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PG&E Letter DCL-10-018

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

10 CFR 50.90

Diablo Canyon Units 1 and 2
Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
License Amendment Request 10-01
Revision to Technical Specification 3.8.1, "AC Sources - Operating"

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.90, Pacific Gas and Electric Company (PG&E) hereby requests approval of the enclosed proposed amendment to Facility Operating License Nos. DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP) respectively. The enclosed license amendment request (LAR) proposes to revise the Technical Specification (TS) 3.8.1, "AC Sources - Operating," Surveillance Requirement (SR) 3.8.1.3 Diesel Generator (DG) load band, the SR 3.8.1.10 DG power factor and load band, the SR 3.8.1.14 DG power factor and load values, and the SR 3.8.1.15 Note 1 DG load band. In addition, SR 3.8.1.10 and SR 3.8.1.14 are revised to add a new note addressing the power factor limit when testing with the DG synchronized with offsite power.

The changes in this LAR are not required to address an immediate safety concern. PG&E requests approval of this LAR no later than February 24, 2011. PG&E requests the license amendment(s) be made effective upon NRC issuance, to be implemented within 120 days from the date of issuance.

This communication contains new commitments to be implemented following NRC approval of the LAR. The commitments are contained in the Attachment 4 of the Enclosure.

If you have any questions or require additional information, please contact Tom Baldwin at 805-545-4720.

A001
NRR

I state under penalty of perjury that the foregoing is true and correct.

Executed on February 24, 2010.

Sincerely,

James R. Becker
Site Vice President

kjse/4328 SAPN 50232181
Enclosure: Evaluation of the Proposed Change
cc: Gary W. Butner, Acting Branch Chief, California Department of Public Health
Elmo E. Collins, NRC Region IV
Michael S. Peck, NRC, Senior Resident Inspector
Diablo Distribution
cc/enc: Alan B. Wang, Project Manager, Office of Nuclear Reactor Regulation

Evaluation of the Purpose Change

License Amendment Request 10-01
Revision to Technical Specification 3.8.1, "AC Sources - Operating"

ATTACHMENTS:

1. Technical Specification Markups
2. Retyped Technical Specification Pages
3. Technical Specification Bases Page Markups
4. Commitments
5. PG&E Calculation No. 9000037760, Revision 20
6. PG&E Calculation No. 9000040769, Revision 0

EVALUATION

1. SUMMARY DESCRIPTION

This letter is a request to amend Operating Licenses DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP), respectively.

The proposed changes would revise the Operating Licenses to revise the Technical Specification (TS) 3.8.1, "AC Sources - Operating," Surveillance Requirement (SR) 3.8.1.3 Diesel Generator (DG) load band, the SR 3.8.1.10 DG power factor and load band, the SR 3.8.1.14 DG power factor and load values, and the SR 3.8.1.15 Note 1 DG load band. In addition, SR 3.8.1.10 and SR 3.8.1.14 are revised to add a new note addressing the power factor limit when testing with the DG synchronized with offsite power.

The current TS 3.8.1 SRs contain load and power factor values that are nonconservative compared to the worst case design basis accident loading conditions contained in the existing calculations. The changes proposed in this License Amendment Request (LAR) correct the nonconservative DG load and power factor values contained in the current TS 3.8.1 SRs.

2. DETAILED DESCRIPTION

Proposed Amendment

The following changes are proposed to the TS 3.8.1 SRs:

SR 3.8.1.3 is revised from:

Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 2340 kW and ≤ 2600 kW.

to:

Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 2475 kW and ≤ 2750 kW.

SR 3.8.1.10 is revised from:

Verify each DG operating at a power factor ≤ 0.87 does not trip and voltage is maintained ≤ 5075 V during and following a load rejection of ≥ 2340 kW and ≤ 2600 kW.

to:

------------------------NOTE---------------------------
If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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.

Verify each DG does not trip and voltage is maintained ≤ 5075 V during and following a load rejection of ≥ 2475 kW and ≤ 2750 kW.

SR 3.8.1.14 is revised from:

----------------------------NOTES----------------------------
1. Momentary transients outside the load and power factor ranges do not invalidate this test.

Verify each DG operating at a power factor ≤0.87 operates for ≥ 24 hours:

a. For ≥ 2 hours loaded ≥ 2600 kW and ≤ 2860 kW; and

b. For the remaining hours of the test loaded ≥ 2340 kW and ≤ 2600 kW.

to:

----------------------------NOTES----------------------------
1. Momentary transients outside the load and power factor ranges do not invalidate this test.
2. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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.

Verify each DG operates for ≥ 24 hours:

a. For ≥ 2 hours loaded ≥ 2750 kW and ≤ 2860 kW; and

b. For the remaining hours of the test loaded ≥ 2475 kW and ≤ 2750 kW.

SR 3.8.1.15 Note 1 is revised from:

----------------------------NOTES----------------------------

1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 2340 kW and ≤ 2600 kW.

to:

----------------------------NOTES----------------------------

1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 2475 kW and ≤ 2750 kW.

In summary, the DG load band is revised in TS 3.8.1 SR 3.8.1.3. The DG power factor and load band are revised in SR 3.8.1.10 and a new note is added addressing the power factor limit when testing with the DG synchronized with offsite power. The DG power factor and load values, except the peak load value, are revised in SR 3.8.1.14 and a new note is added addressing the power factor limit when testing with the DG synchronized with offsite power. The DG load band is revised in Note 1 of SR 3.8.1.15.

The TS 3.8.1 Bases are revised to reflect the revised load and power factor values and the addition of the new notes to SR 3.8.1.10 and 3.8.1.14.

The TS Bases changes are included for information only.

The proposed TS changes are noted on the marked-up TS page provided in Attachment 1. The proposed retyped TS is provided in Attachment 2. The revised TS Bases is contained for information only in Attachment 3.

<u>Alternate Current (AC) Electrical Power Distribution System AC Sources</u>

The DCPP AC Electrical Power Distribution System AC sources consist of offsite power sources (normal and alternate), and the onsite standby power sources (three DGs for each unit). The design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the Engineered Safety Feature (ESF) systems.

The onsite Class 1E AC Distribution System for each unit is divided into three load groups so that the loss of any one group does not prevent the minimum safety functions from being performed. Each load group has connections to two offsite power sources and a single DG.

Offsite power is supplied to the 230 kV and 500 kV switchyards from the transmission network by two 230 kV transmission lines and three 500 kV transmission lines. These two electrically and physically separated circuits provide AC power, through auxiliary and standby startup transformers, to the 4.16 kV ESF buses. A detailed description of the offsite power network and the circuits to the Class 1E buses is found in the Final Safety Analysis Report Update (FSARU) Chapter 8.

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the transformer supplying offsite power to the onsite Class 1E Distribution System. Within 1 minute after the initiating signal is received, all automatic and permanently connected loads needed to recover the unit or maintain it in a safe, condition are returned to service via the load sequencer timers (auto transfer timers). Each ESF component is provided with its own sequencing timer.

The onsite standby power source for each 4.16 kV ESF bus is a dedicated DG. For Unit 1, DGs 1-1, 1-2, and 1-3 are dedicated to ESF buses H, G, and F, respectively. For Unit 2, DGs 2-1, 2-2, and 2-3 are dedicated to ESF buses G, H, and F. A DG starts automatically on a safety injection (SI) signal (e.g., low pressurizer pressure or high containment pressure signals), undervoltage on the offsite standby startup source, or on an ESF bus degraded voltage or undervoltage signal. After the DG has started, it will automatically tie to its respective bus after offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with an SI signal. The DGs will also start and operate in the standby mode without tying to the ESF bus on an SI signal alone or if voltage recovers. Following the trip of offsite power, an undervoltage signal strips nonpermanent loads from the ESF bus. When the DG is tied to the ESF bus, loads are then sequentially connected to their respective ESF bus by the load sequencing timers (ESF timers). The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the DG. Each ESF component is provided with its own load sequencing timer.

In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the DG in the process. Within 1 minute after the initiating signal is received, all loads needed to recover the unit or maintain it in a safe condition are returned to service.

The 4.16 kV/480 V load center transformer loading is required to be less than the self-cooled 1000 kVA rating.

DG Design

The six DGs for Units 1 and 2 are essentially identical, self-contained units housed in individual compartments at the 85 foot elevation in the turbine-generator building. Three are located in the northwest or Unit 1 portion, and three are located in the southwest or Unit 2 portion of the structure. The compartments separate each DG and its accessories from the adjacent units and conform to Design Class I requirements.

The DGs have a net continuous electrical output rating of 2600 kW at 0.8 PF (continuous rating), and are rated for 2752 kW at 0.8 PF and 60 Hz for up to 2000 hours of operation per year (2000-hour rating). Short-term ratings of the DGs are 3000 kW at 0.8 PF for 2 hours per year, 2860 kW at 0.8 PF for 2 hours per 24-hour period (2-hour per 24 hour rating), and 3250 kW at 0.8 PF for 30 minutes per 24 hour period (30-minute per 24 hour rating). During the starting sequence for the safeguard loads, these machines can also carry short-time overloads.

During a design basis-loading scenario with nominal timer interval, these machines maintain the electric power frequency within 5 percent, hold voltages to a minimum of 75 percent, and recover successfully by complying with Safety Guide (SG) 9 in all respects except for DG frequency recovery criteria. The frequency recovery meets the applicable criteria of Regulatory Guide (RG) 1.9, Revision 2, Section C, Position 4. This exception to SG 9 was performed under 10 CFR 50.59.

In addition to testing and analysis to demonstrate performance for nominal timer intervals, preoperational tests and computer simulation were performed for a design basis-loading scenario with the worst case timer drift and tolerances. During this scenario, for the last load block, frequency dipped below 95 percent and recovery times in excess of 60 percent of the timer interval were observed. The frequency recovery times exceeding 60 percent of timer interval were justified by analysis following the guidelines of RG 1.9, Revision 2. The frequency dip below 95 percent was for a fraction of a second and the DG showed strong recovery capability, demonstrating that the objectives of SG 9 were met.

Each DG unit consists of a self-contained diesel engine directly connected to an alternating current generator, and the separate accessories needed for proper operation, all mounted on a common structural steel skid-type base. Mechanical power is provided by an 18 cylinder, four-cycle, 3630 horsepower at 900 rpm, turbocharged and aftercooled, heavy-duty, stationary-type diesel engine.

The generator is rated at 3250 kVA, 0.8 PF, 4160 V, and 60 Hz. The exciter is a static series, boost-type exciter controlled by a static solid-state voltage regulator.

The DG units were supplied by the ALCO Engine Division of White Industrial Power, Inc. The sixth DG, DG 2-3, was manufactured by General Electric Locomotives. In most respects, this DG is similar to the other five DGs.

Calculation for DG Loading for Vital Bus Loads

The current calculation that determines the DG loading for the vital bus loads is Calculation No. 9000037760, Revision 20, which is contained in Attachment 5. The current calculation that determines the worst case accident for the rotating equipment mechanical loads is Calculation No. 9000040769, Revision 0, which is contained in Attachment 6.

The DG loading calculation determines the DG load and power factor for each of the three DGs for DCPP Unit 1 and 2 for the worst case frequency and voltage tolerances (61.2 Hz and 110 percent voltage). The assumptions of the DG loading calculation are described in Section 3.0 of the calculation. A summary of the significant assumptions of the DG loading calculation are as follows:

- Single failure criteria relative to DG loading were considered
- The worst case postulated accident scenario is the large break loss-of-coolant accident
- The highest brake horsepower demand for each pump is assumed regardless of the relative transient time at which the highest demand occurs
- For single pump operation, the highest brake horsepower demand is used and for parallel pump operation for those pumps with shared discharge flowpaths lower brake horsepower demand is used based on system operation
- The maximum demand for nonrotating equipment that automatically connects to the bus is conservatively used without consideration as to when in scenario the peak load occurs
- Redundant 480 V loads are assumed to be operating independently regardless of shared fluid systems to maximize load on each component and the DG
- Diversity factors were applied to account for the noncontinuous loads
- Momentary loads, which may consist of transformer inrush, motor starting inrush, motor operated valves, and inrush associated with control circuits components that change state are not included because they do not operate continuously and are within the short-time capability of the engine generators
- The final steady state load at the conclusion of the automatic loading sequence for DG automatic loads are considered and manual addition

of other loads post accident are not considered since they are procedurally controlled and plant Operators are responsible to ensure the DG rating is not exceeded when initiating manual loads

- Cable and transformer losses were considered
- The alternate feed to loads equipped with manual transfer switches that are administrative controlled by procedure are assumed to be unloaded
- A maximum frequency tolerance of 2 percent and voltage tolerance of 10 percent are considered based on the TS 3.8.1 SR limits
- KVAR loading was considered on a component by component basis

The results of the DG load calculation are contained in Section 8.0 of the calculation. The limiting DG is Unit 2 Bus F DG 2-3, which has a margin of 45 kW to the 2000-hour rating of 2752 kW (rating based on at 60 Hz) at the worst case frequency and voltage variation of 61.2 Hz and 110 percent voltage. Since tests for SRs 3.8.1.3, 3.8.1.10, and 3.8.1.14 are performed with the DG synchronized with the offsite electrical system, operation at other than 60 Hz is not feasible during the testing. Therefore, a value of 2750 kW based on the DG 2000-hour rating (rounded down) has been determined for DG testing at 60 Hz for SRs 3.8.1.3, 3.8.1.10, and 3.8.1.14. A load value of 2750 kW for DG testing at 60 Hz for SRs 3.8.1.3, 3.8.1.10, and 3.8.1.14 and bounds the maximum expected accident load.

The calculation determined the limiting DG power factor is 0.858 for Unit 1 Bus F DG 1-3 at 60 Hz and 100 percent voltage. This is greater than the DG power factor limit of grater than or equal to 0.8.

Purpose for Proposed Amendment

The current TS 3.8.1 SRs contain load and power factor values that are nonconservative compared to the worst case design basis accident loading conditions contained in the existing calculations. The DG load values contained in current SRs 3.8.1.3, 3.8.1.10, 3.8.1.14, and 3.8.1.15 are based on the continuous rating of the DG, which is less than the maximum expected accident loads. In addition, the power factor values contained in SRs 3.8.1.10 and 3.8.1.14 are greater than the minimum expected accident power factors. The changes proposed in this LAR correct the nonconservative DG load and power factor values contained in the current TS 3.8.1 SRs.

During investigation to respond to NRC resident inspector observations related to the inspector implementation of NRC Temporary Instruction 2515/176, “Emergency Diesel Generator Technical Specification Surveillance Requirements Regarding Endurance and Margin Testing,” dated May 16, 2008, PG&E determined the DG load calculations needed to be revised. In response to the inspectors' observations on the DG load calculations, PG&E entered the condition in the corrective action program in Notification 50179082 on January 19, 2009, and performed an operability evaluation and concluded that the DGs were capable of performing their intended safety function and remained operable.

To address the NRC observations on the DG load calculations, PG&E created calculations 9000037760, Revision 20, and calculation 9000040769, Revision 0. The revised required DG load values were verified to be bounded by the load values required by the surveillance test procedures.

During the course of revising calculations 9000037760, Revision 20, and calculation 9000040769, Revision 0, PG&E determined that the overall calculated power factor of the vital busses F, G, and H could be as low as 0.85, that the power factor is lower than the 0.87 value contained in the current TS 3.8.1 SRs, and that the 0.87 value used in the TS 3.8.1 SRs is nonconservative. This condition was entered into the PG&E corrective action program on April 9, 2009, in Notification 50231656. A prompt operability assessment was performed and determined the DGs are capable of performing their intended safety function and are capable of carrying the worst-case calculated load. Technical Specification SR 3.0.3 was entered as a result of the TS SR 3.8.1.10 and SR 3.8.1.14 not being met. The surveillance test procedures STP M-9D1 for SR 3.8.1.10 and STP M-9G for SR 3.8.1.14 were updated to include a maximum power factor value of 0.85 including instrument uncertainty. STP M-9D1 and STP M-9G were performed on all six DGs to verify SR 3.8.1.10 and SR 3.8.1.14 were met for a power factor of 0.85.

This LAR does not include any proposed changes to DCPP compliance with Safety Guide 9. The maximum load limit for the remaining hours of the SR 3.8.1.14.b endurance test is based on the DG 2000-hour rating, which envelopes the maximum expected accident load and is greater than the continuous duty rating of the DG as specified by Regulatory Guide 1.108, Revision 1.

No change is proposed to the power factor value of less than or equal to 0.9 in SR 3.1.8.9 Note 2 because SR 3.8.1.9 is performed in isochronous mode with the DG separated from offsite power.

3. TECHNICAL EVALUATION

SR 3.8.1.3 Revision

The current SR 3.8.1.3 load band of 2340 kW to 2600 kW is based on 90 to 100 percent of the DG continuous rating of 2600 kW. The maximum expected accident load is greater than the DG continuous rating. The proposed maximum load limit of 2750 kW for SR 3.8.1.3 bounds the maximum expected accident load.

The proposed minimum load limit of 2475 kW for SR 3.8.1.3 is 90 percent of the maximum load limit value, consistent with the current SR 3.8.1.3 minimum load limit, which is 90 percent of the maximum load limit. Operation during testing within a load band of 90 to 100 percent of the maximum load limit value of 2750 kW without anomalies will provide adequate assurance of the DG ability to carry 100 percent of maximum expected accident load and avoid routine exceeding of the DG 2000-hour rating. Routine exceeding of the DG 2000-hour rating may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG operability. Verification that the DG is able to carry greater than 100 percent of maximum expected accident load is ensured through performance of the proposed SR 3.8.1.14.a.

SR 3.8.1.10 Revision

A new Note 1 is added to SR 3.8.1.10 to address DG testing while the DG is synchronized with offsite power. For DCPP, SR 3.8.1.10 is performed with the DG synchronized with offsite power. The note specifies the test shall be performed at a power factor less than or equal to 0.85, however, if grid conditions do not permit, the power factor limit is not required to be met and under this condition the power factor shall be maintained as close to the limit as practicable. The Note moves the power factor limit from the SR to the Note.

The DG power factor limit of less than or equal to 0.85 proposed in Note 1 is less than the minimum expected accident power factor of 0.858. The proposed DG power factor limit of less than or equal to 0.85 is greater than the DG power factor limit of greater than or equal to 0.8.

The proposed Note 1 is consistent with NUREG-1431, Revision 3.1, SR 3.8.1.10 Note 2. The proposed Note 1 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 less than or equal to 0.85. This power factor is representative of the actual inductive loading a DG would see under design basis accident conditions. Under certain conditions, however, Note 1 allows the Surveillance to be conducted at a power factor other than less than or equal to 0.85. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to less than or equal to 0.85 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 0.85 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 0.85 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained as close as practicable to 0.85 without exceeding the DG excitation limits.

When the DGs are operating synchronized to the grid, increasing the exciter current increases the generator reactive load (kVAR) and also increases the voltage of the associated bus. Increasing the reactive load at a given real load (kW) increases the apparent load (kVA) and decreases the power factor. The maximum apparent load at which a DG operates is dependent on the corresponding safeguards bus voltage that results from increasing the exciter current to attain the apparent load. The safeguards buses are limited to 4400 V (approximately 105.8 percent of the bus nominal 4160 Volts) to protect the safeguards motors. To achieve a test power factor of 0.85 requires 1704 kVAR on a DG at 2750 kW. As a result of the decreased proposed power factor of less than or equal to 0.85 combined with the increased maximum load limit value of 2750 kW under certain grid conditions, the required kVAR may not be attainable due to the bus voltage limitations. During these situations, the provisions of the proposed Note 1 would be invoked. Additional guidance will be provided to operators in the surveillance procedures as part of implementation of the license amendment request to provide guidance to the operators on use of the new Note added to SR 3.8.1.10 and SR 3.8.1.14.

