesel generator load rejection test in accordance with IEEE 387-1977, Section 6.4.5, shall be performed at least once per 18 months.

5. Each diesel generator shall be loaded to 2950 KW (nominal) for 2 hours every operating cycle.

6. Safeguard bus undervoltage and safeguard bus second level undervoltage relays shall be calibrated at least once per operating cycle.

D. SSC Specified Safety Function

USAR functions:

Emergency power, supplied by alternate sources including two diesel generators, is capable of operating post-accident containment cooling equipment as well as both high head and low head safety injection pumps to ensure an acceptable post loss-of-coolant containment pressure transient **(USAR Chapter 1, section 1.2.7, Electrical Systems).**

Two quick-start diesel generators are provided to supply adequate power to the safeguards emergency buses for plant safety in the event of loss of station and off-site a-c power. Each generator is capable of supplying the power requirements of one complete set of engineered safety features **(USAR Section 1.2.8, Engineered Safety Features).**

The two diesel generators are provided as backup power supplies for the case of loss of all off-site power. Each generator is capable of operating sufficient safety injection and containment cooling equipment to limit the consequences of a post-accident pressure transient to acceptable levels **(USAR Section 1.5.6, Emergency Power)**.

Table 8.2-1 of the USAR lists the diesel-generator loads and the times that they will sequence on if required. The maximum connected loads are 3701.4 kW for DG 1A and 3518.0 kW for DG 1B. Table 8.2-1 also gives a time dependent load list, which shows that the highest estimated loads are 2919.8 and 2893.8 kW for each respective diesel generator, which occurs from one to sixty minute into the loading sequence. After adding safeguard station service transformer loss loads of 25.5 kW and 20.4 kW the maximum diesel generator loads are 2945.3 kW for DG 1A and 2914.2 kW for DG 1B. These loads are both less than the seven-day per year overload rating of 2950 kW for the diesel generators.

Chapter 14 of the USAR describes how the EDGs are credited with a mitigating function if offsite power was unavailable and the diesels are the source of power to safeguards equipment.

Technical Specification functions:

Section 3.7.a.7 states that the reactor shall not be made critical unless "both diesel generators are OPERABLE. The two underground storage tanks combine to supply at least 35,000 gallons of fuel oil for either diesel generator and the day tanks for each diesel generator contain at least 1,000 gallons of fuel oil."

Section 3.7.b.2 states that during power operation or recovery from inadvertent trip, "One diesel generator may be inoperable for a period not exceeding 7 days provided the other diesel generator is tested daily to ensure OPERABILITY and the engineered safety features associated with this diesel generator are OPERABLE." If OPERABILITY is not restored within the time specified, then within 1 hour action shall be initiated to achieve HOT STANDBY within the next 6 hours.

Section 3.7.c states that when its normal or emergency power source is inoperable, a system, train or component may be considered OPERABLE for the purpose of satisfying the requirements of its applicable LIMITING CONDITION FOR OPERATION, provided:

1. Its corresponding normal or emergency power source is OPERABLE; and

2. Its redundant system, train, or component is OPERABLE.

The following tests and surveillance shall be performed per Section 4.6, PERIODIC TESTING OF EMERGENCY POWER SYSTEM:

a.1. Manually-initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly, loading the diesel generator to at least 2600 KW (nominal) for a period of at least 1 hour.

a.2. Automatic start of each diesel generator, load shedding, and restoration to operation of particular vital equipment, all initiated by a simulated loss of all normal a-c station service power supplies together with a simulated safety injection signal. This test will be conducted at each REFUELING interval to assure that each diesel generator will start and assume required loads to the extent possible within 1 minute, and operate for ≥ 5 minutes while loaded with the emergency loads.

a.3. Each diesel generator shall be inspected at each major REFUELING outage.

a.4. Diesel generator load rejection test in accordance with IEEE 387-1977, Section 6.4.5, shall be performed at least once per 18 months.

a.5. Each diesel generator shall be loaded to 2950 KW (nominal) for 2 hours every operating cycle.

E. Impact on SSC Ability to Perform Specified Safety Function

The ability of the EDGs to perform their Specified Safety Functions will not be impacted by the condition identified in CAP 34030 provided the outside air temperature does not exceed 79.2°F for the 1A EDG and 82.4°F for the 1B EDG. In the event that the outside air temperature exceeds these limits, the EDGs may be required to operate outside of the vendor recommended ratings due to elevated combustion intake air temperatures. This may result in accelerated wear of internal engine components, which may ultimately jeopardize the EDGs ability to complete its required mission time.

A review of EDG design basis accident loading has determined that predicted loads are less than those stated in Chapter 8 of the USAR. Attachment 3 provides a summary of the revised loads based on Addendum C to revision 6 of calculation C-042-001. The calculation is approved but not yet issued since the Spent fuel Pool Safety Injection Inhibit modification (DCR 3668) is not yet installed. Addendum C has been included as Attachment 5 to this Operability Determination. The DBA load on the EDGs was determined by adding the SFP motor load to the results of Addendum C to calculation C-042-001 in Attachment 3. From Attachment 3 it can be seen that the loading for the EDGs during the DBA is predicted to remain below 2950 kW however Technical Specification Surveillance 4.6.a.5 requires both EDGs to be loaded to 2950 kW for 2-hours every operating cycle. This test is typically performed during refueling outages,

which normally occur during the Spring or Fall. However the EDGs must have the capability to meet the surveillance test criteria on any day of the year under all environmental conditions in order to remain fully operable in accordance with TS 4.0.a. TS 4.0.a states in part, "Failure to meet a surveillance requirement, whether such failure is experienced during performance of the surveillance or between performances of surveillances, shall be failure to meet OPERABILITY requirements for the LCO."

The 7-day load rating for the EDGs is 2950 kW. Based on reference 3, the EDGs have load ratings above 2950 kW including a 200-hour per year rating of 2973 kW, a 4-hour per year rating of 3009 kW and a 30-minute per year rating of 3050 kW. Although all of these ratings allow operation above 2950 kW, these ratings are based on 90°F combustion air temperature. Since the design of the KPS EDG combustion air system results in an increase of air temperature from outside to the EDG combustion air inlet, it is possible for the vendor limits for combustion air temperature to be exceeded if the EDG were loaded to 2950 kW on a warm day.

This evaluation addresses the impact of outside air temperature (and corresponding inlet combustion intake air temperature) on the performance of each diesel generator under current calculated load conditions as well as TS 4.6.a.5 surveillance test conditions. The concern regarding air temperatures does not impact the ability of the diesel engines to start and assume load nor is there a concern regarding immediate catastrophic failure of the EDGs.

Documentation from the EDG vendor (Engine Systems Incorporated) indicates that operating outside of the ratings specified on the de-rating curves will subject the diesel generator to stresses beyond its design capability. The vendor did not anticipate that the additional stresses would cause immediate catastrophic failure, but did say that exceeding the ratings will result in accelerated wear of internal engine components and could ultimately result in the inability of the EDG to complete its mission time. Components such as cylinder liners, piston rings, bearings and other moving components will generally have a limited expected life. Exceeding this life may result in loss of component function followed by inability of the engine to provide power to turn the generator. Operating under the overload conditions along with elevated combustion air temperatures will further accelerate the wear of internal components and must be offset by either reducing the load placed on the generator or reducing the duration of the overload condition.

The vendor discussed the following example regarding the impact of operating the EDG under elevated loads: If the EDG was loaded to its maximum rating of 3050 kW at combustion air temperature of 90°F for 2 hours (4 times the duration recommended) this would be equivalent to operating the EDG continuously for 4 years at the continuous rating and would likely result in end of life of internal components and failure of the EDG.

Operating under overload conditions due to accident load and surveillance testing requirements is acceptable provided the duration of the loading and the maximum combustion air temperatures are not exceeded. As discussed in CAP 34030, this issue was identified while preparing a revision to calculation C-10044 regarding Diesel Generator Room Temperatures while the EDGs are in operation. A subtask for preparing the revision was to collect EDG room and combustion air temperatures while the EDG was loaded to 2600 kW. The results of the data collection indicated that the difference in temperature between the outside air at the EDG air intake structure and the combustion air at the air filter assembly was 15°-16° F for EDG 1A and 12°-13° for EDG 1B.

Attachment 2 provides further basis for the limiting temperatures that will ensure the EDGs remain within the vendor ratings for accident loading and surveillance testing. The calculation performed in Attachment 2 derived an estimated equilibrium outside air temperature based upon a fixed combustion air temperature that was assumed to be equal to the bulk air temperature within the EDG room. Attachment 2 calculated the maximum outside air temperature for the 1A EDG to be 79.2°F and 82.4°F for the 1B EDG when loaded to 2950 kW.

F. Operability Statement, including Basis for Determination

1A Emergency Diesel Generator

The 1A EDG is considered Operable but non-conforming since the current outside temperature is less than 79.2°F, however per Attachment 2, at outside air temperatures above 79.2°F, the manufacturer ratings for the 1A EDG will require de-rating. This de-rating would result in declaring the 1A EDG Inoperable because it could no longer be proven that the 1A EDG could carry the TS 4.6.a.5 load of 2950 kW without exceeding the vendor ratings. Revision 2 of OPR 151 achieved load reduction on bus 5 by turning off the 1C instrument air compressor to allow a higher outside ambient temperature for Operability of the 1A EDG. To provide further margin in loading during a DBA the 1C instrument air compressor will remain in the OFF position unless needed by Operations for testing or in the event of a failure of the normally in service air compressors. This has been accounted for in Addendum C to calculation C-042-001.

In the event that Operations needs to use the 1C instrument air compressor, the loading on bus 5 will revert to the values specified in Attachment 3. Since these values are less than the 2950 kW in which the Operability restriction is based upon, operating the 1C instrument air compressor will have no effect on the temperature restriction of 79.2°F.

Based on the Technical Specification Surveillance 4.6.a.5 load of 2950 kW, the 1A EDG shall be declared Inoperable when outside air temperatures exceed 78.2°F. The temperature restriction for OPERABILITY of the 1A EDG is 1.0°F lower than that calculated in Attachment 2 of OD-151 (Rev. 1) to allow for tolerance of the meter, which is +/- 1.0°F. The 1A EDG shall be considered operable but non-conforming below the

outside temperature limitations since the 1A EDG may not perform as expected in all probable environmental conditions.

1B Emergency Diesel Generator

The 1B EDG is considered Operable but non-conforming since the current outside temperature is less than 82.4°F, however per Attachment 2, at outside air temperatures above 82.4°F, the manufacturer ratings for the 1B EDG will be exceeded without further de-rating. Further de-rating would result in declaring the 1B EDG Inoperable because it could no longer be proven that the 1B EDG could carry the TS 4.6.a.5 load of 2950 kW without exceeding the vendor ratings.

Based on the Technical Specification Surveillance 4.6.a.5 load of 2950 kW, the 1B EDG shall be declared Inoperable when outside air temperatures exceed 81.4°F. The temperature restriction for OPERABILITY of the 1B EDG is 1.0°F lower than that calculated in Attachment 2 of OD-151 (Rev. 1) to allow for tolerance of the meter, which is +/- 1.0°F. The 1B EDG shall be considered operable but non-conforming below the outside temperature limitations since the 1B EDG may not perform as expected in all probable environmental conditions.

G. Required Compensatory Measures and How They result in an Accepted Condition

Operability of the EDGs will be restricted to outside air temperatures below 78.2°F for the 1A EDG and 81.4°F for the 1B EDG.

The temperature restriction for OPERABILITY of the EDGs is 1.0°F lower than that calculated in Attachment 2 of OD-151 (Rev. 1) to allow for tolerance of the meter, which is +/- 1.0°F.

In support of meeting the temperature limit for the EDGs, the following supplemental actions are being taken.

Establish PPCS alarm for Primary and Back-up MET tower 10-meter platform at 70°F. If temperature exceeds 70°F, perform measurement of temperature at the 1A EDG intake structure using a hand-held calibrated Fluke thermometer. This meter should be stored in the control room. Monitoring of temperature will be performed on the North side of the 1A EDG intake structure at a distance of 8 to 10 inches below the bottom of the missile shield and 8 to 10 inches to the outside of the missile shield.