The current SR 3.8.1.10 load band of 2340 kW to 2600 kW is based on 90 to 100 percent of the DG continuous rating of 2600 kW. The maximum expected accident load is greater than the DG continuous rating. The proposed maximum load limit value of 2750 kW for SR 3.8.1.10 bounds the maximum expected accident load.

The proposed minimum load limit value of 2475 kW for SR 3.8.1.10 is 90 percent of the maximum load limit value, consistent with the current SR 3.8.1.10 minimum load limit which is 90 percent of the maximum load limit. Operation during testing within a load band of 90 to 100 percent of the maximum load limit value of 2750 kW without anomalies will provide adequate assurance of the DG ability to carry 100 percent of maximum expected accident load and avoid routine exceeding of the DG 2000-hour rating. Routine exceeding of the DG 2000-hour rating may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG operability. Verification that the DG is able to carry greater than 100 percent of maximum expected accident load is ensured through performance of the proposed SR 3.8.1.14.

<u>SR 3.8.1.14</u>

A new Note 2 is added to SR 3.8.1.14 to address DG testing while the DG is synchronized with offsite power. For DCPP, SR 3.8.1.14 is performed with the DG synchronized with offsite power. The note specifies the test shall be performed at a power factor less than or equal to 0.85, however, if grid conditions do not permit, the power factor limit is not required to be met and under this condition the power factor shall be maintained as close to the limit as practicable. The Note moves the power factor limit from the SR to the Note.

The DG power factor limit of less than or equal to 0.85 proposed in Note 2 is less than the minimum expected accident power factor of 0.858. The proposed DG power factor limit of less than or equal to 0.85 is greater than the DG power factor limit of greater than or equal to 0.8. The proposed Note 2 is consistent with NUREG-1431, Revision 3.1, SR 3.8.1.14 Note 3. The proposed Note 2 ensures that the DG is tested under load conditions that are as close to design basis conditions as possible. The technical justification for the Note is the same as previously described for proposed SR 3.8.10 Note 1.

RG 1.108, Revision 2, Position 2.a.(3) states to demonstrate the full load carrying capability for an interval of not less than 24 hours of which 22 hours should be at a load equivalent to the continuous rating of the DG, and 2 hours at the load equivalent to the 2-hour rating of the DG. The current maximum load limit value of 2860 kW in SR 3.8.1.14.a meets RG 1.108, Revision 2, Position 2.a.(3) since it is the 2-hour per 24-hour rating of the DG.

The proposed minimum load limit value of 2750 kW for SR 3.8.1.14.a will provide assurance of the DG ability to carry 100 percent of maximum expected accident load since it bounds the maximum expected accident load.

The load band with the proposed minimum load limit value is 2750 kW to 2860 kW and results in a reduction in the current surveillance load band magnitude from 260 kW to 110 kW. A load band magnitude of 110 kW will continue to be adequate for the surveillance test procedure to utilize a test load value for the minimum 2750 kW limit that includes instrument uncertainty in order to account for instrument uncertainties. The surveillance test procedure will use a test load value without instrument uncertainty applied to verify the current maximum SR 3.8.1.14.a load limit of 2860 kW is met because a load band magnitude of 110 kW is too small to apply instrument uncertainties to the test load value when the test load value includes instrument uncertainty to ensure the minimum 2750 kW limit is met. The use of a test load value without instrument uncertainty applied to verify the current maximum SR 3.8.1.14.a load limit of 2860 kW is met is acceptable because the load limit of 2860 kW is based on 110 percent of the DG continuous rating at a power factor of 0.8 and the surveillance test is performed at a DG power factor greater than 0.8.

The proposed maximum load limit of 2750 kW for the remaining hours of the SR 3.8.1.14.b endurance test is based on the 2000-hour rating, which envelopes the maximum expected accident load and is greater than the continuous duty rating of the DG as specified by Regulatory Guide 1.108, Revision 1. The proposed minimum load limit value of 2475 kW for SR 3.8.1.14.b is 90 percent of the maximum load limit value, consistent with the current SR 3.8.1.14 minimum load limit, which is 90 percent of the maximum load limit. Operation during testing within a load band of 90 to 100 percent of the maximum load limit value of 2750 kW without anomalies will provide adequate assurance of the DG ability to carry 100 percent of maximum expected accident load and avoid routine exceeding of the DG 2000-hour rating. Routine exceeding of the DG 2000-hour rating may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG operability. Verification that the DG is able to carry greater than 100 percent of maximum expected accident load is ensured through performance of the proposed SR 3.8.1.14.a. The proposed maximum load limit value of 2750 kW meets RG 1.108, Revision 2, Position 2.a.(3) since it is greater than the 2600 kW continuous rating of the DG.

SR 3.8.1.15

The proposed load limit range of greater than or equal to 2475 kW and less than or equal to 2750 kW for SR 3.8.1.15 Note 1 is the same as the proposed SR 3.8.1.14.b load limit range since SR 3.8.1.15 is performed after SR 3.8.1.14 is performed. The proposed load limit range provides consistency with the load limit range in proposed SR 3.8.1.14.b.

Summary

In summary, the proposed revisions to the TS 3.8.1 SRs ensure the DG load and power factor values used in SRs 3.8.1.3, 3.8.1.10, 3.8.1.14, and 3.8.1.15 bound the maximum expected accident load and minimum expected accident power factor. The proposed DG load values meet RG 1.108, Revision 2, Position 2.a.(3).

4. REGULATORY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

As stated in Section 3.1 of the DCPP FSARU, the DCPP units are designed to comply with the Atomic Energy Commission (AEC) (now the Nuclear Regulatory Commission, or NRC) General Design Criteria (GDCs) for Nuclear Power Plant Construction Permits, published in July 1967. The construction permits were issued by the AEC for DCPP Unit 1 in April 1968 and for DCPP Unit 2 in December 1970. The full power operating licenses were issued for DCPP Unit 1 on November 2, 1984 and for Unit 2 on August 26, 1985. A discussion of the DCPP conformance to the GDCs is contained in FSARU Section 3.1.2, "Overall Plant Requirements," with more details given in the applicable FSARU sections. The AEC published the final rule that added Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," in the Federal Register (36 FR 3255) on February 20, 1971, with the rule effective on May 21, 1971. In accordance with an NRC staff requirements memorandum from S. J. Chilk to J. M. Taylor, "SECY-92-223 -Resolution of Deviations Identified During the Systematic Evaluation Program," dated September 18, 1992, the Commission decided not to apply the 10 CFR 50, Appendix A, GDC to plants with construction permits issued prior to May 21, 1971. Therefore, the GDC which constitute the licensing bases for DCPP are those described in the FSARU.

PG&E has made changes to the DCPP facilities over the life of the units that have committed to some of the GDCs from 10 CFR 50, Appendix A. The extent to which the 10 CFR 50, Appendix A, GDC have been invoked can be found in specific sections of the FSARU and in other DCPP licensing basis documentation such as license amendments.

The applicable July 1967 GDCs to the proposed amendment, as stated in Section 3.1.2 of the DCPP FSARU, are 24 and 39. GDC 24 states "In the event of loss of all offsite power, sufficient alternate sources of power shall be provided to permit the required functioning of the protection systems," and GDC 39 states "Alternate power sources shall be provided with adequate independence, redundancy, capacity, and testability to permit the functioning required of the engineered safety features. As a minimum, the onsite power system and offsite power system shall each, independently, provide this capacity assuming a failure of a single active component in each power system."

FSARU Section 3.1.8.3, for GDC 39 states that DCPP conforms to 10 CFR Part 50, Appendix A, General Design Criteria 17, "Electric Power Systems."

FSARU Section 8.1.4.3 states that DCPP is committed to SG 9, for DG steady state loading capability; RG 1.9, Revision 2, for DG frequency and voltage dip and recovery; and RG 1.9, Revision 3, for DG test scope and test interval frequency.

RG 1.9, Revision 2, is referenced since DCPP incorporated the DG frequency dip and recovery criteria of RG 1.9, Revision 2 Section C, Position 4 under 10 CFR 50.59. This is an exception to SG 9, Section C, Position 4.

RG 1.9, Revision 3, is referenced because the NUREG-1431, Revision 3.1, TS 3.8.1 DG SRs for demonstrating the OPERABILITY of the DGs are in accordance with the recommendations of RG 1.9, Revision 3 for the types of surveillance tests that are incorporated in the SRs. The use of RG 1.9, Revision 3 for demonstrating the OPERABILITY of the DGs is not an exception to SG 9 because SG 9 did not specify the types of surveillance tests that need to be incorporated in the surveillance procedures. The reference to RG 1.9, Revision 3, in the TS 3.8.1 Bases was adopted as part of adoption of the NUREG-1431 TS approved by the

NRC in License Amendment 135 to Facility Operating License Nos. DPR-80 and DPR-82, respectively for DCPP.

The TS 3.8.1 Bases reference RG 1.108, Revision 1 for the scope of SRs 3.8.1.11, 3.8.1.14, 3.8.1.16. RG 1.9, Revision 3, incorporated RG 1.108, however the DCPP licensing basis does not fully meet all the criteria contained in RG 1.9, Revision 3, and therefore RG 1.108, Revision 1 is listed separately in the TS 3.8.1 Bases.

Paragraph 50.36(c)(2)(ii) of 10 CFR, "Technical specifications," requires that "[a] TS limiting condition for operation [LCO] of a nuclear reactor must be established for each item meeting one or more of the [criteria set forth in 10 CFR 50.36(c)(2)(ii)(A)-(D)]." Paragraph 50.36(c)(3) of 10 CFR, "Technical specifications," requires that TSs include SRs, which "are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

The proposed revisions to the DCPP TS are in accordance with the requirements of July 1967 GDCs 24 and 39 and 10 CFR 50.36 and do not adversely affect the compliance of SRs 3.8.1.11, 3.8.1.14, 3.8.1.16 with RG 1.108, Revision 2. In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

4.2 <u>Precedent</u>

In Amendment No. 259 to Facility Operating License No. DPR-26 for the Indian Point Nuclear Generating Unit No. 2, Entergy Nuclear Operations, Inc., obtained approval to use a DG load less than the peak loading conditions in the limiting design basis accident for the remainder of the endurance test surveillance. The proposed minimum load limit of 2475 kW for the remaining hours of the SR 3.8.1.14.b endurance test is less than the peak loading conditions in the limiting design basis accident.

4.3 <u>Significant Hazards Consideration</u>

PG&E has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed change revises the acceptance criteria to be applied to an existing Technical Specification (TS) surveillance test of the facility diesel generators (DGs). Performing a surveillance test is not an accident initiator and does not increase the probability of an accident occurring. The proposed new acceptance criteria will assure that the DGs are capable of carrying the peak electrical loading assumed in the various existing safety analyses, which take credit for the operation of the DGs. Establishing acceptance criteria that bound existing analyses validates the related assumption used in those analyses regarding the capability of equipment to mitigate accident conditions.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different accident from any accident previously evaluated?

Response: No.

The proposed change revises the test acceptance criteria for a specific performance test conducted on the existing DGs. The proposed change does not involve installation of new equipment or modification of existing equipment, so no new equipment failure modes are introduced. The proposed revision to the DG surveillance test acceptance criteria also is not a change to the way that the equipment or facility is operated and no new accident initiators are created.

Therefore, the proposed change does not create the possibility of a new or different accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The conduct of performance tests on safety-related plant equipment is a means of assuring that the equipment is capable of maintaining the margin of safety established in the safety analyses for the facility. The proposed change in the DG TS surveillance test acceptance criteria is consistent with values assumed in existing safety analyses and is consistent with the design rating of the DGs.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above evaluation, PG&E concludes that the proposed change does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5. ENVIRONMENTAL CONSIDERATION

PG&E has evaluated the proposed amendment and has determined that the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6. REFERENCES

1. Safety Guide 9, "Selection of Diesel Generator Set Capacity for Standby Power Supplies," dated March 10, 1971.
2. Regulatory Guide 1.9, Revision 2, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," dated December, 1979.
3. Regulatory Guide 1.9, Revision 3, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," dated July 1993.

4. Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants," Revision 1, August 1977.

5. SECY-92-223 "Resolution of Deviations Identified During the Systematic Evaluation Program," dated September 18, 1992.

6. PG&E Calculation No. 9000037760, Revision 20, "Diesel Generator Loading for Vital Bus Loads Units 1 and 2."

7. PG&E Calculation No. 9000040769, Revision 0, "Maximum EDG Mechanical Loading."

8. NRC Temporary Instruction 2515/176, "Emergency Diesel Generator Technical Specification Surveillance Requirements Regarding Endurance and Margin Testing," dated May 16, 2008.

9. NUREG-1431, Revision 3.1, "Standard Technical Specifications Westinghouse Plants," dated December 1, 2005.

10. Amendment No. 135 to Facility Operating License Nos. DPR-80 and DPR-82, "Conversion to Improved Technical Specifications for Diablo Canyon Power Plant, Units 1 and 2 - Amendment No. 135 to Facility Operating License Nos. DPR 80 and DPR-82 (TAC Nos. M98984 and M98985)," dated May 28, 1999.

11. Amendment No. 259 to Facility Operating License No. DPR-26 for the Indian Point Nuclear Generating Unit No. 2, "Indian Point Nuclear Generating Unit No. 2 - Issuance of Amendment RE: Emergency Diesel Generator Surveillance Test (TAC No. MD9214)," dated April 22, 2009.

Proposed Technical Specification Changes (marked-up)

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required offsite circuit.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.2	-----NOTES----- 1. Performance of SR 3.8.1.7 satisfies this SR. 2. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. ----- Verify each DG starts from standby conditions and achieves speed ≥ 900 rpm, steady state voltage ≥ 3785 V and ≤ 4400 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.3	-----NOTES----- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This SR shall be preceded by and immediately follow without shutdown a successful performance of SR 3.8.1.2 or SR 3.8.1.7. ----- Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ ~~2340~~ 2475 kW and ≤ ~~2600~~ 2750 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.4	Verify each day tank contains ≥ 250 gal of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to transfer fuel oil from storage tanks to the day tank.	In accordance with the Surveillance Frequency Control Program

(continued)

Insert 1

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.10	Verify each DG ~~operating at a power factor ≤ 0.87~~ does not trip and voltage is maintained ≤ 5075 V during and following a load rejection of ≥ ~~2340~~ 2475 kW and ≤ ~~2600~~ 2750 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.11	---NOTES--- 1. All DG starts may be preceded by an engine prelube period. 2. This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. --- Verify on an actual or simulated loss of offsite power signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤10 seconds, 2. energizes auto-connected loads through auto-transfer sequencing timers, 3. maintains steady state voltage ≥ 3785 V and ≤ 4400 V, 4. maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and 5. supplies permanently connected and auto-connected loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

Insert 2

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.14	-----NOTES----- 1. Momentary transients outside the load and power factor ranges do not invalidate this test. ----- Verify each DG ~~operating at a power factor ≤ 0.87~~ operates for ≥ 24 hours: a. For ≥ 2 hours loaded ≥ ~~2600~~ 2750 kW and ≤ 2860 kW; and b. For the remaining hours of the test loaded ≥ ~~2340~~ 2475 kW and ≤ ~~2600~~ 2750 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.15	-----NOTES----- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ ~~2340~~ 2475 kW and ≤ ~~2600~~ 2750 kW. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ----- Verify each DG starts and achieves: a. in ≤ 10 seconds, speed ≥ 900 rpm; and b. in ≤ 13 seconds, voltage ≥ 3785 V, and ≤ 4400 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	-----NOTE----- This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. ----- Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power;	In accordance with the Surveillance Frequency Control Program

(continued)

Technical Specification 3.8.1 Inserts

Insert 1

------------------------NOTE--------------------------
If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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.

Insert 2

2. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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.

Proposed Technical Specification Changes (retyped)

<u>Remove Page</u>	<u>Insert Page</u>
3.8-4	3.8-4
3.8-6	3.8-6
3.8-8	3.8-8
3.8-9	3.8-9

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required offsite circuit.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.2	-------------------NOTES------------------- 1. Performance of SR 3.8.1.7 satisfies this SR. 2. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. -- Verify each DG starts from standby conditions and achieves speed ≥ 900 rpm, steady state voltage ≥ 3785 V and ≤ 4400 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.3	-------------------NOTES------------------- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This SR shall be preceded by and immediately follow without shutdown a successful performance of SR 3.8.1.2 or SR 3.8.1.7. -- Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 2475 kW and ≤ 2750 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.4	Verify each day tank contains ≥ 250 gal of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to transfer fuel oil from storage tanks to the day tank.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.10	-----NOTE----- If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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. ----- Verify each DG does not trip and voltage is maintained ≤ 5075 V during and following a load rejection of ≥ 2475 kW and ≤ 2750 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.11	-----NOTES----- 1. All DG starts may be preceded by an engine prelube period. 2. This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. ----- Verify on an actual or simulated loss of offsite power signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤10 seconds, 2. energizes auto-connected loads through auto-transfer sequencing timers, 3. maintains steady state voltage ≥ 3785 V and ≤ 4400 V, 4. maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and 5. supplies permanently connected and auto-connected loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS *(continued)*

	SURVEILLANCE	FREQUENCY
SR 3.8.1.14	-----NOTES----- 1. Momentary transients outside the load and power factor ranges do not invalidate this test. 2. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.85. 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. ---------- Verify each DG operates for ≥ 24 hours: a. For ≥ 2 hours loaded ≥ 2750 kW and ≤ 2860 kW; and b. For the remaining hours of the test loaded ≥ 2475 kW and ≤ 2750 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.15	-----NOTES----- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 2475 kW and ≤ 2750 kW. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts and achieves: a. in ≤ 10 seconds, speed ≥ 900 rpm; and b. in ≤ 13 seconds, voltage ≥ 3785 V, and ≤ 4400 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	-----NOTE----- This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. ----------	

(continued)

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.1.16 (continued)	Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.17	----------------------------NOTE-------------------------------- This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. --- Verify, with a DG operating in test mode and connected to its bus, an actual or simulated Safety Injection signal overrides the test mode by: a. Opening the auxiliary transformer breaker; and b. Automatically sequencing the emergency loads onto the DG.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.18	----------------------------NOTE-------------------------------- This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, this Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. --- Verify each ESF and auto-transfer load sequencing timer is within its limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.19	----------------------------NOTES------------------------------- 1. All DG starts may be preceded by an engine prelube period. 2. This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. ---	

(continued)

Changes to Technical Specification Bases Pages
(For information only)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.2 and SR 3.8.1.7 (continued)

SR 3.8.1.7 requires that the DG starts from standby conditions and achieves required speed within 10 seconds and required voltage and frequency within 13 seconds. The 10 second start requirement reflects the point during the DG's acceleration at which the DG is assumed to be able to accept load. The 13 second start requirement reflects the point at which the DG is assumed to have reached stable operation. These stability points represent the recovery of the DG and the power distribution system following a transient. This assures the ability of the system to undergo further transients. Actual steady state operation is expected to achieve a level of stability closer to the nominal 60 Hz value. The 10 and 13 second start requirements support the assumptions of the design basis LOCA analysis in the FSAR, Chapter 15 (Ref. 5).

Since SR 3.8.1.7 requires a timed start, it is more restrictive than SR 3.8.1.2, and it may be performed in lieu of SR 3.8.1.2. This is the intent of Note 1 of SR 3.8.1.2.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.3

This Surveillance verifies that the DGs are capable of synchronizing with the offsite electrical system and accepting loads greater than or equal to the equivalent of the maximum expected accident loads. A minimum run time of 60 minutes is required to stabilize engine temperatures, while minimizing the time that the DG is connected to the offsite source.

Although no power factor requirements are established by this SR, the DG is normally operated at a power factor between 0.8 lagging and 1.0. The 0.8 value is the design rating of the machine, while the 1.0 is an operational limitation to ensure circulating currents are minimized. The load band is provided to avoid routine ~~overloading of the DG~~. ← Insert 1 OPERATION within the load range of 90% to 100% of ~~rated full~~ [the expected accident] load without anomalies will provide adequate assurance of the machine's ability to carry 100% of ~~rated full~~ [the expected accident] load if required.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.9 (continued)

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, Note 2 requires that, if synchronized to offsite power, testing must be performed using a power factor ≤ 0.9 lagging. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience.

SR 3.8.1.10

This Surveillance demonstrates the DG's capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The DG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the DG would experience following a full load rejection and verifies that the DG does not trip upon loss of the load. These acceptance criteria provide for DG damage protection. While the DG is not expected to experience this transient during an event and continue to be available, this response ensures that the DG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, testing must be performed using a power factor ≤ ~~0.87~~ 0.85 lagging. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

Insert 2 →

(continued)

REQUIREMENTS

Preplanned maintenance that would require the performance of this SR to demonstrate operability following the maintenance shall only be performed in Modes 3, 4, 5, or 6.

SR 3.8.1.13

This Surveillance demonstrates that DG noncritical protective functions are bypassed when the diesel engine trip cutout switch is in the cutout position and the DG is aligned for automatic operation. The noncritical trips include directional power, loss of field, breaker overcurrent, high jacket water temperature, and diesel overcrank. These noncritical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.14

The refueling outage intent of Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(3), requires demonstration that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ 2 hours of which is at a load equivalent to ~~110% of~~ the ~~continuous duty~~ rating and the remainder of the time at a load equivalent to the continuous duty rating of the DG. The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelubricating and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR.

2-hour → Insert 3

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.14 (continued)

In order to ensure that the DG is tested under load conditions that are as close to design conditions as possible, testing must be performed using a power factor of ≤ 0.87 lagging. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

two Notes.

This Surveillance is modified by Note 1 ~~which~~ states that momentary transients due to changing bus loads do not invalidate this test. Similarly, momentary power factor transients above the power factor limit will not invalidate the test. ← Insert 4

Administrative controls for performing this SR in MODES 1 or 2, with the DG parelleled to an offsite power supply, ensure or require that:

a. Weather conditions are conducive to performing this SR.

b. The offiste power supply and switchyard conditions support performing this SR, including communicating with the transmission group responsible for the 230 kV and 500 kV switchyards to ensure that, during the DG testing, vehicle access to these switchyards is controlled and no elective maintenance or testing on the offsite power sources is performed potentially affecting:

- 230 kV and 500 kV systems (Exceptions are to be authorized by Operations Management)
- Either units' 12 kV startup bus
- Transformers or insulators

c. No equipment or systems assumed to be available for supporting the performance of the SR are removed from service.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.15

This Surveillance demonstrates that the diesel engine can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve stability by reaching the required voltage and frequency within 13 seconds. The 13 second time is derived from the requirements of the accident analysis to respond to a design basis accident. The acceptance criteria represents the recovery of the DG and the power distribution system following a start and load transient. This assures the ability of the system to undergo further transients. Actual steady state operation is expected to achieve a level of stability closer to the nominal 60 Hz value. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

Insert 5

This SR is modified by two Notes. Note 1 ensures that the test is performed with the diesel sufficiently hot. ~~The load band is provided to avoid routine overloading of the DG.~~ Routine overloads may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY. The requirement that the diesel has operated for at least 2 hours at full load conditions prior to performance of this Surveillance is based on test data and manufacturer recommendations for achieving hot conditions. Momentary transients due to changing bus loads do not invalidate this test. Note 2 allows all DG starts to be preceded by an engine prelube period to minimize wear and tear on the diesel during testing.

SR 3.8.1.16

As required by Regulatory Guide 1.108 (Ref. 9), paragraph 2.a.(6), this Surveillance ensures that the manual synchronization and load transfer from the DG to the offsite source can be made and the DG can be returned to ready to load status when offsite power is restored. It also ensures that the autostart logic is reset to allow the DG to reload if a subsequent loss of offsite power occurs. The DG is considered to be in ready to load status when the DG is at rated speed and voltage, the output breaker is open and can receive an auto close signal on bus undervoltage, and the load sequencing timers are reset.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

(continued)

Technical Specification 3.8.1 Bases Inserts

Insert 1

exceeding of the DG 2000-hour rating. Routine exceeding of the DG 2000-hour rating may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

Insert 2

This SR has been modified by a Note. The Note 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 ≤ 0.85. This power factor is representative of the actual inductive loading a DG would see under design basis accident conditions. Under certain conditions, however, the Note allows the Surveillance to be conducted at a power factor other than ≤ 0.85. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.85 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 0.85 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 0.85 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained as close as practicable to 0.85 without exceeding the DG excitation limits.

Insert 3

The maximum load limit value of 2750 kW for the remaining hours of the test is based on the DG 2000-hour rating which envelopes the maximum expected accident load and is greater than the continuous duty rating of the DG as specified by Regulatory Guide 1.108 (Ref. 9).

Insert 4

Note 2 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 ≤ 0.85. This power factor is representative of the actual inductive loading a DG would see under design basis accident conditions. Under certain conditions, however, Note 2 allows the Surveillance to be conducted as a power factor other than ≤ 0.85. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.85 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 0.85 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 0.85 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the DG. In such cases, the power factor shall be maintained close as practicable to 0.85 without exceeding the DG excitation limits.

The load band is provided to avoid routine exceeding of the DG 2-hour per 24 hour rating for the ≥ 2 hours portion of the test and the DG 2000-hour rating during the remaining hours of the test. Routine exceeding of the DG 2-hour per 24 hour and 2000-hour ratings may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

Technical Specification 3.8.1 Bases Inserts (continued)

Insert 5

The load band of 2475 kW to 2750 kW is based on the load band required for SR 3.8.1.14.b. The load band is provided to avoid routine exceeding of the DG 2000-hour rating. Routine exceeding of the DG 2000-hour rating may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

Commitments

Commitment 1

Additional guidance will be provided to operators in the surveillance procedures as part of implementation of the license amendment request to provide guidance to the operators on use of the new Note added to SR 3.8.1.10 and SR 3.8.1.14.

PG&E Calculation No. 9000037760, Revision 20

Design Calculation Cover Sheet

Unit(s): 1&2 File No.: ______ Responsible Group: EDE Calculation No.: 9000037760-20

Design Calculation: ☒ YES ☐ NO System No.: 63(4kV), 21(DG) Quality Classification: Q

Structure, System or Component: Diesel Generator

Subject: Diesel Generator Loading for Vital Bus Loads Units 1 and 2

Computer/Electronic Calculation: ☐ YES ☒ NO

Computer ID	Application Name and Version	Date of Latest Installation/Validation Test

Registered Engineer Stamp: Complete A or B

A. Insert PE stamp or seal below:	B. Insert stamp directing to the PE stamp or seal:
LICENSED PROFESSIONAL ENGINEER · DAVID EUGENE HARTMAN · NO. E18772 · ELECTRICAL · STATE OF CALIFORNIA 6/18/09 Expiration Date: 9/30/10	

Update DCI promptly after approval.

Forward electronic calculation file to CCG for uploading to EDMS, only if the calculation is complete and can be used from EDMS.

Calculation No.: 9000037760-20

RECORD OF REVISIONS

Rev No.	Status	No. of Pages	Reason for Revision	Prepared By	LBIE Screen	LBIE	Check Method*	LBIE Approval		Checked	Supervisor	Registered Engineer	Owner's Acceptance per CF3.ID17
			Remarks	Signature/ LAN ID/ Date	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	PSRC Mtg No.	PSRC Mtg Date	Signature LAN ID/ Date	Signature/ LAN ID/ Date	Signature/ LAN ID/ Date	Signature/ LAN ID/ Date
20	F	46	SAP Not. 50179082, 50207912, 50232181	GAR0/ DEHF 6/18/09	[X] Yes [ ] No [ ] N/A	[ ] Yes [X] No [ ] N/A	[X] A [ ] B [ ] C			HPS2 6-18-09		DEHF 6/18/09	N/A
					[ ] Yes [ ] No [ ] N/A	[ ] Yes [ ] No [ ] N/A	[ ] A [ ] B [ ] C						
					[ ] Yes [ ] No [ ] N/A	[ ] Yes [ ] No [ ] N/A	[ ] A [ ] B [ ] C						
					[ ] Yes [ ] No [ ] N/A	[ ] Yes [ ] No [ ] N/A	[ ] A [ ] B [ ] C						

* Check Method: A = Detailed Check B = Alternate Method (note added pages) C = Critical Point Check

Input Reference		Output Reference	
Calc/Procedure No.	Comments	Calc/Procedure No.	Comments
357A-DC, Rev. 12		M-786	
M-1141, Rev. 0		STP M-9A	
		STP M-9M	
		EOP ECA-0.3	

REASON FOR REVISION

Calculation No. 9000037760 (015-DC)

REVISION NO.	DESCRIPTION OF REVISION
20	Scope of the calculation expanded to include both Units 1 and 2 (Unit 2 was formerly addressed in a separate calculation, 125-DC and 125-DC will now be superseded by revision 20 of this calculation); Frequency and Voltage variation loading impacts are incorporated as summarized in NRC 2008 4th Quarter Report; Clarification of the worst case accident; Update of brake horsepower requirements based on new Mechanical Calc M-1141; Refinements in power factor determination.

LBIE Screen – Applicability Determination

1. Proposed Activity/Implementing Document No:	Unit:	Imp Doc Rev No:
Calculation Update / 9000037760 (015-DC)	☐ 1 ☐ 2 ☒ 1&2	20

Briefly describe what is being changed and why:

The scope of Calculation 15-DC has been expanded to include the diesel generators of both units. Prior revisions were limited to Unit 1 DG's only and Unit 2 was addressed in a separate calculation (i.e. 125-DC). Since the Unit 2 calculation was dependent upon assumptions and computations in the Unit 1 calc, they were combined to reduce administrative overhead. Technical changes include: 1) Incorporation of frequency and voltage variation impacts on the connected loads as summarized in NRC 2008 4th Qtr Inspection Report; 2) Clarification of worst case accident; 3) Update pump brake horse power requirements based on new Mechanical Calc M-1141; and 4) Refine the power factor determination.

2. Applicability Determination (refer to TS3.ID2, Appendix 7.1 Section 2 for general guidance) Does the proposed activity **involve:**			Ref. TS3.ID2 Appendix 7.1
2.a A change to the Facility/ISFSI Operating License (OL), Environmental Protection Plan (EPP) or Technical Specifications (TS)?	☒ Y	☐ N	Block 2.a
2.b A change to the Quality Assurance Program?	☐ Y	☒ N	Block 2.b
2.c A change to the Security Plan?	☐ Y	☒ N	Block 2.c
2.d A change to the Emergency Plan?	☐ Y	☒ N	Block 2.d
2.e A change to the Inservice Testing (IST) Program Plan?	☐ Y	☒ N	Block 2.e
2.f A change to the Inservice Inspection (ISI) Program Plan?	☐ Y	☒ N	Block 2.f
2.g A change to the Fire Protection Program?	☐ Y	☒ N	Block 2.g
2.h A noncompliance with the Environmental Protection Plan or may create a situation adverse to the environment?	☐ Y	☒ N	Block 2.h
2.i A change to the FSARU (including documents incorporated by reference) excluded from the requirement to perform a 50.59/72.48 review?	☐ Y	☒ N	Block 2.i
2.j Maintenance that restores SSCs to their original or newly approved designed condition? (Check "No" if activity is related to ISFSI.)	☐ Y	☒ N	Block 2.j
2.k A temporary alteration supporting maintenance that will be in effect during at-power operations for 90 days or less? (Check "No" if activity is related to ISFSI.)	☐ Y	☒ N	Block 2.k
2.l Managerial or administrative procedure/process controlled under 10 CFR 50, App. B?	☐ Y	☒ N	Block 2.l
2.m Regulatory commitment not covered by another regulatory based change process?	☐ Y	☒ N	Block 2.m
2.n An impact to other plant specific programs (e.g., the ODCM) that are controlled by regulations, the OL, or TS?	☐ Y	☒ N	Block 2.n

3. Applicability Determination Conclusions:

☐ **A 10 CFR 50.59 or 72.48 screen is NOT required** because ALL aspects of the activity are controlled by one or more of the processes listed above, or have been approved by the NRC, or covered in full in another LBIE review.

☒ **A 10 CFR 50.59 or 72.48 screen will be completed** because some or all the aspects of the activity are not controlled by any of the processes listed above or cannot be exempted from the 10 CFR 50.59/72.48 screen.

4. Does the proposed activity involve a change to the plant where the change requires a safety assessment?	☐ Y	☒ N

5. Remarks: (Use this section to provide justification of determination in step 2 as needed.)

2.a <u>Screen for Changes to the Facility License:</u> Tech Spec Bases 3.8.1 states that the DG rating is based on Regulatory Guide 1.9, Rev. 0. As documented in DCM S-21, DG automatic loading is designed to ensure the actual loads do not exceed the smaller of the 2000 hour rating or 90 percent of the 30 minute rating of each set. The conclusion of the subject calculation revision is that the maximum steady state loadings are within this limit (i.e. 2750 KW) which does not change the Tech Spec Bases for this parameter. Tech Spec Bases 3.8.1 also states in SR 3.8.1.10 to verify each DG is operating at a power factor ≤ 0.87. Engineering calculation 015B-DC Rev 1 (reference Notification 50232181), has previously determined that the Tech Specs are non-conservative with respect to power factor. The results of this calculation are in agreement with the conclusions of engineering calculation 015B-DC Rev 1 with respect to this DG parameter. Specifically, the worst case power factor for this calculation is 85.8%. The issuance of this master calculation provides a basis for a licensing amendment request (LAR). The issuance of this calculation does not change existing SSC's, but quantifies what currently exists by incorporating the results of revised motor loading as a result of the issuance of Calculation M-1141 Rev 0, and refinements in the calculation which include the DG loading and capacity effects of elevated frequency and voltage, which in total provide more accurate results for both kilowatt (KW), kilovar (KVAR) and resultant power factor worst case loading for each DG. Therefore, the answer to this question is yes.

2.b Screen for Changes to the Quality Assurance Program: The Quality Assurance Program as described in the FSAR Update, Chapter 17, does not address electrical analysis. Therefore, the answer to this question is no.

2.c Security Plans Screen: The changes discussed in this revision of the subject calculation do not have any impact on the Security Plan since they are documentation changes only. They do not affect the location of safety related equipment or change any security barriers, systems, or features of DCPP or other security impacts. Therefore, the answer to this question is no.

2.d Emergency Plan Screen: The changes discussed in this revision of the subject calculation do not have any impact on the Emergency Plan since they are documentation changes only. They do not alter system, equipment, facilities, or capabilities relied upon or described in the plan or other EP impacts. Therefore, the answer to this question is no.

2.e Inservice Testing Program (IST) Plan Screen: This calculation revision does not involve inservice testing of ASME Code Class 1, 2, and 3 pumps and valves. Therefore, the answer to this question is no.

2.f Inservice Inspection Program (ISI) Plan Screen: This calculation revision does not involve inservice inspection of ASME Code Class 1, 2, and 3 pumps and valves. Therefore, the answer to this question is no.

2.g Fire Protection Program Screen: The changes discussed in this revision of the subject calculation are used solely to confirm the adequacy of existing diesel generator capacity. There are no physical changes or component classification changes. Therefore, the answer to this question is no.

2.h Environmental Protection Screen: The changes discussed in this revision of the subject calculation are documentation changes only and do not involve any effluent discharges, land alteration, increase in hazardous materials, or other environmental impacts. Therefore, the answer to this question is no.

2.i Change to the FSARU: FSAR update will be performed under separate cover in accordance with XI3.ID2, which will contain a separate 50.59 review (reference Notification 50248352).

2.j Screen for Maintenance Activities: This calculation revision is a documentation configuration control update. No design or maintenance activities are involved. Therefore, the answer to this question is no.

2.k Temporary Alteration Screen: This calculation revision is a documentation configuration control update. No temporary alteration activities are involved. Therefore, the answer to this question is no.

2.l Managerial or Administrative Procedure/Process Screen: This calculation revision is a documentation configuration control update. No Managerial or Administrative Procedures/Processes governing the conduct of facility operations are changed by updating and refining this calculation. Therefore, the answer to this question is no.

2.m Screen for Regulatory Commitments and Obligations: The revision is not the result of any periodic inspection/surveillance commitments. The PCD was searched for implementing documents Calc 15-DC and 125-DC, no hits were found. The PCD was searched for implementing documents STP M-9A and M-9M, none found for M-9M, 9 found for M-9A. Of these hits, three could not be eliminated by title: T19179, T35507 and T34173. T19179 pertains to Accumulated water in the DG Day Tank, not applicable. T35507 pertains to test DG to be declared inoperable when paralleled to offsite power source with only one offsite source available, not applicable. T34173 pertains to precautions outlining actions to be taken on a loss of normal feed to a bus while the DG is paralleled to the bus for testing, not applicable. The PCD was searched for implementing document EOP ECA 0.3, two hits were found. Of these two, one could not be eliminated by title: T35018. T35018 pertains to the review and modification of plant and dispatcher procedures to meet the guidelines in NUMARC 87-00, Section 4. The impact of Calc 15-DC Rev 20 on EOP ECA 0.3 is to update Appendix Q Equipment Load Table 1 for new loading information, and to make clarifications to Appendix Q Figure 1 Diesel Generator Load Limits, which does not affect this regulatory commitment. Therefore, the answer to this question is no.

2.n Screen for Impacts to Other Plant Specific Programs: No other plant specific programs including the Offsite Dose Calculation Manual (ODCM) that are controlled by the operating license (OL) or the technical specifications (TS) are impacted by the revision of this calculation which provides updated DG loading information. Therefore, the answer to this question is no.

Preparer Signature: (Qual: TPROC or TLBIE)	Date: 6/18/09	Print Last Name: Hantman
Reviewer Signature: (Qual: TPROC or TLBIE)	Date: 6-18-09	Print Last Name: Singh

Refer to TS3.ID2, Section 6, for instructions on handling completed forms.

LBIE Screen – 10 CFR 50.59/72.48 Screen

1. Proposed Activity/Implementing Document No:	Unit:	Imp Doc Rev No:
Calculation Update / 9000037760 (015-DC)	☐ 1 ☐ 2 ☒ 1&2	20

Briefly describe what is being changed and why:

The scope of Calculation 15-DC has been expanded to include the diesel generators of both units. Prior revisions were limited to Unit 1 DG's only and Unit 2 was addressed in a separate calculation (i.e. 125-DC). Since the Unit 2 calculation was dependent upon assumptions and computations in the Unit 1 calc, they were combined to reduce administrative overhead. Technical changes include: 1) Incorporation of frequency and voltage variation impacts on the connected loads as summarized in NRC 2008 4th Qtr Inspection Report; 2) Clarification of worst case accident; 3) Update pump brake horse power requirements based on new Mechanical Calc M-1141; and 4) Refine the power factor determination.

All of the above described changes are analysis enhancements. This scope of this LBIE screen does not include any physical changes to the plant.

2. The screen performed is for (check one or both as applicable):

☒ 10 CFR 50.59 (Facility Operating License)

☐ 10 CFR 72.48 (Independent Spent Fuel Storage Installation (ISFSI)

Identify SSC(s) described in the FSARU (including subcomponents) and the applicable section(s) in the FSARU affected by the proposed activity (use remarks section for overflow):

Applicable SSC's are: EDG11, EDG12, EDG13, EDG21, EDG22, and EDG23.