If MET tower 10-meter temperature exceeds 70°F, establish hourly monitoring at the 1A EDG intake structure using a hand held calibrated Fluke thermometer. Continue hourly monitoring at the 1A EDG intake structure until the temperature decreases to below 70°F or temperature reaches 75°F. If the temperature at the 1A EDG intake structure is greater

than or equal to 75°F then increase 1A EDG intake structure monitoring to every half-hour. Continue half-hour monitoring at the 1A EDG intake structure until the temperature decreases to below 75°F or temperature reaches 78.2°F. If the temperature at the 1A EDG intake structure is greater than or equal to 78.2°F then the 1A EDG shall be declared INOPERABLE. (See table below)

Continue half-hour monitoring at the 1A EDG intake structure until the temperature decreases to below 75°F or temperature reaches 81.4°F. If the temperature at the 1A EDG intake structure is greater than or equal to 81.4°F then the 1B EDG shall be declared INOPERABLE. (See table below)

During a design basis event, outside air temperature monitoring will be suspended.

Parameter	Required Action (all local monitoring to be performed at the 1A EDG intake structure at a distance of within 1 foot of the bottom of the missile shield.)
≤ 70°F at MET	Routine Monitoring by PPCS Alarm
> 70°F at MET	Establish Local Monitoring using Fluke - Hourly
≤ 70°F at the 1A EDG intake structure	Return to Routine Monitoring by PPCS Alarm
≥ 75°F at the 1A EDG intake structure	Increase Frequency of Local Monitoring using Fluke to Every Half-Hour
< 75°F at the 1A EDG intake structure	Return to Local Monitoring using Fluke - Hourly
≥ 78.2°F at the 1A EDG intake structure	Declare 1A EDG Inoperable
≥ 81.4°F at the 1A EDG intake structure	Declare 1B EDG Inoperable

H. References (e.g., USAR, TS, TS Bases), if applicable

1. Letter From: David A. Strickland (MKW Power Systems) To: Mike Anthony (Duke Engineering Services) Dated 6/11/1992. EMD 645E4 Diesel Engine Ratings at Elevated Temperatures.
2. E-mail From: Robin L. Weeks (Engine Systems Inc) To: Paul G. DeTemple (Kewaunee Power Station) Dated 5/18/2006. Kewaunee EDG loading
3. Letter From: Robin L. Weeks (Engine Systems Inc) To: Paul G. DeTemple (Kewaunee Power Station) Dated 5/19/2006. 20-645E-4 Engine Ratings with EMD A20 Generator.
4. KPS USAR, Rev. 19, 06/01/2005.
5. KNPP Appendix R Design Description, Rev. 5, March 2005.
6. KPS Technical Specifications.

1.0 PURPOSE

1.1 CAP034030 identifies a problem that could result in derating the KPS Emergency Diesel Generators (EDGs) when combustion air temperatures are expected to exceed the limits established by the equipment manufacturer, based on performance data for the EMD 645E4 Diesel supplied by MKW Power Systems (Ref. 5.1), and correspondence from Engine Systems, Inc. (Ref. 5.2).

1.2 Following a design basis accident, the Emergency Diesel Generators (EDGs) are required to carry short time loads in excess of their continuous rating (2600 KW). To support EDG operability under these conditions, combustion air temperatures may not exceed limits set by the manufacturer. CAP038847 identifies another problem associated with Revision 2 of this Attachment to OPR-151. Technical Specification Surveillance Requirement 4.6.a.5 requires the EDGs to be load tested at 2950KW for two hours every operating cycle. At this load the maximum allowable combustion air temperature is 97°F (Refs. 5.1, 5.2). The outdoor air temperature limits corresponding to EDG operation under this condition must be determined. Since the output load of 2950 KW exceeds the maximum calculated design basis accident load, it will be considered the bounding condition for EDG operability (Ref. Attachment 3).

2.0 BACKGROUND

2.1 The ventilation system for the EDG Rooms consists of two normal fans and two QA Type 1 supply fans. The airflow path is controlled by multi-position dampers that mix indoor air with outdoor air, or isolate the indoor air to draw 100% outdoor air. Each EDG supply fan is rated at 60,000 CFM. This evaluation will use a vent fan flow rate of 50,000 CFM to account for uncertainty and degradation (see 2.2, below). This is conservative when used to determine maximum outdoor air temperature for a given heat load because the manufacturer's fan curve indicates that these flow rates are approximately 60,000 CFM when the fans blades are set at number 5, and total system pressure is 1.5" wg (Ref. 5.4, and 2.3, below). To determine room heat loads under the test conditions, the normal vent fan flow will be added to the Vent Supply Fan flow, because they were operating at the times of the tests.

2.2 Implementation of DCR 1193 changed the exhaust airflow path configuration of the EDG 1B Vent Supply Fan. The impact of this modification with respect to fan performance was not quantified at completion since no post-modification testing was performed. This

change may explain the difference in the heat loads for the two EDG rooms (Ref. CAP041614).

2.3 CAP041288 and WOs 07-1291 / 07-1292 were issued in response to a question raised during the NRC Component Design Basis Inspection (CDBI) of February 2007. The NRC Inspector requested verification that the EDG Vent Supply Fan adjustable blades were set at position number 5, as stated in correspondence from the manufacturer (Ref. 5.4). It has been verified that the EDG 1B Vent Supply Fan blades are set at position number 5. (Ref. 5.7).

3.0 INPUTS AND ASSUMPTIONS

3.1 Inputs

3.1.1 Test data taken on August 18, 2005 will be used to determine acceptable combustion air temperatures for the specified EDG 1A loadings. Because the normal vent fan was in operation during the test, its flow will be added to that of the main vent fan. The average of the temperatures taken across the combustion air intake filters will be used because the turbo-charger thoroughly mixes the intake before discharging it to the combustion chambers.

3.1.2 Test data taken on July 28, 2005 will be used to determine acceptable combustion air temperatures for the specified EDG 1B loadings. Because the normal vent fan was in operation during the test, its flow will be added to that of the main vent fan. The average of the temperatures taken across the combustion air intake filters will be used because the turbo-charger thoroughly mixes the intake before discharging it to the combustion chambers.

3.2 Assumptions

3.2.1 It is assumed that airflow across each EDG combustion air intake filter during the tests was evenly proportional to each filter chamber.

3.2.2 It is assumed that the EDG cooling water heat exchangers and exhaust systems have sufficient margin to perform their design basis functions when the EDGs are operating at the 2950 KW output for a two hour period. This assumption is justified by a review of Operator Logs of engine water temperatures for both EDGs between December of 2001 and the present, when the diesels were operating under a range of output loads from 2600KW to 2950KW. Engine water temperatures recorded at instruments

55003 (1A EDG) and 55109 (1B EDG) averaged well below 180°F with an acceptance range of between 160°F and 190 °F. The engine water temperatures also remained below the manufacturer's threshold of less than or equal to 190°F where further derating of the EDG is required based on reference 5.1. A review of the exhaust temperatures recorded in Operators Logs while the EDGs were operating from 2600KW to 2950KW also confirms that that these values have consistently remained well below the 1200°F range of acceptability.

4.0 METHODOLOGY AND ACCEPTANCE CRITERIA

4.1 Methodology

4.1.1 The following industry standard formula will be solved for outdoor air temperatures when room/combustion air temperatures in conjunction with the EDG output loading conditions are as described in 1.2, above. The baseline heat load, Q, for each EDG room will be determined from actual test data taken in the summer of 2005 (Ref. 5.6). In each case, Q will be adjusted for the additional heat gain from the EDG operating at the specified output. (Ref. 5.3):

$CFM = Q \div [C_p * P * \Delta T * 60]$
Where:
CFM = 51,380 cubic feet/minute (Normal and Vent Supply Fans)
Q = heat load in Btu/hr
C_p = specific heat/ dry air = 0.24 Btu/lb/°F
P = density lb/ft^3 (0.075 @ 70°F, Ref. 5.5)
ΔT = Temp @ EDG filters – outdoor air temp

4.1.2 Standard air at 70°F has a density of 0.075 lb/ft^3 at sea level. The correction factor 0.95 for air at 100°F and at 1000 ft above sea level results in a density of 0.071 lb/ft^3. Since the standard air density will yield more conservative results, the correction factor will be disregarded (Ref. 5.5).

4.1.3 A conservative estimate of heat rejection from EDG 1A when operating at the loads described in 1.2, above, will be based on the total room heat loads from actual test data taken on August 18, 2005 (Ref. 5.6). During the test, the EDG was loaded at 2600KW. This evaluation will conservatively assume that the entire room heat load was from EDG components, including the uninsulated parts of the exhaust system. A Btu/minute/KW value will be

derived from the test data and applied to the additional load analyzed in this evaluation, to determine a new total room heat load for operation at 2950 KW. Using the maximum acceptable combustion air temperature of 97°F for this loading condition, the corresponding maximum outdoor air intake temperature required to support EDG operation will be determined.

4.1.4 A conservative estimate of heat rejection from EDG 1B when operating at the loads described in 1.2, above, will be based on the total room heat loads from actual test data taken on July 28, 2005 (Ref. 5.6). During the test, the EDG was loaded at 2600KW. This evaluation will conservatively assume that the entire room heat load was from EDG components, including the uninsulated parts of the exhaust system. A Btu/minute/KW value will be derived from the test data and applied to the additional load analyzed in this evaluation, to determine a new total room heat load for operation at 2950 KW. Using the maximum acceptable combustion air temperature of 97°F for this loading condition, the corresponding maximum outdoor air intake temperature required to support EDG operation will be determined.

4.1.5 The normal ventilation fan in each EDG Room is manually operated with a two position on-off switch. These non-safety related fans, each rated at 1380 CFM are powered from a 120 VAC 1/3 HP motor from non-safeguards sources, and are not credited to operate under accident conditions. During the above referenced tests, these fans were left running. To derive the room heat loads under the test conditions, the normal fan flow of 1380 CFM will be added to the conservatively assumed vent supply fan flow rate of 50,000 CFM.

4.1.6 Each EDG filter assembly consists of four equal chambers. During the tests, temperatures were taken across the four chambers at about the same time (Ref. 5.6). There were variations in the temperature readings across the chambers. To derive an average combustion air intake temperature for each EDG, the temperatures across each filter chamber will be multiplied by the fraction of total mass flow in that area (Ref. 5.3, p. 14.3 and Assumption 3.2.1) :

4.1.6.1 EDG1A measurements taken across the four chambers on August 18, 2005 were 83.5, 84.8, 89.7, and 94.1.

- 83.5 * 0.25 = 20.88
- 84.8 * 0.25 = 21.2
- 89.7 * 0.25 = 22.43
- 94.1 * 0.25 = 23.53

- 20.88 + 21.2 + 22.43 + 23.53 = 88°F

4.1.6.2 EDG1B measurements taken across the four chambers on July 28, 2006 were 88.8, 89.2, 89.8, 95.2.

- 88.8 * 0.25 = 22.2
- 89.2 * 0.25 = 22.3
- 89.8 * 0.25 = 22.45
- 95.2 * 0.25 = 23.8
- 22.2 + 22.3 + 22.45 + 23.8 = 90.75°F, or 91°F

4.1.7 For quick reference, an Excel spreadsheet and graphs indicating acceptable combustion and outdoor air temperatures corresponding to EDG loadings starting with 2600KW and increasing increments to 3009KW is provided as Appendix A. The resulting temperatures were derived by the methodology described above.

4.2 Acceptance Criteria

To ensure full operability of EDG 1A and EDG 1B at the postulated loading conditions, this evaluation will calculate the maximum acceptable outdoor air intake temperatures consistent with manufacturer's maximum recommended combustion air temperatures (Refs. 5.1, 5.2).