Affected FSAR Sections are:

8.3.1.1.8.1, Dedicated Diesel Generators: This Section identifies the DG continuous rating only. Requires update to state design basis rating.

8.3.1.1.9, Operation of Emergency Power System: Starting inrush and momentary loads handled by DG short time overload capability (not impacted by these changes)

8.3.1.1.10(3), Emergency Loads Supplied by Diesel Generators: Worst case DG loading based on LOOP/LOCA scenario (not impacted by these changes)

8.3.1.1.11, Momentary Loads: (Same as 8.3.1.1.9 above)

8.3.1.1.12, Maximum Demand: Does not address impact of frequency and voltage variations on DG loading. Per NEI 98-03, this is "new information requested by the NRC" (Ref. Integrated Inspection Report 05000275/2008005, 05000323/2008005, and 07200026/2008001) and should be added to the FSAR.

8.3.1.1.13.1, Diesel Generator Unit Description: This Section identifies various DG ratings. Requires update to state which rating is the design basis.

Table 8.3-3: Maximum Steady State Load Demand – No Safety Injection Signal. Requires data update.

Table 8.3-5: Diesel Generator Loading Maximum Steady State Load Demand Following a Loss of Coolant Accident. Requires data update

Table 8.3-6: Vital 4160/480 Volt Load Center Loading. Requires data update.

Table 8.3-7: Vital 480V Load Center Maximum Demand. Requires data update.

Describe the design function(s) of the above identified SSC(s) directly or indirectly affected by this proposed activity (use remarks section for overflow):

Each of the six diesel-generator sets is designed to supply the maximum demand of the safe shutdown loads for its associated 4160V vital bus, without exceeding the diesel generating ratings (Ref. DCM S-21, Section 4.3.4(a)).

In order to meet the requirements of an alternate AC power source, at least one Diesel Generator per unit shall be available within 10 minutes that has the capacity to carry the required shutdown loads during a 4 hour station blackout (Ref. DCM S-63, Section 4.3.3.4).

The diesel-generator units are sized to supply the maximum demand of the engineered safety feature loads connected to their respective buses and any Non-Class 1E loads not automatically disconnected (Ref. DCM S-63, Section 4.3.3.4).

The diesel-generator automatic load sequencing is designed to ensure the actual loads do not exceed the smaller of the 2000 hour rating or 90 percent of the 30 minute rating of each set Ref. DCM S-21, Section 4.3.1(o)).

LBIE Screen – 10 CFR 50.59/72.48 Screen

Determine whether the proposed activity/change, test, or experiment (CTE):				Ref. TS3.ID2 Appendix 7.8
2.a	Involves a change to an SSC that adversely affects an FSARU described design function?	☐ Y	☒ N	Block 2.a
2.b	Involves a change to a procedure that adversely affects how FSARU described SSC design functions are performed or controlled?	☐ Y	☒ N	Block 2.b
2.c	Involves a change that adversely revises or replaces an FSARU described evaluation methodology that is used in establishing the design bases or that is used in the safety analyses?	☐ Y	☒ N	Block 2.c
2.d	Involves a test or experiment not described in the FSARU, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the FSARU?	☐ Y	☒ N	Block 2.d
2.e	Relies on a vendor 10 CFR 50.59 or 72.48 evaluation that has NOT been reviewed by the PSRC?	☐ Y	☒ N	Block 2.e

3. Justification, References, and Materials:

3.a Justification for the 10 CFR 50.59/72.48 screen determinations in steps 2.a thru 2.e:

2a) This calculation computes DG loading, and makes no changes to any SSC and therefore does not involve a change to an SSC that adversely affects an FSARU described design function. The purpose of this calculation is design basis sizing of the DG unit. Power factor variation has negligible impact on engine performance. Relative to the generator a lower power factor is more demanding (i.e. more generator heating) for a given KW loading. The power factor operating point is not a generator design property. Power factor results from the connected loads. The benefit of knowing the expected power factor is to establish appropriate test conditions. Also, revisions of this calculation quantify DG loading for the purpose of tracking Operating Margin, and to assure that it is maintained within pre-establish limits based on the ratings of the DG, and it is not adverse to do so. Rather, it is conservative to track changes in Operating Margin to ensure that they are within these pre-established limits.

2b) The preparation of this calculation did not require any procedural changes. The impact of the calculation does require revision of procedures; however these revisions are not adverse, as they only provide clarification and more updated information for use in the affected procedures. The purpose of this calculation is design basis sizing of the DG unit. Also, revisions of this calculation quantify DG loading for the purpose of tracking Operating Margin, and to assure that it is maintained within pre-establish limits based on the ratings of the DG, and it is not adverse to do so. Rather, it is conservative to track changes in Operating Margin to ensure that they are within these pre-established limits.

2c) There are two distinct aspects to this calculation revision. Neither have an adverse impact on the FSAR described design functions listed above. The first change involves the addition of voltage and frequency variation impacts on the loading of connected equipment. The second change is a document change only update of the connected loading data. Design Bases, as defined by reference document NEI 98-03 Rev. 1 can be restraints *derived from generally accepted "state-of-the-art" practices, or requirements derived from analysis (calculations).* The addition of this analysis to the calculation is a transition from an evaluation based on restraints derived from generally accepted "state-of-the-art" practices to a more refined analysis which more clearly demonstrates design margin. Thus this is not a change to, but a refinement of the existing evaluation methodology, which provides more accurate information. There is no adverse impact because both these changes and the resulting computed expected loads more accurately evaluate design margin. The results of the calculation revision indicate an increase in the available margin based on the same design basis rating of the DG.

2d) This calculation does not involve any test or experiment not described in the FSARU where any SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with the analyses or descriptions in the FSARU. It provides input to the periodic surveillance testing that is done by determining worst case DG loading. This input ensures that this periodic testing has values to test for that encompass worst case loading, and describes design margin for the DG.

2e) No vendor evaluation is involved in this calculation.

3.b List references used in this screen:

FSARU, Chapter 8, Section 8.3 Onsite Power Systems; NEI 98-03 Rev. 1 Guidelines for Updating Final Safety *Analysis Reports; Tracking Notification for Calc 015-DC (50035755); Tracking Notification for Calc 125-DC* (50234771)

LBIE Screen – 10 CFR 50.59/72.48 Screen

3.c List all materials attached to this screen:
None

4. 10 CFR 50.59/72.48 Screen Conclusions:

☒ **A 10 CFR 50.59/72.48 evaluation is NOT required** because ALL answers to steps 2.a thru. 2.e are NO.

☐ **A 10 CFR 50.59/72.48 evaluation is to be completed** because one or more of the answers in steps 2.a thru. 2.e are YES, **Complete LBIE Sections 0, 1, and 3.**

5. Remarks (use this section to provide additional information as needed):

Preparer Signature: (Qual: TLBIE)	[signature]	Date: 6/18/09	Print Last Name: Hantman
Reviewer Signature: (Qual: TLBIE)	[signature]	Date: 6-18-09	Print Last Name: Singh

Refer to TS3.ID2, Section 6, for instructions on handling completed forms.

Table Of Contents

1.0 PURPOSE

The purpose of this design calculation is to establish that the Unit 1 and Unit 2 diesel generators (DG) have sufficient capacity and margin to fulfill the onsite power source requirements of General Design Criterion 17 (GDC-17) (Ref. 12.1.1). This is accomplished by demonstrating the DG has sufficient capacity and margin to "... supply continuously the sum of the loads needed to be powered at any given time." (Ref. 12.1.2).

2.0 BACKGROUND

The DG's are designed as Class 1E standby power sources to provide AC electric power to the onsite AC Electrical Distribution System during and following the shutdown of the reactor when the offsite power sources are not available. This is a fundamental requirement of GDC-17 (Ref. 12.1.1). Adequate DG capability means that each DG has sufficient capacity to 1) Start and accelerate the required ESF loads in the prescribed sequence, and 2) Continuously supply the sum of the loads needed to be powered at any given time. The scope of this calculation addresses the latter capability requirement. For DCPP, the transient response capability of the DG (i.e. transient voltage dips, frequency dips, and associated recovery times) to start from standby, accelerate to rated voltage and frequency, and then start and accelerate the loads is evaluated by test. Both NRC Safety Guide 9 (Ref. 12.1.2) and IEEE 387 (Ref. 12.3.3) acknowledge that testing is preferred over analysis for this purpose (Note: IEEE 387 is not a DCPP licensing basis reference).

Regarding the continuous load capability, the DCPP DG's were sized and licensed in accordance with NRC Safety Guide 9 (Ref. 12.1.3). That regulatory position (i.e. DCPP License and design basis) stated that the predicted loads should not exceed the smaller of the 2000 hour rating, or 90 percent of the 30 minute, machine rating (Ref. 12.1.2). As described in Section 6.1 of this calculation, the 2000 hour rating is the smaller of the two. Present day DG sizing guidelines suggest a minimum 5 percent margin between the maximum design basis loading and the continuous rating of the DG (Ref. 12.1.4). It is noted that DCPP license basis is not committed to Reference 12.1.4.

The NRC has developed a Temporary Instruction (TI) (Ref. 12.3.1) for their review of DG designs and testing. A secondary goal of this calculation is to document the DG analysis methodology, assumptions, and conclusions in sufficient detail to facilitate a review based on this TI.

3.0 ASSUMPTIONS

3.1 Assumptions Requiring Validation

None.

3.2 Validated Assumptions

3.2.1 The electrical loading associated with a postulated large break design basis loss of coolant accident (LOCA) envelopes the other postulated DBE accidents (e.g. small break LOCA, steam generator tube rupture, main steam line break, or a station blackout).

Basis: Mechanical Calculation M-1141 (Ref. 12.1.6) determined that a large break LOCA is in fact the worst case for mechanical loads (i.e. electrical rotating equipment), including ECCS and containment heat removal systems. For the remaining ESF support functions, the equipment performance requirements are generally independent of the accident type. Therefore, this assumption is considered conservative.

3.2.2 The maximum demand for non-rotating equipment that automatically connects to the bus is non-mechanistically used without consideration as to when in the scenario the peak occurs or how long it lasts.

Basis: This is conservative and eliminates the need to develop time dependent load profiles.

3.2.3 Brake horsepower single failure impacts on parallel pump operation of the large pumps (i.e. driven by 4 kV motors) is addressed in Reference 12.1.6. However, redundant 480 Volt loads are assumed to be operating independently regardless of shared fluid systems.

Basis: This addresses single failure and maximizes the load on each component / DG. Therefore, this assumption is considered conservative.

3.2.4 The BHP loading of motors driving pumps and fans is assumed to vary based on the cube of the per unit speed of the motor.

Basis: Steady state DG frequencies other than 60 Hz can cause speed changes in rotating equipment. Based on the pump affinity law (Ref. 12.1.6), a speed change results in a load change. The actual load change is some what less than the cube of the per unit speed change because in addition to the motor synchronous frequency change, the motor slip also changes as a result of the load change. This change in slip opposes the synchronous frequency change. Therefore, this assumption is considered conservative.

3.2.5 The following diversity factors are assumed:

a. (A)utomatic: Load is automatically connected to the bus. Diversity factor equals 100 percent.

b. (P)rocedure / Manunal: Load is required to be manually started by an Operator. Diversity factor equals zero percent.

c. (I)ntermittent: Load is automatically started, but has a definite on/off duty cycle. A 50 percent diversity factor is assumed.

d. (L)oad Shed: Operating loads are automatically disconnected. Diversity factor equals zero percent.

e. (M)omentary: Loads manually started by an Operator are assumed to be not operating. A zero diversity factor is assumed.

f. MO(V): Motor operated valves manually or automatically operated. These are a type of momentary load with a duty cycle usually in seconds. A zero diversity factor is assumed.

g. (-): Miscellaneous circuits without any load (e.g. spare). A zero diversity factor is assumed.

Basis: A diversity factor of 100 percent is worst case for operating loads and does not introduce any conservatism. A diversity factor of zero percent is a mechanism to turn off loads that will not be operating. A diversity factor of 50 percent is reasonable for redundant loads that either alternately cycle on and off or share a function (e.g. compressors and heaters). The duty cycle of these load types is typically less than 50 percent (e.g. compressors have multiple stages of loading/unloading). Establishing demand factors less than 100 percent is a common industry technique to account for the amount of time the load is actually operating. Additionally, not all intermittent loads cycle at the same time. Therefore, this assumption is considered reasonable.

3.2.6 Momentary loads, which may consist of transformer inrush, motor starting inrush, motor operated valves (MOV), and the inrush associated control circuit components that change state (e.g. relays and solenoid valves) need not be considered as part of the DG continuous loading.

Basis: Short duty cycle loads by definition do not operate continuously. The Acceptance Criteria of this calculation are based on the DG manufacturer's ratings for extended operation with a high availability confidence factor. The operating time of momentary loads is typically measured in seconds. By definition, they are not within the scope of this continuous loading calculation. The 1 minute rating of the DG is 150 percent of the continuous rating for this purpose. However, to validate this position, the following arguments are provided.

a. Transformer Inrush: The duration of transformer inrush current is measured in cycles, which is not a continuous load. Additionally, the 4.16 kV /480 V load center transformer is the first component energized by the DG (i.e. the DG is initially unloaded). This phenomenon is part of the DG integrated load sequencing test (Ref. 12.1.8).

b. Motor Starting: Motor starting is an electrical transient and the times are measured in seconds. The starting of the large motors is staggered to ensure locked rotor conditions do not overlap. This phenomenon is part of the DG integrated load sequencing test (Ref. 12.1.8) and is not considered as part of the DG continuous loading.

c. Motor Operated Valves: MOV stroke times are generally measured in seconds, which is not a continuous load. Additionally, the pump associated with the fluid system the valve is controlling would not be at its worst case operating point until the MOV is in the required position. Therefore, assuming worst case pump brake horsepower is considered conservative.

d. Relays and Solenoid Valves: This would only be applicable to components powered by Motor Control Center (MCC) control power transformers (CPT). Components powered via battery chargers or the uninterruptible 120 VAC power supplies (i.e. inverters) are already accounted for in their respective power sources. The inrush times of these types of devices would also be in cycles, which is not a continuous load. In addition to being small loads compared to the 3.25 MVA generator, the operation of these loads would be staggered over the entire load sequencing period. Therefore, the aggregate impact of these loads are considered negligible.

e. Auxiliary Lube Oil Pumps: These pumps only operate for the short time frame necessary for the primary pump to come up to speed.

3.2.7 The final steady state load at the conclusion of the automatic loading sequence corresponds to the maximum continuous load. Therefore, it is not necessary to analyze multiple time steps to address manually initiated loads.

Basis: Throughout the DG automatic loading sequence, loads are added. All load shedding occurs prior to connecting the DG to the bus. The manual addition of other loads post accident is procedurally controlled and it is the responsibility of the Operator to ensure the DG rating is not exceeded (Ref. 12.1.9 through 12.1.11, 12.1.13, 12.1.19, and 12.2.2). Therefore, this assumption is reasonable.

3.2.8 Cable and transformer losses are assumed to be 3.0 percent of the DG continuous rating of 3250 kVA at a power factor of 34 percent.

Basis: Per Reference 12.1.7, LOCA Run 004, the losses associated with Load Center Transformer 1F are 2.3 kW no-load plus 16.9 kW+58.5 kVAR under LOCA loading conditions. This yields 19.2 kW+58.5 kVAR for a typical 4.16 kV / 480 V transformer. The transformer losses alone (61.6 kVA) equal 1.9 percent of the DG rating. Per LOCA Run 010-LO, the overall power factor of the losses for the Class 1E distribution is 34 percent. A total loss of 3 percent, to account for cables losses in addition to the transformer yields 33.2 kW+91.7 kVAR per train. This assumption is considered conservative.

3.2.9 The alternate feed to loads equipped with manual transfer switches that are administratively controlled by procedure (Ref. 12.1.19) are assumed to be unloaded.

Basis: The normal plant alignment is the initial condition for this calculation. Reference 12.1.19, besides identifying backup power supplies, also references other Operating Procedures applicable to the scheme. These procedures include precautions and limitations as appropriate.

3.2.10 The spent fuel pit pump is assumed unloaded.

Basis: The spent fuel pit pump has momentary push-button controls with a seal-in contact. The contactor will drop out on the temporary loss of bus voltage during transfer to the DG and will require operator action to restart the pump. Also, this load is not required for mitigation of postulated plant accidents. As such, this load is not considered to have an impact in the diesel generator loading (Ref. 12.1.34).

3.2.11 The hydrogen recombiner is assumed unloaded.

Basis: The hydrogen recombiner is manually controlled and is only used long after the initial LOCA. Electrical load would be significantly reduced at this time (Ref. 12.1.14). Therefore, this assumption is reasonable.

3.2.12 Containment hydrogen purge fans are assumed unloaded.

Basis: Containment hydrogen purge fans have spring return control switch with seal-in. The contactor will drop out on the temporary loss of bus voltage during transfer to the DG and will require operator action to start (Ref. 12.1.35). Electrical load would be significantly reduced at this time (Ref. 12.1.14). Therefore, this assumption is reasonable.

3.2.13 Backup Battery Chargers are assumed unloaded.

Basis: Reference 12.1.12, LCO 3.8.4 specifies that the 125 VDC buses shall be energized from its associated (normal) full-capacity charger. Surveillances are performed at least once per 7 days to assure proper alignment. Also, the time that more than one full-capacity charger can receive power from a single 480V vital bus is limited to 14 days. Therefore, the technical specifications provide assurance that only one battery charger will be connected to a single bus except during an abnormal operating condition and further limits the time that this condition can exist.

3.2.14 Load Center Transformer Fans are assumed not to be running.

Basis: The non-Class 1E transformer cooling fans are not assumed to not be available. The transformer is rated for 1000 kVA without the fans (Ref. 12.1.15, 12.1.16,12.1.17, 12.1.26, 12.1.27 and 12.1.28). Also see Acceptance Criterion 6.4. Therefore, this assumption is reasonable.

3.2.15 Spurious operation of non-Class 1E loads powered from a DG supplied vital bus is not assumed to occur.

Basis: Non-Class 1E loads that may start due to balance-of-plant process signal demands (i.e. non-SI/LOOP) are already assumed to be operating. This assumption is reasonable.

3.2.16 The battery sizing calculations (Refs. 12.1.20 through 12.1.25) were used to determine the Battery Charger loading for operating Battery Chargers. The battery chargers are sized to recharge a fully discharged battery, supply the vital uninterruptible power supplies upon the loss of vital 480 Volts, and supply numerous DC control circuits. For the purpose of this calculation the vital uninterruptible power supplies are fed from the 480 Vac (i.e. not the charger) and the battery is fully charged in standby.

Basis: This calculation is based on the DG and associated buses being energized and operating; therefore, the vital uninterruptible power supplies are already accounted for with respect to DG loading. A failure within the DC system that results in a discharged battery would constitute the "Single Failure" which is equivalent to losing the entire train. Therefore, this assumption is reasonable.

3.2.17 Motor power factor is assumed constant versus frequency within the 2 percent range of this calculation (See Attachment A).

Basis: Motor operation above nominal frequency actually results in a slight improvement in the motor power factor. This assumption is considered conservative.

3.2.18 Diesel engine rated torque is assumed constant within 2 percent of the rated speed. Since horsepower varies directly proportional to rotational speed, this facilitates correcting the DG mechanical rating for other than nominal frequencies.

Basis: Common engine analysis practice, per discussion with ALCO owner's group representative. Therefore, this assumption is reasonable.

3.2.19 The brake horsepower loading of the Centrifugal Charging Pumps is assumed to increase 2 percent from the value determined in Reference 12.1.6.

Basis: Reference 12.1.6 does not address the losses associated with the speed increaser as described in Reference 12.1.29.

4.0 INPUTS

4.1 The load list for each bus shall be developed from the appropriate electrical single line diagram (Ref. 12.1.15, 12.1.16, 12.1.17, 12.1.26, 12.1.27, 12.1.28).

4.2 The mechanical brake horsepower load on electrical motors shall be from Reference 12.1.6.

4.3 The loading of non-rotating electrical equipment should be obtained from Reference 12.1.7. Other equipment specific drawings or other calculations may be used as appropriate.

4.4 Motor power factor and efficiency data should be obtained from Reference 12.1.7 or motor data sheets as applicable.

5.0 METHODOLOGY

As previously stated, the purpose of this calculation is to demonstrate that each DG has sufficient capacity and margin to continuously supply the sum of the loads needed to be powered at any given time. The DG's automatically start and load in response to a loss (or degradation) of offsite power voltage. There are two automatic load sequencing schemes, if separation from the offsite power is the only initiator, the LOOP loading sequence is invoked. If a concurrent Safety Injection actuation signal is present, the LOCA loading sequence is invoked.

The FSAR Chapter 15 accident scenarios affected by the DG (i.e. assume loss of offsite power) are listed below.

5.1 Loss of Normal Feedwater: The motor driven AFW Pumps auto start as part of the LOOP DG loading sequence (FSAR Section 15.2.8).

5.2 LOOP (FSAR Section 15.2.9)

5.3 Small Break LOCA Coincident With a LOOP: A Small break LOCA does result in a SI actuation; however, the Containment Spray pumps are not started (FSAR Section 15.3.1).

5.4 Large Break LOCA Coincident With a LOOP (FSAR Section 15.4.1)

5.5 Main Steam Line Break Coincident With a LOOP (FSAR Section 15.4.2)

5.6 Station Blackout (SBO): The term "Station Blackout" means the loss of both the offsite and onsite AC power sources. However, the DCPP SBO analysis credits one of the Class 1E DG's as an "Alternate AC" power source (Ref. 12.1.5, Section 1.2.2).

Except for the SBO scenario, Revision 19, and earlier, of this calculation was based on an implied assumption that the large break LOCA was the worst case loading scenario of any anticipated operational occurrence. This has been confirmed in Reference 12.1.6 and is no longer an assumption of this calculation.

The SBO event is initially electrically the same as the LOOP event (i.e. no SI signal) with respect to the DG. However, if the DG associated with Bus H is functioning as the SBO "Alternate AC Source," then the associated Safety Injection (SI) Pump may be manually started during the SBO coping period. The Residual Heat Removal (RHR) and Containment Spray (CSP) pumps are not required and would not start (Ref. 12.1.5). Additionally, the Centrifugal Charging Pumps (CCP) would be operating at a significantly reduced mechanical load (Ref. 12.1.29). Therefore, the large break LOCA coincident with a LOOP is the "worst case" and envelopes all the other scenarios listed above.

It is acknowledged that the mechanical demand on ECCS pumps varies with time, based primarily upon RCS pressure. However, the basic approach used to date has been to assume that all ECCS pumps are at maximum brake horsepower demand at the same time. The same is also true for all auxiliary support equipment that automatically connects to the DG.

The basic approach is to analyze each DG to determine the peak operating load of each piece of equipment that would automatically connect to the DG; sum the resultant kilowatts and kilovars; determine the associated power factor. The total kilowatts is then compared to the 2000 hour per year rating and 30 minute per 24 hour rating of the DG set for operating and design margin, respectively. The overall power factor is compared to the generator 0.8 power factor rating.

5.7 Single Failure

It is recognized that the single failure of a Class 1E component can impact the loading of redundant equipment, and thereby redundant DG's. To account for single failure, the following approach is used to determine the load factor of each load.

5.7.1 Redundant loads that share a common discharge fluid path shall all be running at a load level based on the minimum number of pumps necessary to achieve the safety function [e.g. total of three 50% capacity parallel pumps are all running at a brake horsepower loading corresponding to two pump operation] (Ref. 12.1.6).

5.7.2 Redundant non-rotating loads (i.e. loads not in the scope of Reference 12.1.6) shall all be operating at the design basis load level corresponding to single component operation.

The following describes the application of this methodology in more detail and is applicable to all six DG's (i.e. three per unit).

5.8 Data Requirements

5.8.1 DG rating

a. Continuous

b. 2000 Hour per year

c. 30 Minute per 24 Hours

5.8.2 Connected Loads

5.8.3 Load Type (e.g. induction motor driven, heater, regulated electronic device such as battery charger or uninterruptible power supply)

5.8.4 Load Characteristics (e.g. rated load, maximum operating load, power factor, and efficiency)

5.9 Determine maximum LOCA/LOOP continuous loading for each DG bus.

5.9.1 Identify the worst case loading for each individual circuit.

5.9.2 Perform data analysis to determine the cumulative continuous loading of each DG in accordance with Tables 2 through 7:

a. Each DG supplies a single 4 kV vital bus and its corresponding 480 Volt load center. List each load, including nameplate rating (in horsepower or KVA as appropriate), efficiency and power factor as applicable.

b. For each load, compute the rated KW and KVAR steady state loading based on the nameplate data.

c. Identify the load type:

1. (R)otating for all motor driven loads. Motors are basically constant power devices for a given frequency. However, motors are susceptible to speed changes resulting from off-nominal DG frequency operation. The actual load placed on the DG by a motor should be increased based on the cube of the maximum per unit DG frequency (See Assumption 3.2.4).

2. (K)VA for all constant power non-rotating loads (e.g. electronic devices such as a battery charger).

3. (Z)impedance for all constant impedance loads (e.g. resistive heating). These devices are susceptible to power changes resulting from off-nominal DG voltage operation. An increase in voltage results in an increase in current, which in turn results in increased power. Therefore, the actual load placed on the DG by a constant impedance load should be increased based on the square of the maximum per unit DG voltage.

d. Review the control functions for each load and determine the applicable "Demand Category" for each scenario. The following "Demand Categories" are defined and each has an assumed diversity factor for the load (See Assumption 3.2.5).

1. (A)utomatic: Load is automatically connected to the bus. This can be via a loading sequencing signal, a signal initiated by the process associated with the connected load, or via a maintained "run" signal.

2. (P)rocedure / Manual: Load is procedurally required to be manually started.

3. (I)ntermittent: Load is automatically started, but has a definite on/off duty cycle and/or alternates with a redundant load.

4. (L)oad Shed: Load is automatically disconnected from the bus when the bus is aligned to the DG.

5. (M)omentary: Load that may automatically start, but for a very short period of time or limited duty cycle relative to the DG rating.

6. MO(V): Motor operated valve is a specific type of "Momentary" load.

e. For mechanical loads, enter the brake horsepower (bhp), if data is available; otherwise, enter the assumed loading factor.

f. Compute the actual KW and KVAR steady state loading based on the nameplate data and the scenario loading factor. Include worst case frequency or voltage correction factors as applicable. For loads susceptible to increases due to off nominal frequency operation, use a maximum frequency of 61.2 Hz (Ref. 12.1.12, SR 3.8.1.2 & 3.8.1.11). For loads susceptible to increases due to off nominal voltage operation, use a maximum DG voltage of 4,400 Volts (i.e. 110 %) (Ref. 12.1.12, SR 3.8.1.2 & 3.8.1.11).

g. Sum the KW and KVAR steady state loading for each bus. Compute the associated KVA and power factor.

h. Sum the KW and KVAR steady state loading of the 4 kV and 480 Volt buses to determine the DG loading. Compute the associated KVA and power factor.

i. Summary of equations used in Tables 2 through 7:

1. Conversion from HP to input KW/KVAR/KVA:

$$KW = \frac{(\text{HP})(0.746)}{\text{Eff}}$$

$$KVAR = KW * Tan\left(Cos^{-1}(Pf)\right)$$

$$KVA = \sqrt{KW^2 + KVAR^2}$$

2. Conversion from KVA to KW:

$$KW = KVA * Pf$$

3. Demand factor:

$$Damand\ Factor = \frac{bhp}{hp_{Rated}} \quad or \quad = \frac{kVA_{Load}}{kVA_{Rated}}$$

4. Conversion of KW_{Rated} to KW_{Actual} for rotating machines:

$$KW_{Actual} = KW_{Rated} * Demand\ Factor * Diversity\ Factor * Frequency\ Correction\ Factor$$

5. Conversion of KW_{Rated} to KW_{Actual} for constant power devices:

$$KW_{Actual} = KW_{Rated} * Demand\ Factor * Diversity\ Factor$$

6. Conversion of KW_{Rated} to KW_{Actual} for constant impedance devices:

$$KW_{Actual} = KW_{Rated} * Demand\ Factor * Diversity\ Factor * Voltage\ Correction\ Factor$$

7. Determine the KW margin:

$$KW_{MARGIN} = KW_{Rated\ New\ Speed} - \sum KW_{Actual}$$

8. Determine the KVAR margin based on $\sum KW_{Actual}$:

If the $\sum KW_{Actual} < KW_{Rated}$ then, limit the maximum KVAR based on the minimum generator power factor of 0.8.

$$KVAR_{MARGIN} = \left(\sum KW_{Actual} * Tan\left(Cos^{-1}(0.8)\right)\right) - \sum KVAR_{Actual}$$

If the $\sum KW_{Actual} \geq KW_{Rated}$ then, limit the maximum KVAR based on the constant kVA rating of the generator.

$$KVAR_{MARGIN} = KVA_{Rated}\left(Sin\left(Cos^{-1}\left(\frac{\sum KW_{Actual}}{KVA_{Rated}}\right)\right)\right) - \sum KVAR_{Actual}$$

9. Scaling the diesel engine rating for off-nominal speeds: The diesel engine ratings listed in Section 6.0 are based on operating at 60 Hz (i.e. 900 rpm). The available engine horsepower varies with engine speed. The specific relationship is:

i) $$hp = \frac{\tau * rpm}{5252}$$

Conservatively assuming that the engine speed torque curve is flat (i.e. constant torque) for operation near 60 Hz, a 2 percent speed increase will result in a 2 percent power increase for the same torque. (Note: In actuality, the engine speed torque curve would be expected to have a slight positive slope at an engine speed corresponding to 60 Hz.). Therefore, for operation at frequencies other than 60 Hz, the following relationship can be used to correct the DG rating to the new base frequency:

ii) $$KW_{Rated\ New Speed} = KW_{Rated\ 60\,Hz} * \frac{Hz_{New}}{60.0}$$

10. Frequency correction factor for rotating machines (i.e. pumps and fans):

$$Frequency\ Correction\ Factor = \left(f_{P.U.\,Actual}\right)^3$$

11. Voltage correction factor for constant impedance devices:

$$Voltage\ Correction\ Factor = \left(V_{P.U.\,Actual}\right)^2$$

12. Combining 9-11, above, yields the following generic formula to determine that the total DG load is within the rating at a given voltage and frequency:

$$\sum kW_{Const\ kVA} + \sum (V_{PU})^2 (kW_{Const\ Z\ @100\%V}) + \sum (f_{PU})^3 (kW_{Motor\ @60Hz}) \le (f_{PU})(kW_{Rated\ @60Hz})$$

6.0 ACCEPTANCE CRITERIA

6.1 2000 Hour per Year Rating:

6.1.1 The generator rating is 3440 kVA at an 80 percent power factor (Ref. 12.1.3, Section 4.3.6.1).

6.1.2 The engine is rated for 2752 kW at the generator output (i.e. includes generator efficiency) at 60 Hz for up to 2000 hours of operation per year (Ref. 12.1.3, Section 4.3.2).

6.2 30 Minute per 24 Hour Period Rating:

6.2.1 The generator rating is 4062.5 kVA at an 80 percent power factor (Ref. 12.1.3, Section 4.3.6.1).

6.2.2 The engine is rated for 3250 kW at the generator output (i.e. includes generator efficiency) at 60 Hz for up to 30 minutes of operation per 24 hour period (Ref. 12.1.3, Section 4.3.2).

6.3 Based on the above individual component ratings, the diesel generator set steady state loading resulting from automatically connected loads shall not exceed 2752 $KW_{60\ Hz\ Base}$ and the power factor shall be greater than or equal to 80 percent. This load limit corresponds to the smaller of the 2000 hour rating and 90 percent of the 30 minute rating.

6.4 The 4.16 kV / 480 V load center transformer loading shall be less than the self cooled 1000 kVA rating.

7.0 CALCULATION

See the attached Tables 2 through 7 for DG operation at:

7.1 Nominal

7.1.1 60 Hz

7.1.2 100% Voltage

7.2 Technical Specification allowable frequency and maximum voltage (Ref. 12.1.12)

7.2.1 61.2 Hz

7.2.2 110% Voltage

7.3 The results of this calculation may be used to justify surveillance endurance testing load levels. The purpose of an endurance test is to prove operation as close to design conditions as possible (Ref. 12.1.12 Bases SR3.8.1.14). However, caution must be used to preclude routine DG overloading. Since the endurance tests are performed with the DG paralleled to offsite power, operation at other than 60 Hz is not feasible. Therefore, the expected loading levels computed for operation at 61.2 Hz should not be used directly as the basis for surveillance test conditions.

Per equation 10 (Ref. Assumption 3.2.4), pump horsepower demands would increase by 6.12% (i.e. 1.02^3) for operation at 61.2 Hz. Increasing the test load by 6.12% at 60 Hz would require a 6.12% torque increase (Ref. Equation 9(i)), potentially overloading the engine. Since for the same engine torque, the engine can produce 2% more horsepower at 61.2 Hz versus 60.0 Hz, the actual load factor to be applied to the 60.0 Hz test condition would be:

$$\left(\frac{61.2\,Hz}{60.0\,Hz}\right)^3 - \frac{61.2\,Hz - 60.0\,Hz}{60.0\,Hz} = 1.0412$$

Using equation 10 to convert the above 1.0412 load factor to an equivalent frequency yields:

$$f_{Hz} = \sqrt[1/3]{1.0412} * 60\,Hz = 60.8\,Hz$$

Therefore, evaluate DG operation (Tables 2 through 7) at the following conditions to support DG surveillance testing goals:

7.3.1 60.8 Hz

7.3.2 110% Voltage

7.4 The Control Room Ventilation and Pressurization System (i.e. Circuits 52-1F-55, 52-1H-55, 52-2F-61, and 52-2H-55) consists of numerous loads comprised of fans, compressor, heaters, and dampers (Ref. 12.1.30). Train A is typical of the four trains and is used to determine the over all demand factor per train.

Load	Nominal kW	Diversity Factor	DG Load (kW)
OS-98	7.52	1.0	7.52
EH-27B	5.0	0.5	2.50
S-39	3.19	1.0	3.19
S-35	7.52	1.0	7.52
CR-35	8.19	0.5	4.10
CP-35	40.96	0.5	20.48
Total	72.4		45.3

A DG load of 45.3 kW / 72.4 kW yields an overall diversity factor of 63 percent.

7.5 The Diesel Generator Auxiliary Panels feed numerous loads comprised of compressors, pumps, and heaters (Ref. 12.1.31, 12.1.32, and 12.1.33). Demand factors are based on:

Load	Nominal kW	Diversity Factor	Panel A (kW)	Panel B (kW)
Diesel Start Air Compressor (15hp)	13	1.0	13	13
Pre-Circ Lube Oil Pp (3hp)	3	0.0	0	---
Diesel Turbo Air Compressor (15hp)	13	1.0	---	13
Jacket Water Heater	9	0.0	0	---
Lube Oil Heater	12	0.0	0	---
Control Pwr Xfmr	3	1.0	3	---
Gen Space Heater	1.6	0.0	---	0
Total Coincident / Connected			16/40	26/27.6

The demand factors are 40% and 95% for DG Auxiliary Panels A and B, respectively.

8.0 RESULTS

Table 1 summarizes the results.

Table 1: Worst Case Diesel Generator Loading

Unit	Bus	DG	Operating Condition Hz	Operating Condition V(%)	DG Load (kW)	Pf (%)	Margin Operating kW	Margin Operating %	Margin Design kW	Margin Design %	LC Xfmr kVA
1	F	13	60.0	100%	2601	85.8%	151	5.5%	649	20.0%	747
			61.2	110%	2759	85.9%	48	1.7%	556	16.8%	793
			60.8	110%	2707	85.9%	82	2.9%	587	17.8%	779
	G	12	60.0	100%	2366	85.9%	386	14.0%	884	27.2%	614
			61.2	110%	2506	86.0%	301	10.7%	809	24.4%	647
			60.8	110%	2460	85.9%	329	11.8%	834	25.3%	636
	H	11	60.0	100%	2504	87.4%	248	9.0%	746	23.0%	816
			61.2	110%	2650	87.5%	157	5.6%	665	20.1%	859
			60.8	110%	2602	87.5%	187	6.7%	692	21.0%	845
2	F	23	60.0	100%	2604	85.9%	148	5.4%	646	19.9%	746
			61.2	110%	2762	86.0%	45	1.6%	553	16.7%	791
			60.8	110%	2710	86.0%	79	2.8%	584	17.7%	777
	G	21	60.0	100%	2358	85.9%	394	14.3%	892	27.5%	594
			61.2	110%	2498	86.0%	309	11.0%	817	24.6%	626
			60.8	110%	2452	86.0%	337	12.1%	841	25.6%	616
	H	22	60.0	100%	2473	87.5%	279	10.1%	777	23.9%	781
			61.2	110%	2620	87.6%	188	6.7%	695	21.0%	823
			60.8	110%	2572	87.6%	217	7.8%	721	21.9%	811

9.0 MARGIN ASSESSMENT

9.1 Operating Margin

The operating limit is 2752 kW (at 60 Hz), which corresponds to the 2000 hour per year DG rating. The results of this calculation indicate that the minimum operating margin at the expected DG operating condition of 60 Hz and 100 percent voltage is 148 kW (5.4%). Should continuous operation at the maximum allowable frequency and voltage occur the worst case loading will still have positive margin (1.6%).

The present day practice is to require a minimum operating margin of 5 percent, including frequency and voltage variation impacts (Ref. 12.1.4). Although the minimum margin is not a DCPP requirement, it is achieved for expected operating conditions.

9.2 Design Margin

The design limit is 3250 kW (at 60 Hz), which corresponds to the 30 minute per 24 hour DG rating. The results of this calculation indicate that the minimum operating margin at the expected DG operating condition of 60 Hz and 100 percent voltage is 646 kW (19.9%). Should operation at the maximum allowable frequency and voltage occur the worst case loading will still have positive margin (16.7%).

10.0 CONCLUSIONS

10.1 The maximum steady state expected loading of the Unit 1 and Unit 2 emergency DG's is within the capabilities and licensed limits as stated in Acceptance Criterion 6.3. Additionally, consistent with present day practice, a minimum 5 percent margin is available. When the worst case (i.e. not expected) frequency and voltage tolerances (61.2 Hz and 110 percent voltage respectively) are considered, compliance with Acceptance Criterion 6.3 is still achieved.

10.2 The worst case power factor is greater than the 0.8 generator rating as stated in Acceptance Criterion 6.3.

10.3 The load center 4.16kV/480V transformers are operating within their self-cooled rating of 1000 kVA as stated in Acceptance Criterion 6.4.

10.4 During the review of Order 60015038, the Table 2 through 7 results for the 60.8 Hz and 110% voltage condition should be used when considering the worst case loading for endurance testing purposes.