5.0 REFERENCES

5.1 Letter, MKW Power Systems, dated June 11, 1992

5.2 Letter, Engine Systems Inc., dated May 19, 2006

5.3 ASHRAE Fundamentals Handbook, 1997

5.4 Letter KP-S-2786 (File No. 322.4810) Pioneer Service & Engineering Co., Diesel Generator Vent Fans

5.5 Industrial Ventilation (ACGIH), 17th Edition

5.6 CA017971, Calculation of EDG Maximum Room Temperature in Question

5.7 KPS Work Order 07-1292

6.0 CALCULATION AND RESULTS

6.1 EDG 1A maximum acceptable outdoor air temperatures for the specified operation conditions will be determined as described below:

6.1.1 EDG 1A heat rejected to room (Q) on August 18, 2005, is determined by:

$$Q = 51380CFM * [0.24 * 0.075 * 60]*[88 - 72.7]$$

$$At\ 2600KW,\ Q = 849{,}003\ Btu/hr$$

6.1.2 The heat load per KW of EDG output is determined by:

$$849{,}003 \div 2600 \div 60 = 5.4\ Btu/min/KW$$

6.1.3 The additional heat load from operating EDG 1A at 2950KW is:

$$2950 - 2600 = 350KW$$

$$350 * 5.4 * 60 = 114{,}289\ Btu/hr$$

6.1.4 The revised EDG 1A Room heat load for 2950 KW is:

$$849{,}003 + 114{,}289 = 963{,}292\ Btu/hr$$

6.1.5 The maximum allowable outdoor air temperature to support operation of EDG 1A at 2950KW and a maximum combustion air temperature of 97°F will be determined when the Vent Supply Fan (Asset No. 132-081) is supplying 50,000 CFM of 100% outdoor air under the above loading conditions. Under accident conditions, the normal vent fan is not operating:

$$50{,}000 = 963{,}292 \div [(0.24 * 0.075) * (97 - T_{OA}) * 60]$$

$$\mathbf{T_{OA} = 79.2\ °F}$$

$$\Delta T = 17.8°F$$

6.2 EDG 1B maximum acceptable outdoor air temperatures for the specified operation conditions will be determined as described below:

6.2.1 EDG 1B heat rejected to room (Q) on July 28, 2005 is determined by:

$$Q = 51380CFM * [0.24 * 0.075 * 60]*[91 - 78.5]$$

At 2600KW, Q = 693,630 Btu/hr

6.2.2 The heat load per KW of EDG output is determined by:

693,630 ÷ 2600 ÷ 60 = 4.4 Btu/min/KW

6.2.3 The additional heat load from operating EDG 1B at 2950KW is determined by:

2950 – 2600 = 350KW

*350 * 4.4 * 60 = 93,373 Btu/hr*

6.2.4 The revised total EDG 1B Room heat load is:

693,630 + 93,373 = 787,003 Btu/hr

6.2.5 The maximum allowable outdoor air temperature to support operation of EDG 1B at 2950KW and a maximum combustion air temperature of 97°F will be determined when the Vent Supply Fan (Asset No. 132-082) is supplying 50,000 CFM of 100% outdoor air under the above loading conditions. Under accident conditions, the normal vent fan will not be operating:

$CFM = Q \div [C_p * P * \Delta T * 60]$
Where: $CFM = 50{,}000$
$Q = 787{,}003$ *Btu/hr*
C_p = *specific heat Btu/lb/°F (0.24)*
P = *density lb/ft*^{3} *(0.07, Ref. 5.5)*
$\Delta T = T_{room} - T_{OA}$
Room/Combustion air temp, $T_{room} = 97°F$
Equation will be solved for T_{OA}

$$50{,}000 = 787{,}003 \div [(0.24*0.075) * (97 - T_{OA}) * 60]$$

$$\mathbf{T_{OA} = 82.4\ °F}$$

$$\Delta T = 14.6°F$$

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 To support operability of EDG 1A at the output load of 2950 KW, and a maximum combustion air temperature of 97°F, the corresponding outdoor air intake temperatures are tabulated below:

EDG 1A Output	Max Combustion Air Temp.	Max Outdoor Air Temp	Calc. Ref.
2950KW	97°F	79.2°F	6.1.5

7.2 To support operability of EDG 1B at the output load of 2950 KW, and a maximum combustion air temperature of 97°F, the corresponding outdoor air intake temperatures are tabulated below:

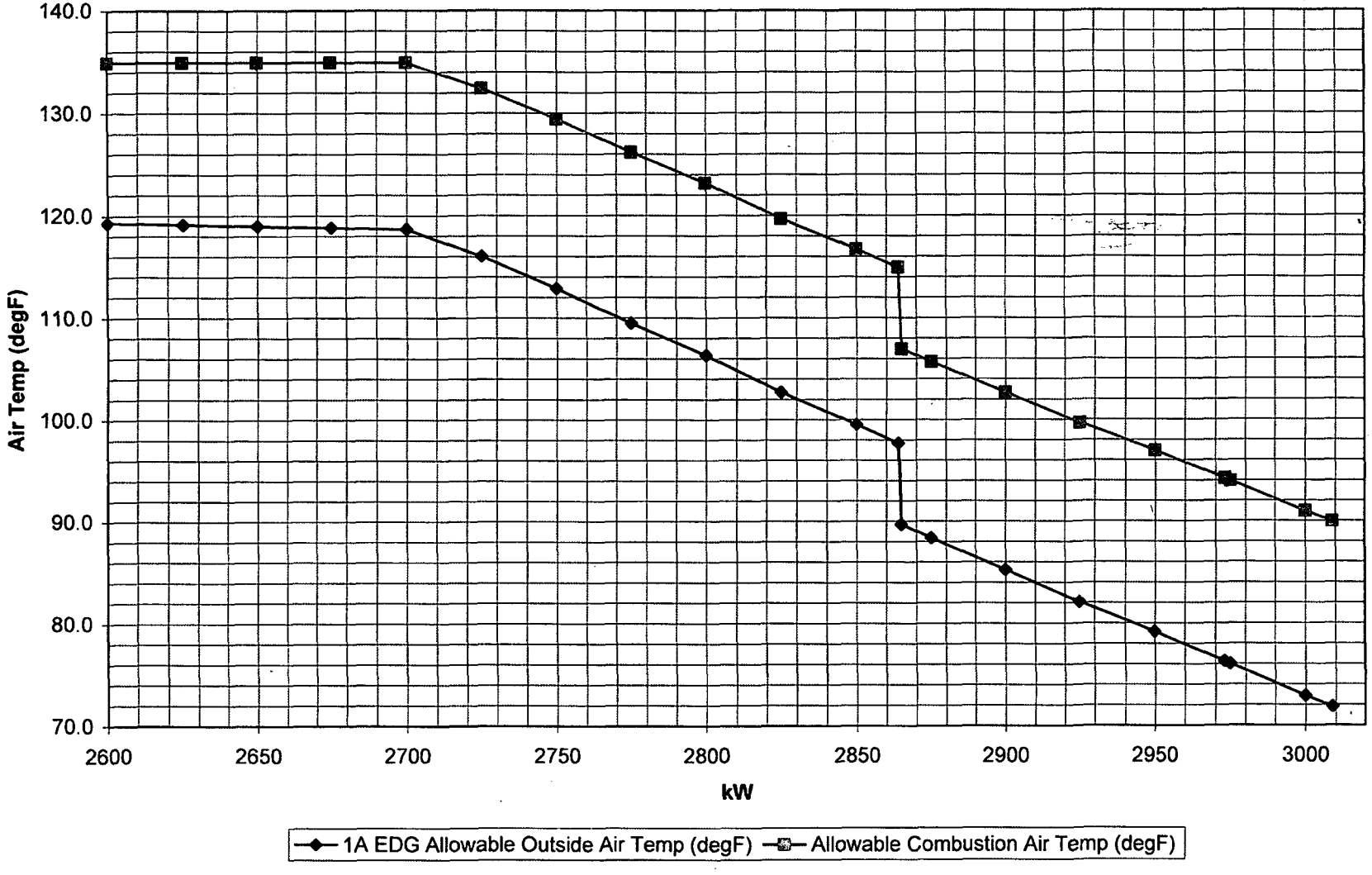
EDG 1B Output	Max Combustion Air Temp.	Max Outdoor Air Temp	Calc. Ref.
2950KW	97°F	82.4°F	6.2.5

7.3 Appendix A contains Excel graphs and a spreadsheet indicating maximum acceptable combustion and outdoor air intake temperatures corresponding to EDG output loadings at approximately 25KW intervals starting with the continuous rated load of 2600KW.

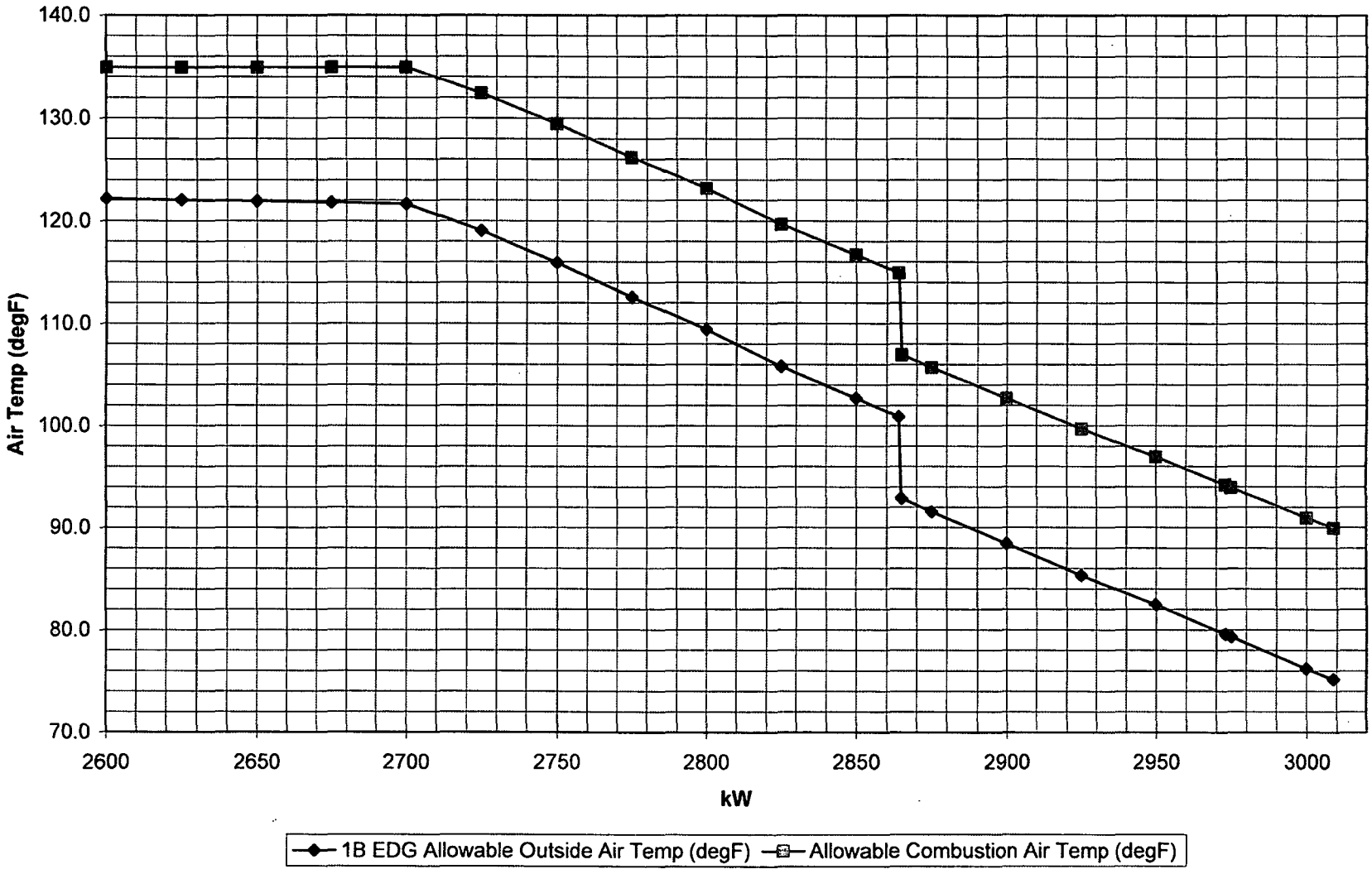
Chart Data

EDG Load (kW)	Rating (kW)	Rating Duration (Hours)	% of Rating	Allowable Combustion Air Temp (degF)	1A EDG Allowable Outside Air Temp (degF)	1A EDG Delta T (degF)	1B EDG Allowable Outside Air Temp (degF)	1B EDG Delta T (degF)
2600	2864	2000	90.78	135	119.3	15.7	122.2	12.8
2625	2864	2000	91.66	135	119.1	15.9	122.0	13.0
2650	2864	2000	92.53	135	119.0	16.0	121.9	13.1
2675	2864	2000	93.40	135	118.8	16.2	121.8	13.2
2700	2864	2000	94.27	135	118.7	16.3	121.7	13.3
2725	2864	2000	95.15	132.5	116.0	16.5	119.0	13.5
2750	2864	2000	96.02	129.5	112.9	16.6	115.9	13.6
2775	2864	2000	96.89	126.25	109.5	16.8	112.5	13.7
2800	2864	2000	97.77	123.25	106.3	16.9	109.4	13.8
2825	2864	2000	98.64	119.75	102.7	17.1	105.8	13.9
2850	2864	2000	99.51	116.75	99.5	17.2	102.7	14.1
2864	2864	2000	100.00	115	97.7	17.3	100.9	14.1
2865	3009	4	95.21	107	89.7	17.3	92.9	14.1
2875	3009	4	95.55	105.75	88.4	17.4	91.6	14.2
2900	3009	4	96.38	102.75	85.2	17.5	88.4	14.3
2925	3009	4	97.21	99.75	82.1	17.7	85.3	14.4
2950	3009	4	98.04	97	79.2	17.8	82.4	14.6
2973	3009	4	98.80	94.25	76.3	18.0	79.6	14.7
2975	3009	4	98.87	94	76.0	18.0	79.3	14.7
3000	3009	4	99.70	91	72.9	18.1	76.2	14.8
3009	3009	4	100.00	90	71.8	18.2	75.2	14.8
3025	3050	0.5	99.18	96.5	78.2	18.3	81.6	14.9
3050	3050	0.5	100.00	90	71.6	18.4	75.0	15.0