10.5 Technical Specification SR3.8.1.14 (Ref. 12.1.12) specifies the operating conditions for the 24 hour endurance test. The first 2 hours are at a power level based on the DG 2 Hr per 24 Hr rating of 2860 kW. The remaining 22 hours of the test are at a power level based on the DG continuous rating of 2600 kW. This calculation is based on 2000 Hr per year rating of 2752 kW. If the same percentages as presently used to develop the T.S. testing ranges (i.e. 2 hrs @ 100-110% and 22 hrs @ 90-100%) are applied to the 2752 kW rating, sufficient overlap exists to permit testing using the current T.S. Additionally, the 2 Hr per 24 Hr rating of 2860 kW envelopes the worst case predicted loading including considerations for frequency and voltage variations (See Table 1 @60.8 Hz).

11.0 IMPACT EVALUATIONS

11.1 DCM's

11.1.1 DCM S-21, Diesel Engine System: Clarify that the DG rating is engine limited as illustrated in Reference 12.3.4, Appendix 8.2. Correct the typographical error regarding the DG 30 minute kVA rating (i.e. 4062.5 kVA versus 462.5 kVA) in Section 4.3.6.1(c) (Notification 50248283).

11.1.2 DCM T-42, Station Blackout (Notification 50248284)

a. Delete reference to Calculation 125-DC as it is superseded by this calculation.

b. Revise Table 4.2-1 and the applicable sections that reference it. The objective is to move design basis, calculation inputs to Mechanical Calculation M-1141 for configuration control. [e.g. Move individual pump SBO brake horsepower determinations to the calculation. Table 4.2-1 can list motor rated horsepower and SBO operating status (i.e. On/Off)]

11.1.3 DCM S-63, 4160V System: Delete reference to Calculation 125-DC as it is superseded by this calculation (Notification 50248285).

11.2 Procedures

11.2.1 STP M-9A, Diesel Engine Generator Routine Surveillance Test, Appendix 8.2 figure is not impacted by this calculation; however, the 0.8 Pf (power factor) line was observed to be in error. Also, it is recommended that the "Maximum Operating Limit" and "Normal Operating Limit" be defined in terms of DG rating. The allowable and abnormal areas of operation should be identified (Notification 50248286).

11.2.2 STP M-9M, Verification of Auto-Connected Loads Less than 2750 kW: Delete references to FSAR Tables 8.3-3, 8.3-5, and 8.3-7. For Unit 2, reference to Electrical Calculation 015-DC instead of 125-DC. As a minimum, the kW loading of individual loads should be reviewed and updated as appropriate. However, it is recommended that this surveillance procedure be restructured to eliminate duplicate configuration control of load kW values (Notification 50248287).

11.2.3 EOP ECA-0.3, Restore 4 kV Buses: Update Appendix Q, Table 1, Equipment Loads, as appropriate. Revise Appendix Q, Figure 1, to distinguish between normal operating, design, and ultimate capability limits (Notification 50248288).

11.2.4 The impact of all DG surveillance test procedures is being coordinated through the DG System Engineer (Notification 50248289). It should be noted that the analytical results associated with operation at 61.2 Hz are not intended to define testing conditions. Worst case loading test conditions should be based on the 60.8 Hz and 110% voltage analytical results.

11.3 Calculations

11.3.1 Mechanical Calculation M-1141, Maximum EDG Mechanical Loading: Update to include mechanical bhp loading for a Station Blackout Scenario. Include DCM T-42 revision under same LBIE (Ref. 11.1.2). Also, delete Electrical Calculation 125-DC from the output reference list (Notification 50248350).

11.3.2 Mechanical Calculation M-786, EDG Fuel Oil Storage: Review Assumptions and Tables 2 through 7 for impacts on M-786 inputs (Notification 50248351).

11.4 Other

11.4.1 The results of this calculation may be used as input to resolve Order 60015038, Non-Conservative Tech Spec 3.8.1. It is stated in Operation 20 of the subject Order taht DCPP is committed to R.G. 1.9, Rev. 0, (Ref. 12.1.2) for steady state loading capability, which is the subject of this calculation. Revision 0 does not specify any steady state testing. Power factor was first introduced in Revision 3, which stipulated a power factor range of 0.8-0.9, which is the DCPP commitment for testing scope. Therefore, one could interpret the DCPP Tech Spec 0.87 power factor value as already conservative.

11.4.2 FSAR: Tables 8.3-3, 8.3-5, 8.3-6, and 8.3-7 are impacted by this calculation revision. Update accordingly (Notification 50248352).

12.0 REFERENCES

12.1 Input References

12.1.1 10 CFR Part 50, Appendix A, GDC-17, Electric Power Systems

12.1.2 NRC Regulatory Guide 1.9 / AEC Safety Guide 9, Selection of Diesel Generator Set Capacity for Standby Power Supplies, March 10, 1971

12.1.3 DCM S-21, Rev. 21A, Diesel Engine System

12.1.4 NRC Regulatory Guide 1.9, Rev. 4, Application and Testing of Safety Related Diesel Generators In Nuclear Power Plants

12.1.5 DCM T-42, Rev. 9, Station Blackout

12.1.6 Calculation 9000040769 (M-1141), Rev. 0, Maximum EDG Mechanical Loading

12.1.7 Calculation 357A-DC, Rev. 12, Load Flow, Short Circuit, and Motor Starting

12.1.8 STP M-15, Rev. 42, Integrated Test of Engineered Safeguards and Diesel Generators

12.1.9 Emergency Procedure EOP E-0.1, Rev. 33/24, Reactor Trip Response

12.1.10 Emergency Procedure EOP E-1, Rev. 27/19, Loss of Reactor or Secondary Coolant

12.1.11 Emergency Procedure EOP E-1.1, Rev. 25/17A, SI Termination

12.1.12 T.S. 3.8.1, AC Sources Operating, Unit 1&2 Amendments 174 & 176

12.1.13 Operating Procedure OP A-4A:I, Rev. 25/18, Pressurizer – Make Available

12.1.14 Operating Procedure OP H-9, Rev. 10/6, Inside Containment H_2 Recombination System

12.1.15 Single Line Drawing 437916, Rev. 45, Single Line Meter and Relay Diagram 480V System Bus 1F

12.1.16 Single Line Drawing 437542, Rev. 49, Single Line Meter and Relay Diagram 480V System Bus 1G

12.1.17 Single Line Drawing 437543, Rev. 46, Single Line Meter and Relay Diagram 480V System Bus 1H

12.1.18 Operating Procedure OP H-5:II, Rev. 17/15, Control Room Ventilation System – Alignment Verification

12.1.19 Operating Procedure OP O-13, Rev. 26, transferring Equipment To/From Alternate Power Source

12.1.20 Calculation 235A-DC, Rev. 9, Battery 11 Sizing

12.1.21 Calculation 235B-DC, Rev. 9, Battery 12 Sizing

12.1.22 Calculation 235C-DC, Rev. 9, Battery 13 Sizing

12.1.23 Calculation 235D-DC, Rev. 9, Battery 21 Sizing

12.1.24 Calculation 235E-DC, Rev. 9, Battery 22 Sizing

12.1.25 Calculation 235F-DC, Rev. 9, Battery 23 Sizing

12.1.26 Single Line Drawing 441237, Rev. 34, Single Line Meter and Relay Diagram 480V System Bus 2F

12.1.27 Single Line Drawing 441238, Rev. 42, Single Line Meter and Relay Diagram 480V System Bus 2G

12.1.28 Single Line Drawing 441239, Rev. 42, Single Line Meter and Relay Diagram 480V System Bus 2H

12.1.29 Calculation M-786, Rev. 16, EDG Fuel Oil Storage

12.1.30 Single Line Drawing 433130, Rev. 16, Single Line Diagram Control Room Pressurization System

12.1.31 Single Line Drawing 437674, Rev. 28, Single Line Diagram 4 kV Diesel Generator Auxiliary Motors (Unit 1)

12.1.32 Single Line Drawing 441359, Rev. 20, Single Line Diagram 4 kV Diesel Generator Auxiliary Motors (Unit 2)

12.1.33 Single Line Drawing 496282, Rev. 13, Single Line Diagram 4 kV Diesel Generator 23 Auxiliary Motors

12.1.34 Schematic Diagram 437654, Rev. 14, Fuel transfer System

12.1.35 Schematic Diagram 448920, Rev. 13, Containment Hydrogen Purge and Monitor System

12.2 Output References

12.2.1 UFSAR Section 8.3, Onsite Power Systems

12.2.2 Emergency Procedure EOP ECA-0.3, Restore 4 kV Buses

12.2.3 STP M-9M, Verification of Auto-Connected Loads Less than 2750 kW

12.2.4 Mechanical Calculation M-786, EDG Fuel Oil Storage

12.3 Other

12.3.1 Temporary Instruction (TI), 2515/176, Emergency Diesel Generator Technical Specification Surveillance Requirements Regarding Endurance and Margin Testing

12.3.2 ACE Order 60010397, Green NCV - EDG- Load Calcs vs Ch 15

12.3.3 IEEE 387-1995, Criteria for Diesel- Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations

12.3.4 STP M-9A, Diesel Engine Generator Routine Surveillance Test

Table 2: DG 13 Unit 1 Bus F

Breaker	Load ID	Load Description	Notes	Rating	Units (KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	LOOP Coincident with LOCA 60.0 Hz 100% V KW	KVAR	KVA	61.2 Hz 110% V KW	KVAR	KVA	60.6 Hz 110% V KW	KVAR	KVA	Rated Load KW	KVAR
Unit 1 4.16 kV Bus F																								
52-HF-08	ASP1	Aux Saltwater Pp 11		400	HP	92.7%	88.8%	4.00	R	A	465	C	116%	374.2	193.8	421.4	397.1	205.6	447.2	389.4	201.6	438.5	321.9	166.7
52-HF-09	AFWP3	Aux Feedwater Pp 13		600	HP	95.5%	90.5%	4.00	R	A	600	C	100%	468.7	220.3	517.9	497.4	233.8	549.6	487.7	229.2	538.9	468.7	220.3
52-HF-10	--	Load Center Xfmr & Cable Losses	See Assumption 3.2.8	3250	KVA		34.0%		K	A		A	3%	33.2	91.7	97.5	33.2	91.7	97.5	33.2	91.7	97.5	1105.0	3056.4
52-HF-11	CCP1	Charging Pp 11	See Assumption 3.2.19	600	HP	94.2%	90.5%	4.00	R	A	650	C	108%	514.5	241.9	568.6	546.0	256.7	603.4	535.4	251.7	591.6	475.2	223.4
52-HF-12	CCWP1	Component Cooling Water Pp11		400	HP	95.0%	89.0%	4.00	R	A	425	C	106%	333.7	171.0	375.0	354.2	181.4	397.9	347.3	177.9	390.2	314.1	160.9
52-HF-15	SIP1	Safety Injection Pp11		400	HP	94.0%	90.4%	4.00	R	A	393	C	98%	311.9	147.5	345.0	331.0	156.5	366.1	324.5	153.5	359.0	317.4	150.1
	Bus Total													2036	1066	2298	2159	1126	2435	2117	1106	2388.7		
															Power Factor	88.6%			88.7%			88.6%		
Unit 1 480 V Bus F																								
52-1F-00	THF	480 Bus F Load Center Xfmr Fans	See Assumption 3.2.14	3	KVA		90.0%	0.24	R	A		A	0%										2.7	1.3
52-1F-01	CFC1-2	Containment Fan Cooler 12		100	HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	128.6
52-1F-02	CFC1-1	Containment Fan Cooler 11		100	HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-1F-04	E43	480V Swgr Exhaust Fan E43		50	HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.6	27.5	49.8	39.9	26.4
52-1F-05	S43	480V Swgr Supply Fan S43		50	HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.6	27.5	49.8	39.9	26.4
52-1F-06	RHRSP1	RHR Sump Pp11		1.5	HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-1F-07	8107	Cold Leg Loop Charging VLV 1		1	HP				R	V			0%											
52-1F-08	E-1	Aux Bldg Exhaust Fan E-1		150	HP	94.5%	88.5%	0.46	R	A	160	C	107%	126.3	66.4	142.7	134.0	70.5	151.5	131.4	69.1	148.5	118.4	62.3
52-1F-09	CVCS-8105	Charging Pp 11/12 Recirc Line Isol		1	HP				R	V			0%											
52-1F-10	Spare								-	-			0%											
52-1F-11	FCV-430	CCW Hx 1-1 Outlet Hdr A		1.6	HP				R	V			0%											
52-1F-12	LCV-112B	Vol Control Tank Outlet Vlv 1		0.68	HP				R	V			0%											
52-1F-13	S-1-1	Cont H2 Purge Supply Fan 1-1	See Assumption 3.2.12	7.5	HP				R	P			0%											
52-1F-14	TG1	FW Pp11 Turning Gear		1	HP	48.0%	85.0%	0.46	R	A	1	NP	100%	1.6	1.0	1.8	1.6	1.0	1.9	1.6	1.0	1.9	1.6	1.0
52-1F-15	RHRSP3	RHR Sump Pp13		1.5	HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-1F-16	SI-8801A	Charging Injection		3.2	HP				R	V			0%											
52-1F-17	SI-8803A	Charging Injection		3.2	HP				R	V			0%											
52-1F-18	SI-8807A	RHR Disch To SI Pps		0.66	HP				R	V			0%											
52-1F-19	SI-8805A	Refueling Water Supply 1		1.33	HP				R	V			0%											
52-1F-20	Spare								-	-			0%											
52-1F-21	Spare								-	-			0%											
52-1F-22	FW-FCV-441	S/G 14 FW Isolation		5.3	HP				R	V			0%											
52-1F-23	CCW-FCV-750	RCP Barrier Seal CCW Return Isol		0.67	HP				R	V			0%											
52-1F-24	FW-FCV-438	S/G 11 FW Isolation		5.3	HP				R	V			0%											
52-1F-25	SFPP1	Feed Spent Fuel Pit Pp 11 (Alt)	See Assumption 3.2.9	100	HP				R	P			0%											
52-1F-26	Spare								-	-			0%											
52-1F-27	TYBU	Non-Vital Instr AC Backup Reg Xfmr		15	KVA				K	P			0%											
52-1F-28	MPF28	DG12 Aux Pnl B		32.5	KVA		85.0%	0.46	R	I		C	95%	13.1	8.1	15.4	13.9	8.6	16.4	13.7	8.5	16.1	27.6	17.1
52-1F-29	Spare								-	-			0%											
52-1F-30	MS-FCV-38	Aux FW Pp 11 Steam Lead 3		1.3	HP				R	V			0%											
52-1F-31	SI-8980	Refueling Water To RHR Suction		5.2	HP				R	V			0%											
52-1F-32	SI-8974A	Safety Injection PPS Recirc Line To RWST		1	HP				R	V			0%											
52-1F-33	SFPP2	Feed Spent Fuel Pit Pp 12 (Alt)	See Assumption 3.2.9	75	HP				R	P			0%											
52-1F-34	SW-1-8	ASW Pp 11 Inlet Gate 1-8		4	HP				R	V			0%											
52-1F-35	CS-8992	Spray Additive Tank Outlet		0.7	HP				R	V			0%											
52-1F-36	S-69	4kV Swgr Supply Fan S69		1.5	HP	85.5%	78.3%	0.46	R	A	1.5	NP	100%	1.3	1.0	1.7	1.4	1.1	1.8	1.4	1.1	1.7	1.3	1.0
52-1F-37	Spare								-	-			0%											
52-1F-38	PWMUP1	Primary Makeup Water Pp11		15	HP	86.9%	89.6%	0.46	R	M	15	NP	100%										12.9	8.4

Table 2: DG 13 Unit 1 Bus F

	Load			Nameplate					Load	Demand	Mechanical			LOOP Coincident with LOCA										
					Units	Efficiency	Power	Voltage	Type	Category	Load,	Load	Demand	60.0 Hz 100% V			61.2 Hz 110% V			60.8 Hz 110% V			Rated Load	
Breaker	ID	Description	Notes	Rating	(KVA/HP)	(%)	Factor (%)	(kV)	(R/K/Z)	(A/P/I/L/M/V/S)	(bhp)	Basis	Factor (%)	KW	KVAR	KVA	KW	KVAR	KVA	KW	KVAR	KVA	KW	KVAR
52-1F-39	E-103	Intake Struc ASW Pp 11 Exhaust Fan		1	HP	87.8%	85.0%	0.46	R	A	1	NP	100%	0.8	0.5	1.0	0.9	0.6	1.1	0.9	0.5	1.0	0.8	0.5
52-1F-40	RCS-8000A	Prz Relief Vlv 1-1		0.7	HP				R	V			0%											
52-1F-41	SW-FCV-601	Units 1 & 2 ASW Pump Cross-Tie		1	HP				R	V			0%											
52-1F-42	ED11	Battery Charger 11		76.6	KVA	94.6%	74.0%	0.48	K	A		C	20%	12.0	10.9	16.2	12.0	10.9	16.2	12.0	10.9	16.2	59.9	54.6
52-1F-43	Spare								-	-			0%											
52-1F-44	CCWAP1	CCW Pp11 Aux Lube Oil Pp		0.5	HP	72.3%	66.6%	0.46	R	M	0.5	NP	100%										0.5	0.6
52-1F-45	TRPI	Rod Position Indication Reg Xfmr TRPI		10	KVA		80.0%	0.48	Z	A			100%	8.0	6.0	10.0	9.7	7.3	12.1	9.7	7.3	12.1	8.0	6.0
52-1F-46	SI-8808A	Accum Injection Cold Loop		5.2	HP				R	V			0%											
52-1F-47	FP1.	Fire Pp 0-1	See Assumption 3.2.15	200	HP	94.6%	89.9%	0.46	R	A		A	0%										157.7	78.8
52-1F-48	SI-8802A	SI Pp 11 Discharge (Hot Leg)		2	HP				R	V			0%											
52-1F-49	SI-8821A	SI Pp 11 Discharge (Cold Leg)		1	HP				R	V			0%											
52-1F-50	BATP1	Boric Acid Transfer Pp11 (FAST)		15	HP	89.4%	89.0%	0.46	R	I	13	C	87%	5.4	2.8	6.1	5.8	2.9	6.5	5.6	2.9	6.3	12.5	6.4
52-1F-51	TRY12	Instr Reg Xfmr Inv UPS 12 (Alt Bypass)	See Assumption 3.2.9	20	KVA	81.0%	80.0%		K	P		C	80%										19.8	14.8
52-1F-52	ED131	Battery Charger 131	See Assumption 3.2.13	76.6	KVA	94.6%	74.0%	0.48	K	P		A	0%										59.9	54.5
52-1F-53	Spare								-	-			0%											
52-1F-54	FW-LCV-113/115	AFW Pp Disch Hdr Level Control S/G 13		0.66	HP				R	V			0%											
52-1F-55	EPCE2	Control Rm Ventilation "E" Train		80	KVA		90.0%	0.48	R	A		C	63%	45.4	22.0	50.4	48.1	23.3	53.5	47.2	22.9	52.4	72.0	34.9
52-1F-56	MPF56	DG13 Aux Pnl A		47	KVA		85.0%	0.48	R	I		C	40%	8.0	5.0	9.4	8.5	5.3	10.0	8.3	5.2	9.8	40.0	24.8
52-1F-57	TRY11	Instr Reg Xfmr Inv UPS 12 (Bypass)		20	KVA	81.0%	80.0%		K	A			0%										19.8	14.8
52-1F-58	TH1A	Boric Acid Heat Trace		30	KVA		100.0%	0.21	Z	I		OP	46%	6.9		6.9	8.3		8.3	8.3		8.3	30.0	
52-1F-59	Spare								-	-			0%											
52-1F-60	AP1	Charging Pp11 Aux Lube Oil Pp		2	HP	71.1%	85.0%	0.46	R	M	2	NP	100%										2.1	1.3
52-1F-61	TH3A	Boric Acid Heat Trace		18	KVA		100.0%	0.48	Z	I		C	36%	3.2		3.2	3.9		3.9	3.9		3.9	18.0	
52-1F-62	TRY14	Instr Reg Xfmr Inv UPS 14 (Alt Bypass)	See Assumption 3.2.9	20	KVA	81.0%	80.0%		K	P		C	80%										19.8	14.8
52-1F-63	SI-8923A	SI Pp 11 Suction From RWST		1	HP				R	V			0%											
52-1F-64	Spare								-	-			0%											
52-1F-65	VAC-FCV-669	H2 Recombiner Isol Vlv (Out Cont)		0.67	HP				R	V			0%											
52-1F-66	E-5	Fuel Handling Bldg Exhaust Fan E5		75	HP	91.8%	87.8%	0.46	R	A	75	NP	100%	60.9	33.2	69.4	64.7	-35.3	73.7	63.4	34.6	72.2	60.9	33.2
52-1F-67	TSC	Technical Support Center Alt Feed	See Assumption 3.2.9	187	KVA		80.0%	0.48	K	P		C	71%										149.6	112.2
52-1F-68	IY11	Nuclear Instrument UPS 11		20	KVA	57.2%	80.0%	0.48	K	A		C	80%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	28.0	21.0
52-1F-69	Spare								-	-			0%											
	Bus Total													565	489	747	600	518	793	589	509	779		
															Power Factor	75.6%			75.7%			75.7%		
	DG Total													2601	1555	3030	2759	1644	3211	2707	1614	3152		
															Power Factor	85.8%		Power Factor	85.9%		Power Factor	85.9%		
													Operating Margin	151	398		48	411		82	416			
														5.5%			1.7%			2.9%				
													Design Margin	649	396		558	425		587	416			
														20.0%			16.8%			17.8%				