1A EDG kW vs Allowable Outside Air Temp



1B EDG kW vs Allowable Outside Air Temp



EDG kW Loading

	1A EDG			1B EDG		
1C Instrument Air Compressor OFF Spent Fuel Pool Cooling ON						
	C-042-001 Addendum C	**Additional Load**	**Adjusted Load**	**C-042-001 Addendum C**	**Additional Load**	**Adjusted Load**
60 Second Load	2821.2	34.9	2856.1	2837.5	34.9	2872.4
30 Minute Load	2823	34.9	2857.9	2839.6	34.9	2874.5
60 Minute Load	2657	34.9	2691.9	2673.6	34.9	2708.5
120 Minute Load	2019.1	34.9	2054	2035.7	34.9	2070.6
240 Minute Load	2019.1	34.9	2054	2035.7	34.9	2070.6
1C Instrument Air Compressor ON Spent Fuel Pool Cooling ON						
	C-042-001 Addendum C	**Additional Load**	**Adjusted Load**	**C-042-001 Addendum C**	**Additional Load**	**Adjusted Load**
60 Second Load	2821.2	69.8	2891	2837.5	34.9	2872.4
30 Minute Load	2823	69.8	2892.8	2839.6	34.9	2874.5
60 Minute Load	2657	69.8	2726.8	2673.6	34.9	2708.5
120 Minute Load	2019.1	69.8	2088.9	2035.7	34.9	2070.6
240 Minute Load	2019.1	69.8	2088.9	2035.7	34.9	2070.6

Diesel Load Reduction – Station Air Compressor 1C to OFF

References

E 258	Circuit Diagram MCC 1-52A
E 1452	Schematic for 1C Air Compressor
E 1603	Logic for 1C Air Compressor
C-042-002 Rev 6	DG Load Calculation
USAR Table 8.2-1	DG Load (MAX) For DBA
50.59 Screening	# 06-044-00

A review of the EDG 1A loads was performed using the above reference drawings. Maintaining the 1C air compressor (1-349) in the OFF position will reduce the load of the EDG 1A by 33.9 kW (40 hp). The normal local switch configuration for the 1C air compressor is to automatically start on decreasing air header pressure. This configuration change will reduce the loading of the EDG 1A. This load is a non-safety related Appendix R designated load. This configuration change will not affect air compressor 1A, which will remain on MCC 5262 and air compressor 1B, which will remain on MCC 62A.

In the event that Operations needs to use the 1C instrument air compressor, the loading on bus 5 will revert to the values specified in Attachment 3. To account for additional EDG loading due to operation at frequencies other than 60 Hz, the motor load multiplier of 1.03030 as derived in revision 4 of calculation C-10915 will be applied to the 1C instrument air compressor motor. The load to be added to the results of Addendum C of calculation C-042-001 revision 6 will be 34.9 kW.

Calculation

kW= (40 hp)(0.7457kw/hp) / 0.88 efficiency = 33.9 kW

33.9 X 1.03030 = 34.9 kW

Load Change	DG 1A (kW)	DG 1B (kW)
Station Air Compressor 1C	34.9	0

ATTACHMENT 4

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING KEWAUNEE LICENSE AMENDMENT REQUEST 230

COPIES OF SELECTED REFERENCES

REFERENCE PROVIDED IN THIS ATTACHMENT

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

List of References Included in this Attachment

1. Not Included.
2. Not Included.
3. "Safety Evaluation by the Directorate of Licensing, U. S. Atomic Energy Commission in the Matter of Wisconsin Public Service Corporation, Wisconsin Power and Light, and Madison Gas and Electric Company, Kewaunee Nuclear Power Plant, Kewaunee County, Wisconsin, Docket No. 50-305," dated July 24, 1972.
4. Not Included.
5. Not Included.
6. Letter from S. A. Varga (NRC) to E. R. Mathews (WPSC), Amendment No. 33 to Facility Operating License No. DPR-43, Kewaunee Power Plant, dated April 8, 1981.
7. Letter from M. B. Fairtile (NRC) to D. C. Hintz (WPSC), Amendment No. 68 to Facility Operating License DPR-43, Kewaunee Power Plant, dated July 10, 1986.
8. Letter from Robin L. Weeks (Engine Systems, Inc.) to P. DeTemple (DEK), "Reference: 20-645E4 Engine Ratings with EMD A20 Generator," dated May 19, 2006.
9. Letter from D. A. Strickland (MKW Power Systems, Inc.) to M. Anthony (Duke Engineering and Services, Inc.), dated June 11, 1992.
10. Enclosed in attachment 2.
11. Enclosed in attachment 3.

Reference 3

"Safety Evaluation by the Directorate of Licensing, U. S. Atomic Energy Commission in the Matter of Wisconsin Public Service Corporation, Wisconsin Power and Light, and Madison Gas and Electric Company, Kewaunee Nuclear Power Plant, Kewaunee County, Wisconsin, Docket No. 50-305," dated July 24, 1972.

Section 8.3.1, AC POWER SYSTEM
(pages 8-3 through 8-5)

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July 24, 1972

SAFETY EVALUATION

BY THE

DIRECTORATE OF LICENSING

U.S. ATOMIC ENERGY COMMISSION

IN THE MATTER OF

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY, AND

MADISON GAS AND ELECTRIC COMPANY

KEWAUNEE NUCLEAR POWER PLANT

KEWAUNEE COUNTY, WISCONSIN

DOCKET NO. 50-305

MASTER

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line o- e loss of the Kewaunee generator will not cause a cascading failure of the power transmission system. In addition, the Kewaunee unit is capable of a 100% net load rejection via a combination of atmospheric and condenser dump without reactor scram, thus adding to the reliability and availability of the preferred offsite power system.

The applicant's offsite power system is in accord with General Design Criterion 17 requirements and is acceptable.

8.3 Onsite Power System

8.3.1 AC Power System

The auxiliary power requirements for the Kewaunee Plant are supplied from six 4.16 kV buses, two of which are used for Class IE (safety) loads. The power for the Class IE electric system is supplied by fully independent and redundant 4.16 kV load groups. In addition to the redundant preferred supplies two redundant standby diesel generators are provided. The diesel generators will start on receiving an under-voltage, accident, or turbine trip signal, and each will be connected to its respective 4.16 kV bus on a loss of bus voltage.

Power for the auxiliary and emergency loads at 480 volts will be supplied by ten buses, four of which are emergency buses. Two station service transformers connected through a single breaker to each of the two redundant emergency 4.16 kV buses will serve four

480 volt emergency buses. In addition to the four 480 volt emergency buses, a non-redundant 480 volt swing motor control center (MCC 1 - 5262) is energized from the emergency buses. It may be manually connected to either redundant load group. None of its loads is required for safety. This design has been evaluated; we have determined that the guidelines of Safety Guide No. 6 are not compromised, and that the design is acceptable.

The applicant has incorporated several automatic transfer switches throughout this design. In no case is there an automatic transfer made between redundant power systems. The transfers are made between buses of the same train; thus, again Safety Guide No. 6 is not violated.

The two emergency diesel generators are located in separate rooms in a Class I (seismic) portion of the administration building. The units each have their own independent auxiliary systems. Originally, the motor driven air compressor for each diesel was connected to the emergency bus supplied from the redundant diesel. We advised the applicant that, in order to satisfy the split-bus concept and to meet the intent of Safety Guide No. 6, each air compressor motor must be connected to its own diesel generator emergency bus. The applicant has revised the design accordingly.

Redundant 35,000 gallon Class I (seismic) underground fuel oil storage tanks are provided. Total onsite fuel storage capacity

provides for over 7 days of full load operation of both diesel generators. This design meets the requirement of Section 5.2.4 of IEEE-308 and is satisfactory.

The applicant has stated that each diesel generator has a 2000 hour rating of 2860 kW. The maximum load that occurs is 2737 kW during the first 30 minutes following an accident; after that, the load is significantly less. The limiting criterion of Safety Guide No. 9 is that which limits the maximum accident load to less than 90% of the 30 minute rating (2750 kW). We conclude that the standby power system meets the intent of Safety Guide No. 9.

8.3.2 DC Power System

Two fully redundant dc systems and station batteries with individual chargers are provided. In addition, a spare charger is provided that may be manually connected to replace either normally-connected charger. The batteries are sized to carry shutdown loads following a plant trip, such that, on a complete loss of ac power, adequate power at not less than 105 volts dc would be available for at least one hour. The chargers are capable of fully recharging the batteries from a discharged level of 105 'ts within a 24-hour period while carrying their normal load. We conclude that these provisions are acceptable.

The two battery rooms are normally ventilated by the turbine building supply fan. In the event of a loss of offsite power or

Reference 6

Letter from S. A. Varga (NRC) to E. R. Mathews (WPSC), Amendment No. 33 to Facility Operating License No. DPR-43, Kewaunee Power Plant, dated April 8, 1981.

APR 8 1981

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RDiggs
RLicciardo
CParrish
Gray File 4
Chairman, ASLAB

Docket No. 50-305

Mr. Eugene R. Mathews, Vice President
Power Supply and Engineering
Wisconsin Public Service Corporation
Post Office Box 1200
Green Bay, Wisconsin 54305

Dear Mr. Mathews:

The Commission has issued the enclosed Amendment No. 33 to Facility Operating License No. DPR-43 for Kewaunee Nuclear Power Plant. The amendment consists of changes to the Technical Specifications in response to your application transmitted by letter dated November 16, 1979.

The amendment revises the Technical Specifications in respect to (a) reactivity anomalies and reporting requirements; (b) testing requirements for the Shield Building Ventilation System, the Auxiliary Building Special Ventilation System and the Spent Fuel Pool Sweep System; (c) Periodic Testing of Diesel Generators; and (d) Bases of Section 3.5, Instrumentation System/Safety Injection.

Copies of the Safety Evaluation and the Notice of Issuance are also enclosed.

Sincerely,

Original signed by:
S. A. Varga

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

CP
5-1

Enclosures:
1. Amendment No. 33 to DPR-43
2. Safety Evaluation
3. Notice of Issuance

cc: w/enclosures
See next page

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Concurrence, as to form of Amdt, and FR notice only

OFFICE	ORB#1:DL	ORB#1:DL	ORB#1:DL	AD/OR:DL	D/DL	OELD	
SURNAME	CParrish	RLicciardo:ds	SVarga	TNovak	DEisenhut	BMBordenick	
DATE	3/23/81	3/24/81 4/8/81	3/24/81	3/24/81	3/ /81	3/31/81	

NRC FORM 318 (10/80) NRCM 0240 OFFICIAL RECORD COPY ☆ USGPO: 1980—329-824

Docket

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 8, 1981

Docket No. 50-305

Mr. Eugene R. Mathews, Vice President
Power Supply and Engineering
Wisconsin Public Service Corporation
Post Office Box 1200
Green Bay, Wisconsin 54305

Dear Mr. Mathews:

The Commission has issued the enclosed Amendment No. 33 to Facility Operating License No. DPR-43 for Kewaunee Nuclear Power Plant. The amendment consists of changes to the Technical Specifications in response to your application transmitted by letter dated November 16, 1979.

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Copies of the Safety Evaluation and the Notice of Issuance are also enclosed.

Sincerely,

Steven A. Varga

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Enclosures:
1. Amendment No. 33 to DPR-43
2. Safety Evaluation
3. Notice of Issuance

cc: w/enclosures
See next page

Mr. Eugene R. Mathews
Wisconsin Public Service Corporation

cc: Steven E. Keane, Esquire
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777 East Wisconsin Avenue
Milwaukee, Wisconsin 53202

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Stanley LaCrosse, Chairman
Town of Carlton
Route 1
Kewaunee, Wisconsin 54216

Mr. Donald L. Quistroff, Chairman
Kewaunee County Board
Kewaunee County Courthouse
Kewaunee, Wisconsin 54216

Chairman
Public Service Commission of Wisconsin
Hill Farms State Office Building
Madison, Wisconsin 53702

Mr. Patrick Walsh
Assistant Attorney General
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Madison, Wisconsin 53702

U. S. Nuclear Regulatory Commission
Resident Inspectors Office
Route #1, Box 999
Kewaunee, Wisconsin 54216

Director, Criteria and Standards Division
Office of Radiation Programs (ANR-460)
U. S. Environmental Protection Agency
Washington, D. C. 20460

U. S. Environmental Protection Agency
Federal Activities Branch
Region V Office
ATTN: EIS COORDINATOR
230 South Dearborn Street
Chicago, Illinois 60604

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

KEWAUNEE NUCLEAR PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 33
License No. DPR-43

1. *The Nuclear Regulatory Commission (the Commission) has found that:*

   A. The application for amendment by Wisconsin Public Service Corporation, Wisconsin Power and Light Company and Madison Gas and Electric Company (the licensees) dated November 16, 1979, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provision of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

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2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-43 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 33 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: April 8, 1981

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 33 TO FACILITY OPERATING LICENSE NO. DPR-43

DOCKET NO. 50-305

Revise Appendix A as follows:

Remove pages	Insert pages
TS 3.5-2	TS 3.5-2
TS 3.8-2	TS 3.8-2
TS 4.4-5	TS 4.4-5
TS 4.4-6	TS 4.4-6
TS 4.6-1	TS 4.6-1
TS 4.12-1	TS 4.12-1
TS 4.12-2	TS 4.12-2
TS 6-17	TS 6-17

Basis: Instrumentation has been provided to sense accident conditions and to initiate operation of the engineered safety features.[1] Section 2.3 of these specifications describes the limiting safety system settings for the protective instrumentation.

Safety Injection

Safety injection can be activated automatically or manually to provide additional water to the reactor coolant system or to increase the concentration of boron in the coolant.

Safety injection is initiated automatically by (1) low pressurizer pressure, (2) low main steam line pressure in either loop and (3) high containment pressure. Protection against a Loss-of-Coolant Accident is primarily through signals (1) and (3). Protection against a Steam Line Break is primarily by means of signal (2).

Manual actuation is always possible. Safety Injection signals can be blocked during those operating modes where they are not "required" for safety and where their presence might inhibit operating flexibility; they are generally restored automatically on return to the "required" operating mode.

6. Direct communication between the control room and the operating floor of the containment shall be available whenever changes in core geometry are taking place.

7. Heavy loads, greater than the weight of a fuel assembly, will not be transported over or placed in either spent fuel pool when spent fuel is stored in that pool. Placement of additional fuel storage racks is permitted, however, these racks may not traverse directly above spent fuel stored in the pools.

8. The containment ventilation and purge system, including the radiation monitors which initiate containment ventilation isolation, shall be tested and verified to be operable immediately prior to a refueling operation.

9. A. The spent fuel pool sweep system, including the charcoal adsorbers, shall be operating during fuel handling and when any load is carried over the pool if irradiated fuel in the pool has decayed less than 30 days. If the spent fuel pool sweep system, including the charcoal adsorber, is not operating when required, fuel movement shall not be started (any fuel assembly movement in progress may be completed).

to this value.

c. Residual Heat Removal System

1. Those portions of the Residual Heat Removal System external to the isolation valves at the containment shall be hydrostatically tested at 350 psig at each major refueling outage, or they shall be tested during their use in normal operation at least once between successive major refueling outages.

2. The total leakage from either training shall not exceed two gallons per hour. Visible leakage that cannot be stopped at test conditions shall be suitably measured to demonstrate compliance with this Specification.

3. Any repairs necessary to meet the specified leak rate shall be accomplished within seven days of resumption of power operation.

d. Shield Building Ventilation System

1. At least once per operating cycle or once every 18 months whichever occurs first, the following conditions shall be demonstrated:

A. Pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 10 inches of water and the pressure drop across any HEPA filter bank is less than 4 inches of water at the system design flow rate (+10%)

B. Automatic initiation of each train of the system.

C. Operability of heaters at rating and the absence of defects by visual inspection

2. A. The in-place DOP test for HEPA filters shall be performed (1) at least once per 18 months and (2) following painting, fire, or chemical release in any ventilation zone communicating with the system.

B. The laboratory tests for activated carbon in the charcoal filters shall be performed (1) at least once per 18 months for filters in a standby status or after 720 hours of filter operation, and

following painting, fire or chemical release in any ventilation zone communicating with the system.

C. Cold DOP testing shall be performed after each complete or partial replacement of a HEPA filter bank or after any maintenance on the system that could affect the HEPA bank bypass leakage.

D. Halogenated hydrocarbon testing shall be performed after each complete or partial replacement of a charcoal adsorber bank or after any maintenance on the system that could affect the charcoal adsorber bank bypass leakage.

E. Each train shall be operated with the heaters on at least 10 hours every month.

3. Perform an air distribution test on the HEPA filter bank after any maintenance or testing that could affect the air distribution within the systems. The test shall be performed at designflow rate (±10%). The results of the test shall show the air distribution is uniform within ±20%.

4. Each train shall be determined to be operable at the time of its periodic test if it produces measurable indicated vacuum in the annulus within two minutes after initiation of a simulated safety injection signal and obtains equilibrium discharge conditions that demonstrate the Shield Building leakage is within acceptable limits.

e. Auxiliary Building Special Ventilation System

1. Periodic tests of the Auxiliary Building Special Ventilation System, including the door interlocks, shall be performed in accordance with Specifications 4.4.d.1 through 4.4.d.3 except for Specification 4.4.d.2.E.

2. Each train of Auxiliary Building Special Ventilation System shall be operated with the heaters on at least 15 minutes every month.

4.6 PERIODIC TESTING OF EMERGENCY POWER SYSTEM

Applicability

Applies to periodic testing and surveillance requirements of the emergency power system.

Objective

To verify that the emergency power sources and equipment are operable.

Specification

The following tests and surveillance shall be performed:

a. Diesel Generators

1. Manually-initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly in accordance with the intent of Paragraph 6.4.1 and 6.4.3 of IEEE 387-1977.
2. Automatic start of each diesel generator, load shedding, and restoration to operation of particular vital equipment, all initiated by a simulated loss of all normal a-c station service power supplies together with a simulated safety injection signal. This test will be conducted at each refueling interval to assure that each diesel generator will start and assume required loads to the extent possible within one minute. During this test a checkout of emergency lighting will be performed.
3. Each diesel generator shall be inspected at each major refueling outage.
4. Diesel generator load rejection test in accordance with IEEE 387-1977, section 6.4.5 shall be performed at least once per 18 months.

b. Station Batteries

1. The voltage of each cell shall be measured to the nearest hundredth volt each month. An equalizing charge shall be applied if the lowest cell in the battery falls below 2.13 volts. The temperature and specific gravity of a pilot cell in each battery shall be measured.

4.12 SPENT FUEL POOL SWEEP SYSTEM

Applicability

Applies to testing and surveillance requirements for the spent fuel pool sweep system in Specifications 3.8.a.9.

Objective

To verify the performance capability of the spent fuel pool sweep system.

Specification

a. At least once per operating cycle or once every 18 months, whichever occurs first, the following conditions shall be demonstrated:

   1. Pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 10 inches of water and the pressure drop across any HEPA bank is less than 4 inches of water at the system design flow rate (±10%).

   2. Automatic initiation of each train.

b. 1. The in-place DOP test for HEPA filters shall be performed (1) at least once per 18 months and (2) following painting, fire, or chemical release in any ventilation zone communicating with the system.

   2. The laboratory tests for Activated Carbon in the charcoal filters shall be performed (1) at least once per 18 months for filters in a standby status or after 720 hours of filter operation, and (2) following painting, fire, or chemical release in any ventilation zone communicating with the system.

   3. Cold DOP testing shall be performed after each complete or partial replacement of a HEPA filter bank or after any maintenance on the system that could affect the HEPA bank bypass leakage.

4. Halogenated hydrocarbon testing shall be performed after each complete or partial replacement of a charcoal adsorber bank or after any maintenance on the system that could affect the charcoal adsorber bank bypass leakage.

c. Perform an air distribution test on the HEPA filter bank after any maintenance or testing that could affect the air distribution within the system. The test shall be performed at design flow rate (±10%). The results of the test shall show the air distribution is uniform within ±20%.

steady state conditions greater than or equal to one percent; a calculated reactivity balance indicating a shutdown margin less conservative than specified in the technical specifications; short-term reactivity increases that correspond to a reactor period of less than 5 seconds or, if subcritical, an unplanned reactivity insertion of more than 50¢; or occurrence of any unplanned criticality.

(5) Failure of malfunction of one or more components which prevents or could prevent, by itself, the fulfillment of the functional requirements of system(s) used to cope with accidents analyzed in the SAR.

(6) Personnel error or procedural inadequacy which prevents or could prevent, by itself, the fulfillment of the functional requirements of systems required to cope with accidents analyzed in the SAR.

Note: For items 6.9.2.a(5) and 6.9.2.a(6) reduced redundancy that does not result in a loss of system function need not be reported under this section but may be reportable under items 6.9.2.b(2) and 6.9.2.b(3) below.

(7) Conditions arising from natural or man-made events that, as a direct result of the event require plant shutdown, operation of safety systems, or other protective measures required by technical specifications.

(8) Errors discovered in the transient or accident analyses or in the methods used for such analyses as described in the safety analysis report or in the bases for the technical specifications

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 33 TO FACILITY OPERATING LICENSE NO. DPR-43

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

KEWAUNEE NUCLEAR POWER PLANT

DOCKET NO. 50-305

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Introduction (General)

By letter dated November 16, 1979, Wisconsin Public Service Corporation (the Licensee) submitted their porposed Amendment No. 41 to the Technical Specifications for the Kewaunee Nuclear Power Plant. The proposal requested changes in respect of:

a) reactivity anomalies and reporting requirements;

b) testing requirements for the Shield Building Ventiliation System, the Auxiliary Building Ventilation System, and the Spent Fuel Pool Sweep System;

c) Periodic Testing of Diesel Generators;

d) Bases of Section 3.5, Instrumentation System/Safety Injection.

Each of these requested changes has been evaluated to establish its particular features, and related safety and environmental impacts, and the necessary safety conclusions have been drawn. The results are presented as separate Safety Evaluations for each request and are presented in the following sections in the sequence, and under the Titles, of this Introduction.

Safety Evaluation - Reactivity Anomalies and Reporting Requirements

Introduction

By the letter dated November 16, 1979, the licensee submitted that the limit for reactivity anomalies for the comparison of measured to predicted boron concentration is one percent reactivity per Technical Specification 4-9, while the reporting requirement for this reactivity anomaly in specification 6.9.2.a.(4) is $1.00 in reactivity. To be consistent with the Technical Specification limit of one percent reactivity, a request was made to change the reporting requirements of 6.9.2.a.(4) to one percent reactivity also.

Evaluation

We find that the existing reporting requirement for reactivity anomalies is inconsistent with the limit allowed by the Technical Specification and that the change requested to make the reporting requirements of 6.9.2.a(4) to one percent reactivity should be made.

We further find that the request represents an administrative change to correct an inconsistency in the reporting requirement in the Techncial Specifications with no environmental or safety impact. We therefore find that the change requested is acceptable and the appropriate revision to the Technical Specification has been made on page TS 6-17.

Safety Evaluation - Testing Requirements for the Shield Building Ventilation System, the Auxiliary Building Special Ventilation System and the Spent Fuel Pool System

Introduction

By letter dated November 16, 1979, Wisconsin Public Service Corporation proposed changes (Amendment 41) to the Kewaunee Nuclear Power Plant Techncial Specification which revises Section 4.4.d, (Shielding Building Ventilation System), 4.4.c, (Auxiliary Building Special Ventilation System), and 4.12 (Spent Fuel Pool Sweep System).