Table 3: DG 12 Unit 1 Bus G

Breaker	Load ID	Load Description	Notes	Rating (Units KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	LOOP Coincident with LOCA 60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	Rated Load KW	Rated Load KVAR
Unit 1 4.16 kV Bus G																							
52-HG-06	ASP2	Aux Saltwater Pp 12		400 HP	92.7%	88.8%	4.00	R	A	465	C	110%	374.2	193.8	421.4	397.1	205.6	447.2	389.4	201.6	438.5	321.9	166.7
52-HG-07	CSP1	Containment Spray Pp 11		400 HP	93.4%	90.9%	4.00	R	A	435	C	109%	347.4	159.3	382.2	368.7	169.1	405.6	361.5	165.8	397.7	319.5	146.5
52-HG-08	RHRP1	Residual Heat Removal Pp 11		400 HP	93.7%	93.5%	4.00	R	A	410	C	103%	326.4	123.8	349.1	346.4	131.4	370.5	339.7	128.8	363.3	316.5	120.8
52-HG-09	CCP2	Charging Pp 12	See Assumption 3.2.19	600 HP	94.2%	90.5%	4.00	R	A	650	C	108%	514.5	241.9	568.6	546.0	256.7	603.4	535.4	251.7	591.6	475.2	223.4
52-HG-10		Load Center Xfmr & Cable Losses	See Assumption 3.2.6	3250 KVA		34.0%		K	A		A	3%	33.2	91.7	97.5	33.2	91.7	97.5	33.2	91.7	97.5	1106.0	3056.4
52-HG-11	CCP3	Charging Pp 13		600 HP	95.0%	92.1%	4.00	R	L	434	C	72%										471.2	199.3
52-HG-12	CCWP2	Component Cooling Water Pp 12		400 HP	95.0%	89.0%	4.00	R	A	425	C	106%	333.7	171.0	375.0	354.2	181.4	397.9	347.3	177.9	390.2	314.1	160.9
		Bus Total											*1930*	*981*	*2165*	*2046*	*1036*	*2283*	*2008*	*1018*	*2250*		
														Power Factor	89%			89%			89%		
Unit 1 480 V Bus G																							
52-1G-00	THG	480 Bus G Loadcenter Xfmr Fans	See Assumption 3.2.14	3 KVA		90.0%	0.46	R	A		A	0%										2.7	1.3
52-1G-01	CFC1-3	Containment Fan Cooler 13		100 HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-1G-02	CFC1-5	Containment Fan Cooler 15		100 HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-1G-04	*BATP2*	*Boric Acid Transfer Pp 12 (FAST)*		15 HP	89.4%	89.0%	0.46	R	I	13	C	87%	5.4	2.8	6.1	5.8	2.9	6.5	5.6	2.9	6.3	12.6	6.4
52-1G-05	SI-8808D	Accum 14 Inject to Cold Loop 4		5.2 HP				R	V			0%											
52-1G-06	RHRSP2	RHR Sump Pp 12		1.5 HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-1G-07	SI-8808B	Accum 12 Inject to Cold Loop 2		5.2 HP				R	V			0%											
52-1G-08	BOPAC1	TG Bearing Oil Pp		60 HP	91.8%	85.0%	0.46	R	A	60	NP	100%	48.8	30.2	57.4	51.7	32.1	60.9	50.7	31.4	59.7	48.8	30.2
52-1G-09	CVCS-8106	CHG Pp 1 and 2 Miniflow Vlv 2		1 HP				R	V			0%											
52-1G-10	CVCS-8108	Normal CHG to Regen. Hx Stop Vlv 2		1 HP				R	V			0%											
52-1G-11	LCV-112C	Volume Control Tank Outlet Vlv 2		0.67 HP				R	V			0%											
52-1G-12	SI-8809A	RHR Inject to Loops 1 and 2 Hot Leg		5.2 HP				R	V			0%											
52-1G-13	SI-8801B	Chg Inject Outlet Vlv 2		3.2 HP				R	V			0%											
52-1G-14	SI-8805B	Chg Pp Refuel Water Supply Vlv 2		1.33 HP				R	V			0%											
52-1G-15	RHR-8700A	RHR Pp 11 Suction Vlv		1.6 HP				R	V			0%											
52-1G-16	SI-8804A	RHR Discharge to Chg Pp		3.2 HP				R	V			0%											
52-1G-17	S1	Supply Fan S1 Fuel Handling Bldg.		25 HP	87.8%	83.1%	0.46	R	A	25	C	100%	21.2	14.2	25.6	22.5	15.1	27.1	22.1	14.8	26.6	21.2	14.2
52-1G-18	RHRSPP4	RHR Sump Pp 14		1.5 HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-1G-19	Spare							-	-			0%											
52-1G-20	Spare							-	-			0%											
52-1G-21	CS-9001A	Spray Pp 11 Discharge Stop Vlv 1		2 HP				R	V			0%											
52-1G-22	EH20	Charcoal Filter Preheater		54 KVA		100.0%	0.48	Z	P			100%										54.0	
52-1G-23	FCV-363	RCP Cooling Water Return Iso. Vlv 2		0.13 HP				R	V			0%											
52-1G-24	SI-8835	SI Pp Discharge Cold Leg		2 HP				R	V			0%											
52-1G-25	RHR-8701	RHR Suction from Loop 4 Hot Leg Vlv 2		2.6 HP				R	V			0%											
52-1G-26	CVCS-8100	RCP Seal Water Return Iso Vlv 1		0.67 HP				R	V			0%											
52-1G-27	SI-8803B	Charging Injection Supply Vlv 2		3.2 HP				R	V			0%											
52-1G-28	FCV-431	CCW Hx Outlet Vlv		1.6 HP				R	V			0%											
52-1G-29	FCV-641A	RHR Pp 11 Recirc Vlv		0.7 HP				R	V			0%											
52-1G-30	TLE11	Emergency Lighting Xfmr TLE11		25 KVA		80.0%	0.48	K	A		C	50%	10.0	7.5	12.5	10.0	7.5	12.5	10.0	7.5	12.5	20.0	15.0
52-1G-31	MPG31	DG12 Aux Pnl A		47 KVA		85.0%	0.48	R	I		C	40%	8.0	5.0	9.4	8.5	5.3	10.0	8.3	5.2	9.8	40.0	24.8
52-1G-32	BATHA2	Boric Acid Tank 12 Heater A		7.5 KVA		100.0%	0.48	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-1G-34	Spare							-	-			0%											
52-1G-35	IY12	Nuclear Instrument UPS 12		20 KVA	57.2%	80.0%	0.48	K	A		C	80%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	28.0	21.0
52-1G-36	FCV-356	RCP Comp Cooling Water Supply Vlv		0.13 HP				R	V			0%											
52-1G-37	TRY13	Instr Reg Xfmr Inv UPS 13 (Alt Bypass)	See Assumption 3.2.9	20 KVA	81.0%	80.0%	0.48	K	P		C	80%										19.8	14.8
52-1G-38	TLE16	Emergency Lighting Xfmr TLE16		25 KVA		80.0%	0.48	K	A		C	60%	12.0	9.0	15.0	12.0	9.0	15.0	12.0	9.0	15.0	20.0	15.0
52-1G-39	RY11	Containment Rad Monitor Pp RY11		1.5 HP	87.8%	85.0%	0.46	R	A	1.5	NP	100%	1.3	0.8	1.5	1.4	0.8	1.6	1.3	0.8	1.6	1.3	0.8
52-1G-40	DFOTP2	Diesel Fuel Transfer Pp 2 (Alt Feed)	See Assumption 3.2.9	5 HP	81.0%	85.0%	0.46	R	P	5	NP	100%										4.6	2.9
52-1G-41	CCWAP2	CCW Aux. Lube Oil Pp 1-2		0.5 HP	72.3%	66.6%	0.46	R	M	0.5	NP	100%										0.5	0.6
52-1G-42	ED12	Battery Charger 12		78.6 KVA	94.6%	74.0%	0.48	K	A		A	20%	12.0	10.9	16.2	12.0	10.9	16.2	12.0	10.9	16.2	59.9	54.5
52-1G-43	TY11	Inverter Backup Xfmr TY11		7.5 KVA		80.0%	0.48	K	P			0%										6.0	4.5

Table 3: DG 12 Unit 1 Bus G

	Load			Nameplate					Load	Demand	Mechanical	LOOP Coincident with LOCA											Rated Load	
Breaker	ID	Description	Notes	Rating	Units (KVA/HP)	Efficiency (%)	Power Factor (%)	Voltage (kV)	Type (R/K/Z)	Category (A/P/I/L/M/V/S)	Load, (bhp)	Load Basis	Demand Factor (%)	60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	KW	KVAR
52-1G-44	LCV-106	S/G AFW Supply Vlv 11		0.33	HP				R	V			0%											
52-1G-45	RHR-8716A	RHR Hx 11 to RCS Loop 1&2 Hot Leg		5.3	HP				R	V			0%											
52-1G-46	RCS-8000B	Pressurizer Power Relief Vlv 2		0.7	HP				R	V			0%											
52-1G-47	FCV-439	S/G 1-2 FW Isol Vlv		5.3	HP				R	V			0%											
52-1G-48	CS-9003A	RHR Pp 11 To Spray Hdrs 1&3		3.2	HP				R	V			0%											
52-1G-49	Spare								-	-			0%											
52-1G-50	TH2A	Boric Acid Heat Trace Xfmr TH2A		30	KVA		100.0%	0.48	Z	I		OP	22%	3.3		3.3	4.0		4.0	4.0		4.0	30.0	
52-1G-51	BATHA1	Boric Acid Tank 11 Heater A		7.5	KVA		100.0%	0.46	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-1G-52	PWMUP2	Primary Water Make Up Pp 12		15	HP	86.9%	89.6%	0.46	R	I	15	NP	100%	6.4	3.2	7.2	6.8	3.4	7.6	6.7	3.3	7.5	12.9	6.4
52-1G-53	S1-2	Cont H2 Purge Sys. Supply Fan 12	See Assumption 3.2.12	7.5	HP	85.5%	89.0%	0.46	R	P			0%										6.5	3.4
52-1G-54	SW-1-9	ASW Pp 12 Gate Operator 19		4	HP				R	V			0%											
52-1G-55	CS-8994A	Spray Additive Tank TK Outlet Vlv 1		0.7	HP				R	V			0%											
52-1G-56	RHR-8703	RHR Recirc to Cold Loop 3 & 4		5.3	HP				R	V			0%											
52-1G-57	CVCS-8104	Emergency Borate Vlv		0.7	HP				R	V			0%											
52-1G-58	SI-8982A	Cont Recirc Sump Outlet Vlv 1		5.3	HP				R	V			0%											
52-1G-59	MUWTP2	Make Up Water Transfer Pp 2		30	HP	86.5%	86.0%	0.46	R	A	31	C	103%	26.7	15.9	31.1	28.4	16.8	33.0	27.8	16.6	32.3	25.9	15.4
52-1G-60	E-101	ASW Pp 12 Vault Exhaust Fan E-101		1	HP	87.8%	85.0%	0.46	R	A	1	NP	100%	0.8	0.5	1.0	0.9	0.6	1.1	0.9	0.6	1.0	0.8	0.5
52-1G-61	TY16	Instrument Transformer TY16		15	KVA		85.0%	0.48	K	A		C	57%	7.3	4.5	8.6	7.3	4.5	8.6	7.3	4.5	8.6	12.8	7.9
52-1G-62	MPG62	DG13 Aux Pnl B		32.5	KVA		85.0%	0.46	R	I		C	85%	13.1	8.1	15.4	13.9	8.6	16.4	13.7	8.5	16.1	27.6	17.1
52-1G-63	S68	4Kv Vital Bus G Supply Fan S68		1.5	HP	84.0%	76.0%	0.46	R	A	1.5	NP	100%	1.3	1.1	1.8	1.4	1.2	1.9	1.4	1.2	1.8	1.3	1.1
52-1G-64	AP2	Chg Pp 12 Aux Lube Oil Pp		2	HP	71.1%	85.0%	0.46	R	M	2	NP	100%										2.1	1.3
52-1G-65	S31	Supply Fan S31 Aux. Bldg		60	HP	91.8%	85.0%	0.46	R	A	60	NP	100%	46.8	30.2	57.4	51.7	32.1	60.9	50.7	31.4	59.7	48.8	30.2
52-1G-66	SFPP1	Spent Fuel Pit Pp11	See Assumption 3.2.10	100	HP	92.0%	90.5%	0.46	R	P	90	C	90%										81.1	38.1
52-1G-67	EHRS-1	Internal H2 Recombiner Sys Group 1	See Assumption 3.2.11	75	KVA		100.0%	0.48	Z	P			0%										75.0	
52-1G-68	LCV-107	S/G 12 AFW Supply Valve		0.33	HP				R	V			0%											
52-1G-69	LCV-108	S/G 13 AFW Supply Valve		0.33	HP				R	V			0%											
52-1G-70	LCV-109	S/G 14 AFW Supply Valve		0.33	HP				R	V			0%											
52-1G-72	EPPH12	Pressurizer Htr Group 12 Alt Supply	See Assumption 3.2.8	483	KVA		100.0%	0.48	Z	P		OP	95%										483.0	
52-1G-73	FCV-658	Ext H2 Recombiner CHPS 1-2 Isol Vlv		0.67	HP				R	V			0%											
52-1G-74	CEL83/TH210	Containment H2 Monitor Panel PM210		3	KVA		85.0%	0.48	Z	I		NP	85%	1.1	0.7	1.3	1.3	0.8	1.5	1.3	0.8	1.5	2.6	1.6
52-1G-75	TPRM11	Radiation Monitoring Sys Xfmr 1		15	KVA		80.0%	0.48	K	A		C	80%	9.6	7.2	12.0	9.6	7.2	12.0	9.6	7.2	12.0	12.0	9.0
52-1G-76	RMS-120	Radiation Monitoring Sys Xfmr (Future)		7.5	KVA		85.0%	0.48	K	-			0%										6.4	4.0
52-1G-77	EPCB2	Control Rm Ventilation "B" Train Alt.	See Assumption 3.2.9	80	KVA		90.0%	0.46	R	P		A	63%										72.0	34.9
52-1G-78	TRY12	Instr Reg Xfmr Inv UPS 12 (Bypass)		20	KVA	81.0%	80.0%	0.48	K	A		C	0%										19.8	14.8
52-1G-79	TRY11	Instr Reg Xfmr Inv UPS 11 (Alt Bypass)	See Assumption 3.2.9	20	KVA	81.0%	80.0%	0.48	K	P		C	80%										19.8	14.8
	Bus Total													437	431	614	461	454	647	453	446	636		
															Power Factor	71.2%			71.2%			71.3%		
	DG Total													2366	1412	2756	2506	1490	2916	2460	1464	2862		
															Power Factor	85.8%		Power Factor	86.0%		Power Factor	85.9%		
													Operating Margin	386	362		301	390		329	381			
														14.0%			10.7%			11.8%				
													Design Margin	684	362		609	390		634	381			
														27.2%			24.4%			25.3%				