Evaluation

The present Kewaunee Plant Technical Specification for Engineered Safety Feature (ESF) ventilation filter systems require in place cold DOP and halogenated hydrocarbon tests for HEPA filters and laboratory tests for activated carbon for charcoal filters after each 720 hours of system operation. Ventilation system design at the Kewaunee Plant requires that the Spent Fuel Pool Sweep System be operated continuously with the charcoal filter units normally bypassed. The licensee proposes to revise the Technical Specification with the wording that testing should be performed (1) initially, (2) at least once per 18 months thereafter for system operation, and (3) following painting, fire, or chemical release in any ventilation zone communicating with the system. This revision will permit the elimination of laboratory testing for activated carbon every 720 hours of Spent Fuel Pool Sweep Systems operation, as is now required, to laboratory testing at least once per 18 months of the bypassed charcoal filter units.

The proposed Technical Specificaiton is acceptable since it is in agreement with Table 2, Laboratory Tests for Activated Carbon, in Regulatory Guide 1.52 (Revision 2) which has identical wording. The revisions to the Technical Specification arising from this request are made on pages TS 4.4-5, TS 4.4-6, TS 4.12-1 and TS 4.12-2.

Amendment No. 12 to the Facility Operating License No. DPR-43 for the Kewaunee Nuclear Power Plant issued January 18, 1977, requires the following:

> "The spent fuel pool sweep system, including the charcoal adsorbers, shall be operating during fuel handling and when any load is carried over the pool if irradiated fuel in the pool has decayed less than 30 days. If the spent fuel pool sweep system <u>including the charcoal adsorber</u>, is not operating when required, fuel movement shall not be started (any fuel assembly movement in progress may be completed)."

The above is paragraph 3.8.a.9.A of the Technical Specification, with the exception of the words which are underlined, including the charcoal adsorber, and which have been recommended by the NRC for addition in the interest of clarification. By subsequent telephone conversaion the licensee has agreed to this clarification and this has been incorporated on page TS 3.8-2.

Safety Evaluation - Periodic Testing of Diesel Generators

Introduction

By letter dated November 16, 1979, the licensee (Wisconsin Public Service Corporation) submitted their proposed Amendment No. 41 to the Kewaunee Plant Technical Specifications. This amendment established a full load rejection test frequency of once per 18 months. The licensee has also submitted a letter dated August 16, 1979, from Western Engine Company who conducts the testing and service of the licensee's emergency standby diesel generators, on the frequency of the load rejection tests.

Evaluation

The existing Technical Specification of Kewaunee Nuclear Power Plant requires that each month the diesel generator undergo starting tests, rated load test and load rejection test (per the intent of IEEE 387 - Criteria for Diesel Generator Units Applied As Standby Power Supplies for Nuclear Power Generating Stations). The proposed changes to this section of the Technical Specifications deletes the monthly performance of the load rejection test and corrects the specification to conform with our original intent to require that this diesel generator load rejection test (in accordance with section 6.4.5 of IEEE Standard 387-1977) be performed at least once per 18 months.

A letter dated August 16, 1979, from Western Engine Company to the licensee, states that their technicians, who had conducted the diesel generator monthly tests, raised the concern that monthly full load rejection tests could create unnecessary strain on several diesel generator components: generator, engine governor, switchgear, circuit breaker, etc. Western Engine Company Technical Supervision strongly suggested that the full load rejection test be done on an annual basis.

It its letter dated November 16, 1979, the licensee has stated that a revised frequency of 18 months for the full load rejection tests is in accordance with the Standard Technical Specifications (STS) issued to recently licensed nuclear plants. Further, the licensee states that a reduced frequency has also been recommended by the diesel-generator manufacturer.

The purpose of the load rejection test is to verify that the voltage requirements are met and that overspeed limits are not exceeded during diesel generator load shedding. Regulatory Guide 1.108 (1977) requires this test to be performed during plant preoperational test program and at least once every 18 months thereafter. The Standard Technical Specifications also require the same interval between such tests. We agree that a load rejection test does impose additional strain on many diesel-generator components and frequent load rejection tests are unnecessary since such a feature is not required in the expected automatic operation of the diesel generators at nuclear power plants. Thus, a test frequency of once per 18 months as proposed by the licensee is in agreement with the requirements currently imposed by the Standard Technical Specifications and will reduce the strain of frequent monthly tests.

The Kewaunee Plant Technical Specifications does include the requirements of testing the diesel-generators per the intent of IEEE Standard 387-1977.

Based on our review of the licensee's submittal and on the requirements of Regulatory Guide 1.108 and the Standard Technical Specifications, we find the changes to the Technical Specifications of Kewaunee Nuclear Power Plant acceptable. The revisions to the Technical Specifications meeting these requirements are shown as indicated on page TS 4.6-1.

Safety Evaluation - Bases of Section 3.5, Instrumentation System/ Safety Injection

Introduction

In their transmittal, the licensee advised that Amendment 29 to the Kewaunee Technical Specification which changed the previous pressurizer pressure coincident with level, safety injection signal, for pressurizer pressure only, overlooked the change which was also required to the Bases. Revised wording was submitted to correct this oversight.

Evaluation

The revised wording was reviewed and during this is was considered appropriate to reword the related subsection entitled "Safety Injection" for the purpose of clarification. This was undertaken by verbal agreement with the licensee.

We find that the request represents an administrative change to correct an inconsistency in the Technical Specifications with no environmental or safety impact. We therefore find the change is acceptable and the appropriate revisions to the Technical Specifications has been made on TS 3.5-2.

Environmental Consideration

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: April 8, 1981

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UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-305

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 33 to Facility Operating License No. DPR-43, issued to Wisconsin Public Service Corporations, Wisconsin Power and Light Company, and Madison Gas and Electric Company (the licensees), which revised Technical Specifications for operations of the Kewaunee Nuclear Plant (the facility) located in Kewaunee, Wisconsin. The amendment is effective as of the date of issuance.

The amendment revises the Technical Specifications in respect to (a) reactivity anomalies and reporting requirements; (b) testing requirements for the Shield Building Ventilation System, the Auxiliary Building Special Ventilation System and the Spent Fuel Pool Sweep System; (c) Periodic Testing of Diesel Generators; and (d) Bases of Section 3.5, Instrumentation System/Safety Injection.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the

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Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since this amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated November 16, 1979, (2) Amendment No. 33 to License No. DPR-43 and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C. and at the Kewaunee Public Library, 314 Milwaukee Street, Kewaunee, Wisconsin 54216. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Licensing.

Dated at Bethesda, Maryland, this 8th day of April, 1981.

FOR THE NUCLEAR REGULATORY COMMISSION

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Reference 7

Letter from M. B. Fairtile (NRC) to D. C. Hintz (WPSC), Amendment No. 68 to Facility Operating License DPR-43, Kewaunee Power Plant, dated July 10, 1986.

July 10, 1986

Docket No. 50-305

Mr. D. C. Hintz
Manager, Nuclear Power
Wisconsin Public Service Corporation
Post Office Box 19002
Green Bay, Wisconsin 54307-9002

Dear Mr. Hintz:

The Commission has issued the enclosed Amendment No. 68 to Facility Operating License No. DPR-43 for the Kewaunee Nuclear Power Plant. The amendment consists of changes to the Technical Specifications in response to your application transmitted by letter dated April 15, 1986.

The amendment changes the frequency of loading the diesel generators to their short-term rating from once each month to once each refueling cycle and completes our TAC No. 61288.

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's next regular biweekly Federal Register notice.

Sincerely,

/S/

Morton B. Fairtile, Project Manager
Project Directorate #1
Division of PWR Licensing-A

Enclosures:
1. Amendment No. 68 to DPR-43
2. Safety Evaluation

cc: w/enclosures
See next page

Office:	LA/PAD#1	PM/PAD#1	OELD	PD/PAD#1
Surname:	PShuttleworth	M. Fairtile		GLear
Date:	06/24/86	06/30/86	07/ /86	07/07/86

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P PDR

Mr. D. C. Hintz
Wisconsin Public Service Corporation

Kewaunee Nuclear Power Plant

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ACRS (10)
OPA
LFMB (w/cy of TAC w/Amd No. & date issued)

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D C 20555

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

KEWAUNEE NUCLEAR PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 68
License No. DPR-43

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Wisconsin Public Service Corporation, Wisconsin Power and Light Company, and Madison Gas and Electric Company (the licensees) dated April 15, 1986 complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. This issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-43 is hereby amended to read as follows:

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(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 68 , are hereby incorporated in the license. The licensees shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Morton B. Fairtile

Morton B. Fairtile, Project Manager
Project Directorate #1
Division of PWR Licensing-A

Attachment:
Changes to the Technical
Specifications

Date of Issuance: July 10, 1986

ATTACHMENT TO LICENSE AMENDMENT NO. 68

TO FACILITY OPERATING LICENSE NO. DPR-43

DOCKET NO. 50-305

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change.

REMOVE	INSERT
4.6-1	4.6-1
4.6-2	4.6-2
4.6-3	4.6-3
4.6-4	4.6-4

4.6 PERIODIC TESTING OF EMERGENCY POWER SYSTEM

Applicability

Applies to periodic testing and surveillance requirements of the emergency power system.

Objective

To verify that the emergency power sources and equipment are operable.

Specification

The following tests and surveillance shall be performed:

a. Diesel Generators

1. Manually-initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly, loading the diesel generator to at least 2600 KW (nominal) for a period of at least 1 hour.
2. Automatic start of each diesel generator, load shedding, and restoration to operation of particular vital equipment, all initiated by a simulated loss of all normal a-c station service power supplies together with a simulated safety injection signal. This test will be conducted at each refueling interval to assure that each diesel generator will start and assume required loads to the extent possible within one minute, and operate for $\geq$5 minutes while loaded with the emergency loads.
3. Each diesel generator shall be inspected at each major refueling outage.
4. Diesel generator load rejection test in accordance with IEEE 387-1977, section 6.4.5 shall be performed at least once per 18 months.
5. Each diesel generator shall be loaded to 2950 KW (nominal) for 2 hours every operating cycle, not to exceed 18 months.

6. Safeguard Bus Undervoltage and Safeguard Bus Second Level Undervoltage relays shall be calibrated at least once per operating cycle (not to exceed 18 months).
7. During each operating cycle (not to exceed 18 months), a checkout of emergency lighting will be performed.

b. Station Batteries

1. The voltage of each cell shall be measured to the nearest hundredth volt each month. An equalizing charge shall be applied if the lowest cell in the battery falls below 2.13 volts. The temperature and specific gravity of a pilot cell in each battery shall be measured.
2. The following additional measurements shall be made every three months: the specific gravity and height of electrolyte in every cell and the temperature of every fifth cell.
3. All measurements shall be recorded and compared with previous data to detect signs of deterioration.
4. The batteries shall be subjected to a load test during the first refueling and once every five years thereafter. Battery voltage shall be monitored as a function of time to establish that the battery performs as expected during heavy discharge and that all electrical connections are tight.

BASIS TECHNICAL SPECIFICATION 4.6, PERIODIC TESTING OF EMERGENCY POWER SYSTEMS

Each diesel generator can start and be ready to accept full load within 10 seconds, and will sequentially start and supply the power requirements for one complete set of engineered safety features equipment in approximately one minute.(1)

The specified test frequencies provide reasonable assurance that any mechanical or electrical deficiency will be detected and corrected before it can result in failure of one emergency power supply to respond when called upon to function. Its possible failure to respond is, of course, anticipated by providing two diesel generators, each supplying through an independent bus, a complete and adequate set of engineered safety features equipment. Further, both diesel generators are provided as backup to multiple sources of external power, and this multiplicity of sources should be considered with regard to adequacy of test frequency.

BASIS TECHNICAL SPECIFICATION 4.6.a.1, MONTHLY DIESEL GENERATOR SURVEILLANCE

The monthly tests specified for the diesel generators will demonstrate their continued capability to start and carry rated load. The fuel supplies and starting circuits and controls are continuously monitored, and abnormal conditions in these systems would be indicated by an alarm without need for test startup. Monthly tests are performed in accordance with the intent of IEEE 387-1977, paragraph 6.6.1.

BASIS TECHNICAL SPECIFICATION 4.6.a.2, REFUELING INTERVAL DIESEL GENERATOR SURVEILLANCE

The refueling interval diesel generator surveillance demonstrates that the emergency power system, and its control system, will function automatically to provide engineered safety equipment power in the event of loss of offsite power coincident with a safety injection signal. This test demonstrates proper tripping of motor feeder breakers, main supply and tie breakers on the affected bus, and sequential starting of essential equipment to demonstrate operability of the diesel generators. This surveillance is performed to meet the intent of IEEE 387-1977 paragraph 6.6.2. (Note also that Reg. Guide 1.108 addresses diesel generator surveillance.)

A separate test demonstrates that the emergency lighting system is operable.

BASIS TECHNICAL SPECIFICATION 4.6.a.3, REFUELING INTERVAL DIESEL GENERATOR INSPECTION

Inspections are performed at refueling outage intervals in order to maintain the diesel generators in accordance with the manufacturers' recommendations. The inspection procedure is periodically updated to reflect experience gained from past inspections and new information as it is available from the manufacturer.

BASIS TECHNICAL SPECIFICATION 4.6.a.4, 18-MONTH LOAD REJECTION TEST

The load rejection test demonstrates the capability of rejecting the maximum rated load without overspeeding or attaining voltages which would cause the diesel generator to trip, mechanical damage, or harmful overstresses.

BASIS TECHNICAL SPECIFICATION 4.6.a.5, OPERATING CYCLE SHORT-TERM LOAD TEST

Loading the diesel generators to their short-term rating will demonstrate their capability to provide a continuous source of emergency AC power during a load perturbation of up to 112% of the diesel generator's continuous rating.

BASIS TECHNICAL SPECIFICATION 4.6.b STATION BATTERIES

Station batteries will deteriorate with time, but precipitous failure is extremely unlikely. The surveillance specified is that which has been demonstrated over the years to provide indication of a cell becoming unserviceable long before it fails.

If a battery cell has deteriorated, or if a connection is loose, the voltage under load will drop excessively, indicating need for replacement or maintenance.

Reference

(1) UFSAR Section 8.2

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 68 TO FACILITY OPERATING LICENSE NO. DPR-43

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

KEWAUNEE NUCLEAR POWER PLANT

DOCKET NO. 50-305

Introduction

By letter dated April 15, 1986, Wisconsin Public Service Corporation, et. al., proposed a change to its Technical Specifications for the Kewaunee Nuclear Power Plant which in effect would change the frequency of loading the diesel generators to their short-term rating from once each month to once each refueling cycle. The present Technical Specifications for monthly surveillance incorrectly references Paragraph 6.4.3 of IEEE Std. 387-1977 which applies to refueling cycle surveillance.

Evaluation

Technical Specification 4.6.a.1. presently states that tests will be conducted monthly in accordance with the intent of Paragraph 6.4.1 and 6.4.3 of IEEE 387-1977. The licensees propose to replace the words "in accordance with the intent of Paragraph 6.4.1 and 6.4.3 of IEEE 387-1977" with the words "loading the diesel generator to at least 2600 KW (nominal) for a period of at least 1 hour." In addition, the applicants propose to add Technical Specification 4.6.a.5 as follows:

> "5. Each diesel generator shall be loaded to 2950 KW (nominal) for 2 hours every operating cycle, not to exceed 18 months."

The effect of the changes would be to apply the continuous rating load test on a monthly cycle and a short-term rating load test on a refueling cycle basis. We find that these changes are consistent with Paragraph 6.6.1 of IEEE Std. 387-1977, which requires monthly tests at the lower continuous rating, and Paragraph 6.6.2 of IEEE Std. 387-1977, which requires less frequent tests at the higher short-term rating. We also find that the proposed testing frequencies are consistent with Regulatory Guide 1.108.

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PDR ADOCK 05000305
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The licensees also propose changes in the descriptive section (Basis) of Technical Specification 4.6.a. We have reviewed these descriptive changes and note their effect is to add to or clarify the purpose of the diesel generator testing. We find these changes acceptable.

Summary and Conclusion

Staff agrees that the licensees' proposed change in Technical Specification 4.6.a for the diesel generators is consistent with IEEE Std. 387-1977 and Regulatory Guide 1.108. A continuous rating load test will be performed on a monthly basis, whereas the short-term rating load test will be performed on a refueling cycle basis, not to exceed 18 months. We conclude that the proposed Technical Specification change will not adversely affect the health and safety of the public and that the proposed change is acceptable.

Environmental Consideration

This amendment involves a change to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR Sec 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor:
A. Toalston

Date: July 10, 1986

Reference 8

Letter from Robin L. Weeks (Engine Systems, Inc.) to P. DeTemple (DEK), "Reference: 20-645E4 Engine Ratings with EMD A20 Generator," dated May 19, 2006.

Engine Systems, Inc.

Nuclear Parts & Service

Friday, May 19, 2006 Revision 1

Dominion Energy
Kewaunee Power Station
Attn: Paul DeTemple

Reference: 20-645E4 Engine Ratings with EMD A20 Generator

Gentlemen:

The June 11, 1992 letter from MKW Power Systems regarding "EMD 645E4 Diesel Engine Ratings at Elevated Temperatures" applies to your diesel generators. Therefore your diesels are subject to derating based upon the instructions in the letter and the engine horsepower and generator KW ratings listed below.

Altitude derating is not required for the 20-645E4 engine below 7000 feet above sea level. We do not have any other factors of derating, and therefore air inlet temperature appears to be the only derating factor in your case.

The following ratings are based upon 90°F intake air temperature:

1. Continuous Operation Published Rating:
   - 3600 Brake Horsepower
   - 2600 KW

Note: All KW ratings are based upon an A20 generator efficiency of rating 97.2%

KW = HP x 0.746 x .972

Note: (1) Unit will operate at the Continuous Rating 24 hours with 10% overload for any 2 hours per 24 hours without additional maintenance.

Note: (2 – 5) If operated under the following conditions yearly maintenance must be preformed in accordance with EMD guidelines.

2. Overload Operation for 2000 Hr. Rating per year
   - 3950 Brake Horsepower
   - 2864 KW
3. Overload Operation for 200 Hr. Rating per year
   - 4100 brake Horsepower
   - 2973 KW
4. Overload Operation for 4 Hr. Rating per year
   - 4150 brake Horsepower
   - 3009 KW

COOPER ENERGY SERVICES
WOODWARD Industrial Controls
INGERSOLL-RAND ENGINE STARTING SYSTEMS
EMD ELECTRO-MOTIVE Authorized Distributor

175 Freight Road, Rocky Mount, NC 27804 / Telephone (252-977-2720) / Fax (252-446-3830)

5. Overload Operation for 30 Minutes per year
    - 4225 Brake Horsepower
    - 3050 KW

The above ratings are not cumulative and (2-5) are not subject to overload.

Operating outside of the limits specified above will subject the diesel generator to stresses beyond its design capability. The diesel generator is designed to operate reliably at the ratings specified above.

Although operations within these ratings are not detrimental to the diesel generator, regularly subjecting the diesel generator to these overload operations will accelerate wear. Accelerated component wear may negatively impact the machine's reliability and will result in more frequent teardown inspections in accordance with the manufacturer's recommendations.

Regular testing of the diesel generator at its continuous rating is sufficient to demonstrate functionality of the diesel generator while minimizing wear.

IEEE 387-1995 Specifies load testing at 90-100% of the continuous rating.

Should you have any questions or need additional information, please don't hesitate to call me @ 252-407-8517 or by email at robin.weeks@kirbycorp.com.

Sincerely,

Robin L. Weeks
Applications Engineer
Engine Systems, Inc.
(252) 407-8517
fax (252) 446-1134

Reference 9

Letter from D. A. Strickland (MKW Power Systems, Inc.) to M. Anthony (Duke Engineering and Services, Inc.), dated June 11, 1992

MKW POWER SYSTEMS, Inc.

DUKE ENGINEERING AND SERVICES, INC. Advanced Nuclear Programs RECEIVED JUN 17 1992 File_____	
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Proj.File ( )	

AUTHORIZED DISTRIBUTOR

June 11, 1992

Duke Engineering and Services, Inc.
230 South Tryon Street
P. O. Box 1004
Charlotte, N. C. 28201

Attention: Mike Anthony

Dear Mike,

It was a pleasure to meet you at the Owner's Group meeting, it is always nice to be able to tie a face to an name and voice. It was my impression that the meeting was conducted very well and produced positive results.

As I announced at the meeting; Don Galeazzi requested a meeting with EMD on Friday June 5, 1992 to discuss the engine rating curves. This was a direct result of the concerns and valued input from the members, voiced during the meeting.

We have attached the revised rating curves which were a result of that meeting.

We would appreciate it if you would distribute to the Owner's Group members.

Sincerely,

MKW Power Systems, Inc.

David A. Strickland
Nuclear Sales Representative

Post Office Box 1928 • Rocky Mount, North Carolina 27802-1928 • Phone: (919) 977-2720
TWX: (510) 929-0725 • FAX: (919) 446-3830

MKW POWER SYSTEMS, Inc.

EMD 645E4 Diesel Engine Ratings
at Elevated Temperatures
June 11, 1992

THE EMD 645 DIESEL ENGINE RATINGS ARE BASED ON 90°F ENGINE INTAKE AIR TEMPERATURE. FOR HIGHER INTAKE AIR TEMPERATURES THE ENGINE MUST BE DERATED IN ACCORDANCE WITH THE ATTACHED CURVE(S) AS DESCRIBED BELOW:

1. FOR OPERATION WHERE THE ENGINE COOLANT TEMPERATURE OUT OF THE ENGINE IS LIMITED TO 190°F:

   A. USE CURVE "B" FOR THE "CONTINUOUS", "SHORT-TIME" AND "2000 HR" RATINGS.

   * B. USE CURVE "A" FOR THE "200 HR", AND "4 HR" RATINGS.

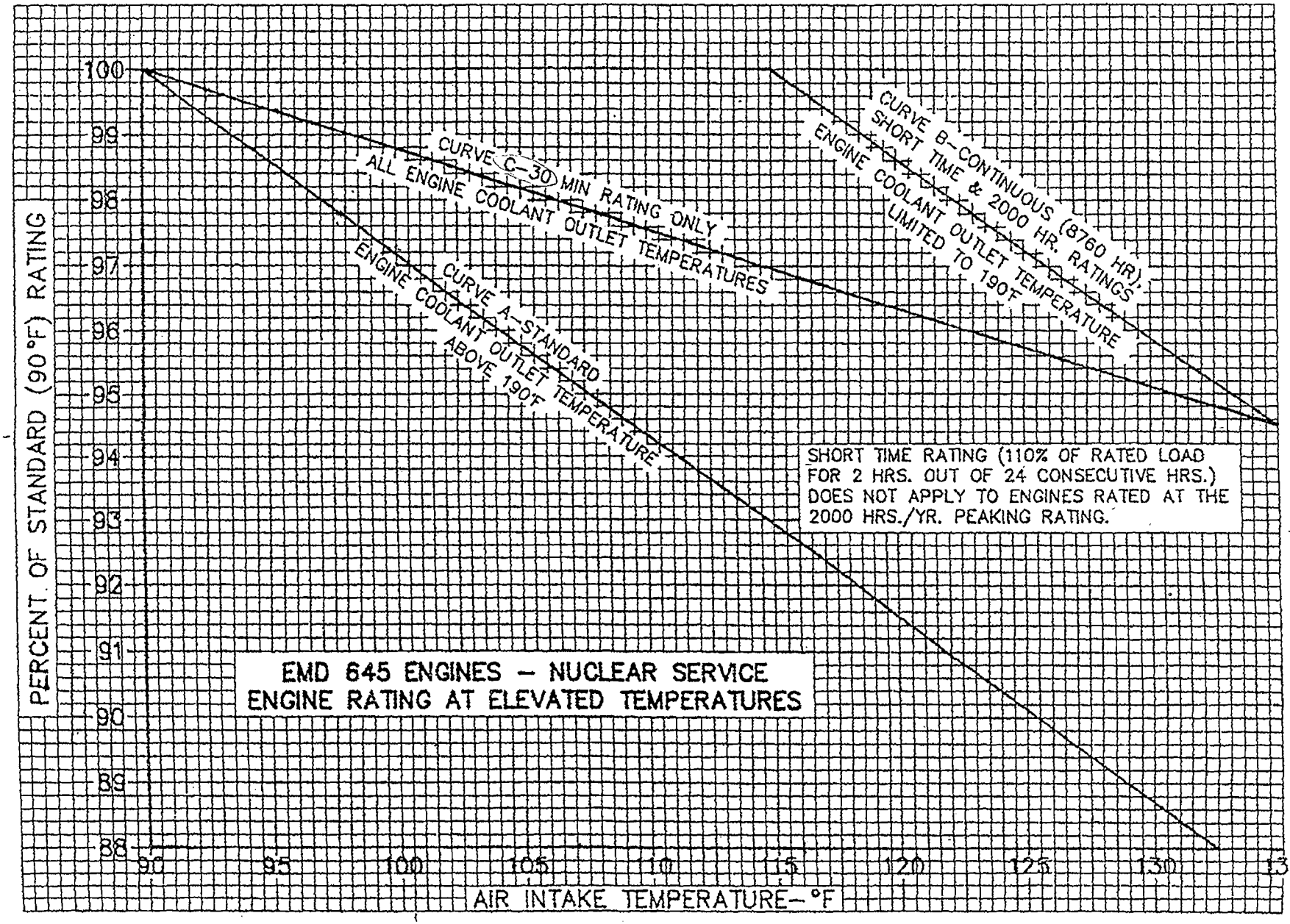
   * C. USE CURVE "C" FOR THE "30 MIN" RATING.

   * Where these curves intersect the 2000 hr rating curve, the 2000 hr rating curve will apply.

2. FOR OPERATION WHERE THE ENGINE COOLANT TEMPERATURE OUT OF THE ENGINE IS ABOVE 190°F:

   A. USE CURVE "A" FOR ALL RATINGS EXCEPT THE "30 MIN" RATING.

   B. USE CURVE "C" FOR THE "30 MIN" RATING.



EMD 645 ENGINES — NUCLEAR SERVICE
ENGINE RATING AT ELEVATED TEMPERATURES

ATTACHMENT 5

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING KEWAUNEE LICENSE AMENDMENT REQUEST 230

REVISED MARKED UP AND AFFECTED TECHNICAL SPECIFICATION PAGES

KEWAUNEE POWER STATION

DOMINION ENERGY KEWAUNEE, INC.

4.6 PERIODIC TESTING OF EMERGENCY POWER SYSTEM

APPLICABILITY

Applies to periodic testing and surveillance requirements of the emergency power system.

OBJECTIVE

To verify that the emergency power sources and equipment are OPERABLE.

SPECIFICATION

The following tests and surveillance shall be performed:

a. Diesel Generators

1. Manually-initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly, loading the diesel generator to at least 2600 KW (nominal) for a period of at least 1 hour.

2. Automatic start of each diesel generator, load shedding, and restoration to operation of particular vital equipment, all initiated by a simulated loss of all normal a-c station service power supplies together with a simulated safety injection signal. This test will be conducted at each REFUELING interval to assure that each diesel generator will start and assume required loads to the extent possible within 1 minute, and operate for ≥ 5 minutes while loaded with the emergency loads.

3. Each diesel generator shall be inspected at each major REFUELING outage.

4. Diesel generator load rejection test in accordance with IEEE 387-1977, Section 6.4.5, shall be performed at least once per 18 months.

5. Each diesel generator shall be operated ~~loaded at a power factor of ≤ 0.9, or as close to the power factor limit as practicable when in parallel operation,~~ for ≥ 24 hours every operating cycle:

   Note 1 Momentary transients outside the load and power factor ranges do not invalidate this test.

   Note 2 This Surveillance shall not normally be performed in the OPERATING or HOT STANDBY MODE. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this surveillance requirement.

   Note 3 If performed with the diesel generator synchronized with offsite power, it shall be performed at a power factor ≤ 0.9. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable.

   A. For ≥ 2 hours loaded ~~to ≥ 2730 KW and ≤~~to 2860~~2950~~ KW ~~-~~(nominal)~~(nominal)~~ and,

   B. For the remaining hours of the test loaded ~~≥ 2340 KW and ≤~~to 2700 KW (nominal) ~~for 2 hours every operating cycle~~.

6. Safeguard bus undervoltage and safeguard bus second level undervoltage relays shall be calibrated at least once per operating cycle.

b. Station Batteries

1. The voltage of each cell shall be measured to the nearest hundredth volt each month. An equalizing charge shall be applied if the lowest cell in the battery falls < 2.13 volts. The temperature and specific gravity of a pilot cell in each battery shall be measured.

2. The following additional measurements shall be made quarterly: the specific gravity and height of electrolyte in every cell and the temperature of every fifth cell.

3. All measurements shall be recorded and compared with previous data to detect signs of deterioration.

4. The batteries shall be subjected to a load test during the first REFUELING and once every 5 years thereafter. Battery voltage shall be monitored as a function of time to establish that the battery performs as expected during heavy discharge and that all electrical connections are tight.

4.6 PERIODIC TESTING OF EMERGENCY POWER SYSTEM

APPLICABILITY

Applies to periodic testing and surveillance requirements of the emergency power system.

OBJECTIVE

To verify that the emergency power sources and equipment are OPERABLE.

SPECIFICATION

The following tests and surveillance shall be performed:

a. Diesel Generators

1. Manually-initiated start of each diesel generator, and assumption of load by the diesel generator. This test shall be conducted monthly, loading the diesel generator to at least 2600 KW (nominal) for a period of at least 1 hour.

2. Automatic start of each diesel generator, load shedding, and restoration to operation of particular vital equipment, all initiated by a simulated loss of all normal a-c station service power supplies together with a simulated safety injection signal. This test will be conducted at each REFUELING interval to assure that each diesel generator will start and assume required loads to the extent possible within 1 minute, and operate for ≥ 5 minutes while loaded with the emergency loads.

3. Each diesel generator shall be inspected at each major REFUELING outage.

4. Diesel generator load rejection test in accordance with IEEE 387-1977, Section 6.4.5, shall be performed at least once per 18 months.

5. Each diesel generator shall be operated for ≥ 24 hours every operating cycle:

   Note 1 Momentary transients outside the load and power factor ranges do not invalidate this test.

   Note 2 This Surveillance shall not normally be performed in the OPERATING or HOT STANDBY MODE. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this surveillance requirement.

   Note 3 If performed with the diesel generator synchronized with offsite power, it shall be performed at a power factor ≤ 0.9. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable.

   A. For ≥ 2 hours loaded to 2860 KW (nominal) and,

   B. For the remaining hours of the test loaded to 2700 KW (nominal).

6. Safeguard bus undervoltage and safeguard bus second level undervoltage relays shall be calibrated at least once per operating cycle.

b. Station Batteries

1. The voltage of each cell shall be measured to the nearest hundredth volt each month. An equalizing charge shall be applied if the lowest cell in the battery falls < 2.13 volts. The temperature and specific gravity of a pilot cell in each battery shall be measured.

2. The following additional measurements shall be made quarterly: the specific gravity and height of electrolyte in every cell and the temperature of every fifth cell.

3. All measurements shall be recorded and compared with previous data to detect signs of deterioration.

4. The batteries shall be subjected to a load test during the first REFUELING and once every 5 years thereafter. Battery voltage shall be monitored as a function of time to establish that the battery performs as expected during heavy discharge and that all electrical connections are tight.

BASIS – Periodic Testing of Emergency Power Systems (TS 4.6)

~~Periodic Testing of Emergency Power Systems, TS 4.6~~

Each diesel generator can start and be ready to accept full load within 10 seconds, and will sequentially start and supply the power requirements for one complete set of engineered safety features equipment in approximately one minute.[1] This test will be conducted during each REFUELING outage to ~~assure~~ ensure that the diesel generator will start and assume required loads in accordance with the timing sequence ~~through step 9~~ listed in USAR Table 8.2-1 after the initial starting sequence.

The specified test frequencies provide reasonable assurance that any mechanical or electrical deficiency will be detected and corrected before it can result in failure of one emergency power supply to respond when called upon to function. Its possible failure to respond is, of course, anticipated by providing two diesel generators, each supplying through an independent bus, a complete and adequate set of engineered safety features equipment. Further, both diesel generators are provided as backup to multiple sources of external power, and this multiplicity of sources should be considered with regard to adequacy of test frequency.

Monthly Diesel Generator Surveillance~~,~~ (TS 4.6.a.1)

The monthly tests specified for the diesel generators will demonstrate their continued capability to start and carry rated load. The fuel supplies and starting circuits and controls are continuously monitored, and abnormal conditions in these systems would be indicated by an alarm without need for test startup. Monthly tests are performed in accordance with the intent of IEEE 387-1977, paragraph 6.6.1.

REFUELING Interval Diesel Generator Surveillance~~,~~ (TS 4.6.a.2)

The REFUELING interval diesel generator surveillance demonstrates that the ~~e~~Emergency ~~power~~ Power ~~system~~System, and its control system, will function automatically to provide engineered safety equipment power in the event of loss of off-site power coincident with a safety injection signal. This test demonstrates proper tripping of motor feeder breakers, main supply and tie breakers on the affected bus, and sequential starting of essential equipment to demonstrate OPERABILITY of the diesel generators. This test is initiated by simultaneously unblocking safety injection and simulating a loss-of-voltage signal. This surveillance is performed to meet the intent of IEEE 387-1977 paragraph 6.6.2. (Note also that Reg. Guide 1.108 addresses diesel generator surveillance.)

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[1] USAR Section 8.2

REFUELING Interval Diesel Generator Inspection, TS 4.6.a.3

Inspections are performed at REFUELING outage intervals in order to maintain the diesel generators in accordance with the manufacturers' recommendations. The inspection procedure is periodically updated to reflect experience gained from past inspections and new information as it is available from the manufacturer.

18-Month Load Rejection Test, TS 4.6.a.4

The load rejection test demonstrates the capability of rejecting the maximum rated load without overspeeding or attaining voltages which would cause the diesel generator to trip, mechanical damage, or harmful overstresses.

Operating Cycle Short-Term Load Test, TS 4.6.a.5

Loading the diesel generators to their short-term rating will demonstrate their capability to provide a continuous source of emergency AC power during a load perturbation of up to 110~~2~~% of the diesel generator's continuous rating.

IEEE 387-1977 paragraph 3.7.2, defines a diesel generators short time rating. Paragraph 6.4.3 defines the rated load test for diesel generators, and item 2 states to load the diesel generator to the short time rating for 2 hours. Paragraph 6.6.2 describes the operational testing to be performed for the diesel generators. Although the rated load test is not listed in paragraph 6.6.2, item 2 of paragraph 6.4.3 has been determined to be necessary to be performed on the emergency diesel generators.

NRC Regulatory Guide 1.9, Revision 2, Regulatory Position 14, describes the method in which this test should be performed. This test follows Position 14 except that instead of the continuous rating load being applied for 22 hours the KPS emergency diesel generators shall be loaded to 2700 kW for 22 hours. Loading the emergency diesel generators to 2700 kW is acceptable because it will bound the post-accident emergency diesel generator loads without increasing the frequency of the 18-month diesel inspection surveillance. ~~and 2.2.9 at every refueling outageonce per 18 months~~ The diesel generator starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelubricating, warmup, and for gradual loading are applicable to this surveillance requirement.

The "once per operating cycle" f~~F~~requency is consistent with the recommendations of IEEE Std. 387-1977, paragraph 6.6.2, takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

Three n~~N~~otes modify this Surveillance. Note 1 states that momentary transients due to changing busloads do not invalidate this test. Similarly, momentary power factor transients above the power factor operation will not invalidate the test. The reason for Note 2 is that during operation with the reactor critical, performance of this Surveillance could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, unit safety systems. This restriction from normally performing the Surveillance in the OPERATING or HOT STANDBY MODE is further amplified to allow the Surveillance to be performed for reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant

safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed Surveillance, a successful Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when the Surveillance is performed in the OPERATING or HOT STANDBY MODE. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this surveillance requirement.

Note 3 ensures that the DG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.9. This power factor is representative of the actual inductive loading a DG would see under design basis accident conditions. Under certain conditions, however, Note 3 allows the Surveillance to be conducted as a power factor other than ≤ 0.9. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.9 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.9 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the DG excitation levels needed to obtain a power factor of 0.9 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the diesel generator. In such cases, the power factor shall be maintained close as practicable to 0.9 without exceeding the diesel generator excitation limits.

Station Batteries, TS 4.6.b

Station batteries will deteriorate with time, but precipitous failure is extremely unlikely. The surveillance specified is that which has been demonstrated over the years to provide indication of a cell becoming unserviceable long before it fails.

If a battery cell has deteriorated, or if a connection is loose, the voltage under load will drop excessively, indicating need for replacement or maintenance.