Table 4: DG 11 Unit 1 Bus H

Breaker	Load ID	Load Description	Notes	Nameplate Rating	Nameplate Units (KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	LOOP Coincident with LOCA 60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	Rated Load KW	Rated Load KVAR
Unit 1 4.16 kV Bus H																								
52-HH-08	AFWP2	Aux Feedwater Pp 12		600	HP	95.5%	90.5%	4.00	R	A	600	C	100%	468.7	220.3	517.9	497.4	233.8	549.6	487.7	229.2	538.9	468.7	220.3
52-HH-09	CSP2	Containment Spray Pp 12		400	HP	93.4%	90.9%	4.00	R	A	440	C	110%	351.4	161.1	386.6	372.9	171.0	410.3	365.7	167.7	402.3	319.5	146.5
52-HH-10	THH	Load Center Xfmr & Cable Losses	See Assumption 3.2.8	3250	KVA		34.0%		K	A		A	3%	33.2	91.7	97.5	33.2	91.7	97.5	33.2	91.7	97.5	1105.0	3056.4
52-HH-11	RHRP2	Residual Heat Removal Pp 12		400	HP	93.6%	93.4%	4.00	R	A	424	C	106%	337.9	129.3	361.8	358.6	137.2	384.0	351.6	134.5	376.6	318.8	121.9
52-HH-12	CCWP3	Component Cooling Water Pp 13		400	HP	95.0%	89.0%	4.00	R	A	425	C	106%	333.7	171.0	375.0	354.2	181.4	397.9	347.3	177.9	390.2	314.1	160.9
52-HH-15	SIP2	Safety Injection Pp 12		400	HP	94.0%	90.4%	4.00	R	A	393	C	98%	311.9	147.5	345.0	331.0	156.5	366.1	324.5	153.5	359.0	317.4	150.1
		Bus Total												1837	921	2055	1947	972	2176	1910	955	2135		
															Power Factor	89%			89%			89%		
Unit 1 480 V Bus H																								
52-1H-00	TIS-THH10	480 Bus H Loadcenter Xfmr Fans	See Assumption 3.2.14	3	KVA		90.0%	0.24	R	A		A	0%										2.7	1.3
52-1H-01	CFC1-4	Containment Fan Cooler 14		100	HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	136.3	164.6	87.5	135.6	161.4	81.8	126.6
52-1H-03	FP2	Fire Pp 0-2	See Assumption 3.2.15	200	HP	94.6%	89.9%	0.46	R	A		A	0%										157.7	76.8
52-1H-04	E44	480V Swgr Exhaust Fan E44		50	HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.6	27.5	49.8	39.9	26.4
52-1H-05	MUWTP1	Make Up Water Transfer Pp 01		30	HP	86.5%	86.0%	0.46	R	A	31	C	103%	26.7	15.9	31.1	28.4	16.8	33.0	27.8	16.5	32.3	25.9	15.4
52-1H-06	CS-9003B	RHR PP 12 to Spray HDRs 2 & 4		3.3	HP				R	V			0%											
52-1H-07	S-44	Aux Bldg Switchgr. Rm. Supply Fan S-44		50	HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.6	27.5	49.8	39.9	26.4
52-1H-08	S-2	FHB Supply Fan S-2		25	HP	87.6%	83.1%	0.46	R	A	25	NP	100%	21.2	14.2	25.6	22.5	15.1	27.1	22.1	14.8	26.6	21.2	14.2
52-1H-09	Spare								-	-			0%											
52-1H-10	TG2	FW PP 12 Turning Gear		1	HP	58.0%	85.0%	0.46	R	A	1	NP	100%	1.3	0.8	1.5	1.4	0.8	1.6	1.3	0.8	1.6	1.3	0.8
52-1H-11	CS-9001B	Spray PP 12 Disch Stop Vlv 1		2	HP				R	V			0%											
52-1H-12	SI-8982B	Cont Recirc Sump Outlet Vlv 2		5.3	HP				R	V			0%											
52-1H-13	Spare								-	-			0%											
52-1H-14	SI-8808C	Accum 13 Inject to Cold Loop 3		5.2	HP				R	V			0%											
52-1H-15	FCV-641B	RHR PP 12 Recirc Vlv		0.7	HP				R	V			0%											
52-1H-16	FCV-355	Comp Cooling Header C Isolation Vlv		1	HP				R	V			0%											
52-1H-17	FCV-357	RCB Barrier CCW Return		0.7	HP				R	V			0%											
52-1H-18	FCV-749	RCP Bearing Oil Cooling Return Vlv 1		0.25	HP				R	V			0%											
52-1H-19	RHR-8702	RHR Suction from Loop 4 Hot Leg Vlv 1		2.6	HP				R	V			0%											
52-1H-20	SI-8976	SI Pp Suction from Refuel Water		1.3	HP				R	V			0%											
52-1H-21	Spare								-	-			0%											
52-1H-22	TLE13	Emergency Ltg. Xfmr. TLE13		37.5	KVA		80.0%	0.48	K	A		OP	101%	30.3	22.7	37.9	30.3	22.7	37.9	30.3	22.7	37.9	30.0	22.5
52-1H-23	MPH23	DG11 Aux Pnl A		47	KVA		85.0%	0.48	R	I		C	40%	8.0	5.0	9.4	8.5	5.3	10.0	8.3	5.2	9.8	40.0	24.8
52-1H-24	S-32	Aux Bldg Supply Fan S-32		60	HP	89.3%	85.0%	0.46	R	A	60	NP	100%	50.1	31.1	59.0	53.2	33.0	62.6	52.2	32.3	61.4	50.1	31.1
52-1H-25	SI-8804B	RHR HX 12 to SI Pp Suction		3.2	HP				R	V			0%											
52-1H-26	SI-8802B	SI PP 12 Discharge Hot Leg		2	HP				R	V			0%											
52-1H-27	CVCS-8112	RCP Seal Water Return Isolation Vlv 2		0.66	HP				R	V			0%											
52-1H-28	FCV-440	Steam Gen 13 FW In Isolation Vlv		5.3	HP				R	V			0%											
52-1H-29	RHR-8716B	RHX 12 to RC Loop 1 & 2 Hot Leg		6.3	HP				R	V			0%											
52-1H-30	FCV-37	AFW Turbine 11 Lead 2 Steam Supply Vlv		1.3	HP				R	V			0%											
52-1H-31	SI-8821B	SI Pp 12 Discharge Cold Leg Loop		1	HP				R	V			0%											
52-1H-32	SI-8807B	RHR Discharge to SI Pp		0.67	HP				R	V			0%											
52-1H-33	RCS-8000C	Pressurizer Power Relief Vlv 13		0.7	HP				R	V			0%											
52-1H-34	ED132	Battery Charger 132		76.6	KVA	94.6%	74.0%	0.48	K	A		C	20%	12.0	10.9	16.2	12.0	10.9	16.2	12.0	10.9	16.2	59.9	54.5
52-1H-35	EHRS-2	Internal H2 Recombiner Sys Group 2	See Assumption 3.2.11	75	KVA		100.0%	0.48	Z	P			100%										75.0	
52-1H-36	CCWAP3	CCW PP 13 Aux Lube Oil Pp		0.5	HP	70.0%	68.6%	0.46	R	M	0.5	NP	100%										0.5	0.6
52-1H-37	S-67	Vital 4KV Switchgear Bus H Supply Fan		1.5	HP	85.5%	77.0%	0.46	R	A	1.5	NP	100%	1.3	1.1	1.7	1.4	1.2	1.8	1.4	1.1	1.8	1.3	1.1
52-1H-39	TLE15	Emergency Ltg. Xfmr. TLE15		25	KVA		80.0%	0.48	K	A		C	45%	9.0	6.8	11.3	9.0	6.8	11.3	9.0	6.8	11.3	20.0	15.0
52-1H-40	CS-8994B	Spray Additive Tank Outlet Vlv 2		0.7	HP				R	V			0%											
52-1H-41	FCV-495	ASW Pp 12 Crosstie Vlv		1	HP				R	V			0%											
52-1H-42	FCV-496	ASW Pp 11 Crosstie Vlv		1	HP				R	V			0%											
52-1H-43	RHR-8700B	RHR Pp 12 Suction Vlv		1.6	HP				R	V			0%											
52-1H-44	SI-8974B	SI Pp Recirc Stop Vlv		1	HP				R	V			0%											

Table 4: DG 11 Unit 1 Bus H

Breaker	Load ID	Load Description	Notes	Nameplate Rating	Units (KVA/HP)	Efficiency (%)	Power Factor (%)	Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	LOOP Coincident with LOCA: 60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	Rated Load KW	Rated Load KVAR
52-1H-45	SI-8809B	RHR Inject to Loop 3 & 4 Hot Leg		5.2	HP				R	V			0%											
52-1H-46	Spare								-	-			0%											
52-1H-47	SFPP12	Spent Fuel Pit Pp 12	See Assumption 3.2.10	75	HP	92.0%	90.5%	0.46	R	P	75	C	100%										60.8	28.8
52-1H-48	E-2	Overall Exhaust Fan E-2		150	HP	92.1%	90.5%	0.46	R	A	160	C	107%	129.6	60.9	143.2	137.5	64.6	152.0	134.9	63.4	149.0	121.5	57.1
52-1H-49	MPH49	DG13 Aux Pnl B		32.5	KVA		85.0%	0.48	R	I		C	95%	13.1	8.1	15.4	13.9	8.6	16.4	13.7	8.5	16.1	27.6	17.1
52-1H-50	TRY14	Instr Reg Xfmr Inv UPS 14 (Bypass)		20	KVA	81.0%	80.0%	0.48	K	A		C	0%										19.8	14.8
52-1H-51	E1-2	Containment H2 Purge Exh Fan 1-2	See Assumption 3.2.12	7.5	HP	84.5%	85.0%	0.46	R	P	7.6	NP	100%										6.8	4.1
52-1H-52	Spare								-	-			0%											
52-1H-54	TH1B	Boric Acid Heat Trace Xfmr TH1B		30	KVA		100.0%	0.48	Z	I		C	40%	6.0		6.0	7.3		7.3	7.3		7.3	30.0	
52-1H-55	EPCA2	Control Rm Ventilation "A" Train		80	KVA		90.0%	0.48	R	A		C	63%	45.4	22.0	50.4	48.1	23.3	53.5	47.2	22.9	52.4	72.0	34.9
52-1H-56	TRY13	Instr Reg Xfmr Inv UPS 13 (Bypass)		20	KVA	81.0%	80.0%	0.48	K	A		C	0%										19.8	14.8
52-1H-57	Spare								-	-			0%										-	
52-1H-58	BATHB2	Boric Acid Tank 12 Heater B		7.5	KVA		100.0%	0.48	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-1H-59	BATHB1	Boric Acid Tank 11 Heater B		7.5	KVA		100.0%	0.48	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-1H-60	ED121	Battery Charger 121	See Assumption 3.2.13	76.6	KVA	94.6%	74.0%	0.48	K	P		C	20%										59.9	54.5
52-1H-61	IY14	Nuclear Instrument UPS 14		20	KVA	57.2%	80.0%	0.48	K	A			80%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	28.0	21.0
52-1H-62	LCV-110/111	S/G 11 & 12 AFW Supply Valves		0.66	HP				R	V			0%											
52-1H-63	TH2B	Boric Acid Heat Trace Xfmr TH2B		30	KVA		100.0%	0.48	Z	I		C	24%	3.6		3.6	4.4		4.4	4.4		4.4	30.0	
52-1H-64	Spare								-	-			0%											
52-1H-65	DFOTP1	Diesel Fuel Transfer PP 1		5	HP	81.0%	85.0%	0.46	R	I	5	NP	100%	2.3	1.4	2.7	2.4	1.5	2.9	2.4	1.5	2.8	4.6	2.9
52-1H-66	TCR	Com. Rm. Transformer		15	KVA		80.0%	0.48	K	A		NP	50%	6.0	4.5	7.5	6.0	4.5	7.6	6.0	4.5	7.5	12.0	9.0
52-1H-68	TRY15	Instrument AC Regulating Xfmr TRY15		15	KVA		80.0%	0.48	K	A		C	80%	9.6	7.2	12.0	9.6	7.2	12.0	9.6	7.2	12.0	12.0	9.0
52-1H-69	TH3B	Boric Acid Heat Trace Xfmr TH3B		30	KVA		100.0%	0.48	K	I		C	22%	3.3		3.3	3.3		3.3	3.3		3.3	30.0	
52-1H-70	E-6	Iodine Removal Fan E-6		75	HP	91.6%	87.8%	0.46	R	A	75	NP	100%	60.9	33.2	69.4	64.7	35.3	73.7	63.4	34.6	72.2	60.9	33.2
52-1H-71	SI-8923B	SI PP 12 Raw Water Supply		1	HP				R	V			0%											
52-1H-72	FCV-668	Ext. H2 Recombiner CHPS 1-2 Isol Vlv		0.67	HP				R	V			0%											
52-1H-73	FCV-659	Ext. H2 Recombiner CHPS 1-1 Isol Vlv		0.67	HP				R	V			0%											
52-1H-74	EPPH13	Pressurizer Heater Group 13	See Assumption 3.2.9	483	KVA		100.0%	0.48	Z	P		OP	90%										483.0	
52-1H-75	CEL82/TH209	Containment H2 Monitoring Pnl. PM209		3	KVA		85.0%	0.48	Z	I		NP	85%	1.1	0.7	1.3	1.3	0.8	1.5	1.3	0.8	1.6	2.6	1.6
52-1H-76	TPH	Loadcenter PJ1G Xfmr. TPH	Abandoned in place	5	KVA		80.0%	0.48	K	-			0%										4.0	3.0
52-1H-77	IY13	Nuclear Instrument UPS 13		20	KVA	57.2%	80.0%	0.48	K	A			80%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	28.0	21.0
52-1H-78	Spare								-	-			0%											
52-1H-79	TPRM12	Rad. Mon. Sys. Xfmr. 2		15	KVA		80.0%	0.48	K	A		A	80%	9.6	7.2	12.0	9.6	7.2	12.0	9.6	7.2	12.0	12.0	9.0
52-1H-80	(FUTURE)	Rad. Mon. Sys. Xfmr. (FUTURE)		7.5	KVA		80.0%	0.48	K	-			0%										6.0	4.5
52-1H-81	EPCD2	Control Rm Ventilation "D" Train Alt.	See Assumption 3.2.9	80	KVA		90.0%	0.46	R	P		C	63%										72.0	34.9
	Bus Total													667	470	816	703	494	859	692	486	845		
															Power Factor	81.7%			81.8%			81.8%		
	DG Total													2504	1391	2864	2660	1466	3028	2602	1440	2974		
															Power Factor	87.4%		Power Factor	87.5%		Power Factor	87.5%		
													Operating Margin	248	486		157	522		187	511			
														9.0%			5.6%			6.7%				
													Design Margin	746	486		665	522		692	511			
														23.0%			20.1%			21.0%				

Table 5: DG 23 Unit 2 Bus F

Breaker	Load ID	Load Description	Notes	Nameplate Rating	Nameplate Units (KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	LOOP Coincident with LOCA: 60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	Rated Load KW	Rated Load KVAR
Unit 2 4.16 kV Bus F																								
52-HF-08	ASP1	Aux Saltwater Pp 21		400	HP	92.7%	88.8%	4.00	R	A	465	C	116%	374.2	193.8	421.4	397.1	205.6	447.2	389.4	201.6	438.5	321.9	168.7
52-HF-09	AFWP3	Aux Feedwater Pp 23		600	HP	95.5%	90.5%	4.00	R	A	600	C	100%	468.7	220.3	517.9	497.4	233.8	549.6	487.7	229.2	538.9	468.7	220.3
52-HF-10	–	Load Center Xfmr & Cable Losses	See Assumption 3.2.8	3250	KVA		34.0%		K	A		A	3%	33.2	91.7	97.5	33.2	91.7	97.5	33.2	91.7	97.5	1105.0	3056.4
52-HF-11	CCP1	Charging Pp 21	See Assumption 3.2.19	600	HP	94.2%	90.5%	4.00	R	A	650	C	108%	514.5	241.9	568.6	546.0	256.7	603.4	535.4	251.7	591.6	475.2	223.4
52-HF-12	CCWP1	Component Cooling Water Pp21		400	HP	95.0%	89.0%	4.00	R	A	425	C	106%	333.7	171.0	375.0	354.2	181.4	397.9	347.3	177.9	390.2	314.1	160.9
52-HF-15	SIP1	Safety Injection Pp21		400	HP	94.0%	90.4%	4.00	R	A	393	C	98%	311.9	147.5	345.0	331.0	156.5	366.1	324.5	153.5	359.0	317.4	150.1
	Bus Total													2036	1066	2298	2159	1128	2435	2117	1108	2389		
														Power Factor		89%	Power Factor		89%			89%		
Unit 2 480 V Bus F																								
52-2F-00	THF	480 Bus F Load Center Xfmr Fans	See Assumption 3.2.14	3	KVA		90.0%	0.24	R	A		A	0%										2.7	1.3
52-2F-01	CFC2-2	Containment Fan Cooler 22		100	HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-2F-02	CFC2-1	Containment Fan Cooler 21		100	HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-2F-04	2E-5	Fuel Handling Bldg Exhaust Fan 2-E6		75	HP	91.6%	87.6%	0.46	R	A	75	NP	100%	60.9	33.2	69.4	64.7	35.3	73.7	63.4	34.6	72.2	60.9	33.2
52-2F-06	RHRSP1	RHR Sump Pp11		1.5	HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-2F-07	8107	Cold Leg Loop Charging VLV 1		1	HP				R	V			0%											
52-2F-08	2E-1	Aux Bldg Exhaust Fan E-1		150	HP	92.1%	90.5%	0.46	R	A	160	C	107%	129.6	60.9	143.2	137.5	64.6	152.0	134.9	63.4	149.0	121.5	57.1
52-2F-09	CVCS-8105	Charging Pp 21/22 Recirc Line Isol		1	HP				R	V			0%											
52-2F-10	Spare								-	-			0%											
52-2F-11	FCV-430	CCW Hx 2-1 Outlet Hdr A		1.6	HP				R	V			0%											
52-2F-12	LCV-112B	Vol Control Tank Outlet Vlv 1		0.66	HP				R	V			0%											
52-2F-13	Spare								-	-			0%											
52-2F-14	TG1	FW Pp21 Turning Gear		1	HP	58.0%	85.0%	0.46	R	A	1	NP	100%	1.3	0.8	1.5	1.4	0.8	1.6	1.3	0.8	1.6	1.3	0.8
52-2F-15	RHRSP3	RHR Sump Pp23		1.5	HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-2F-16	SI-8801A	Boron Injection		2.6	HP				R	V			0%											
52-2F-17	SI-8803A	Boron Injection		2.6	HP				R	V			0%											
52-2F-18	SI-8807A	RHR Disch To SI Pps		0.66	HP				R	V			0%											
52-2F-19	SI-8805A	Refueling Water Supply 1		1.33	HP				R	V			0%											
52-2F-20	Spare								-	-			0%											
52-2F-21	Spare								-	-			0%											
52-2F-22	FW-FCV-441	S/G 24 FW Isolation		5.3	HP				R	V			0%											
52-2F-23	CCW-FCV-750	RCP Barrier Seal CCW Return Isol		0.67	HP				R	V			0%											
52-2F-24	FW-FCV-438	S/G 21 FW Isolation		5.3	HP				R	V			0%											
52-2F-25	S-45	480V Swgr Supply Fan S45		50	HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.8	27.5	49.8	39.9	26.4
52-2F-26	E-45	480V Swgr Exhaust Fan E45		50	HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.8	27.5	49.8	39.9	26.4
52-2F-27	TYBU	Non-Vital Instr AC Backup Reg Xfmr	See Assumption 3.2.9	15	KVA				K	P			0%											
52-2F-28	MPF28	DG21 Aux Pnl B		32.5	KVA		85.0%	0.48	R	I		C	95%	13.1	8.1	15.4	13.9	8.6	16.4	13.7	8.5	16.1	27.6	17.1
52-2F-29	S-2-1	Cont H2 Purge Supply Fan 2-1	See Assumption 3.2.12	7.5	HP				R	P			0%											
52-2F-30	MS-FCV-38	Aux FW Pp 21 Steam Lead 3		1.3	HP				R	V			0%											
52-2F-31	SI-8980	Refueling Water To RHR Suction		5.2	HP				R	V			0%											
52-2F-32	SI-8974A	Safety Injection PPS Recirc Line To RWST		1	HP				R	V			0%											
52-2F-33	VAC-FCV-669	H2 Recombiner Isol Vlv (Out Cont)		0.7	HP				R	V			0%											
52-2F-34	SW-2-8	ASW Pp 21 Inlet Gate 2-8		4	HP				R	V			0%											
52-2F-35	CS-8992	Spray Additive Tank Outlet		0.7	HP				R	V			0%											
52-2F-36	2S-69	4kV Swgr Supply Fan S69		1.5	HP	65.5%	78.3%	0.46	R	A	1.5	NP	100%	1.3	1.0	1.7	1.4	1.1	1.8	1.4	1.1	1.7	1.3	1.0
52-2F-37	Spare								-	-			0%											
52-2F-38	PWMUP1	Primary Makeup Water Pp21		15	HP	86.9%	89.6%	0.46	R	M	15	NP	100%										12.9	6.4
52-2F-39	E-104	Intake Struc ASW Pp 21 Exhaust Fan		1	HP	87.8%	85.0%	0.46	R	A	1	NP	100%	0.8	0.5	1.0	0.9	0.6	1.1	0.9	0.5	1.0	0.8	0.5
52-2F-40	RCS-8000A	Prz Relief Vlv 1-1		0.7	HP				R	V			0%											

Table 5: DG 23 Unit 2 Bus F

Breaker	Load ID	Load Description	Notes	Nameplate Rating	Nameplate Units (KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	LOOP Coincident with LOCA 60.0 Hz 100% V KW	KVAR	KVA	61.2 Hz 110% V KW	KVAR	KVA	60.8 Hz 110% V KW	KVAR	KVA	Rated Load KW	Rated Load KVAR
52-2F-41	Spare								-	-			0%											
52-2F-42	ED21	Battery Charger 21		76.6	KVA	94.6%	74.0%	0.48	K	A		C	20%	12.0	10.9	16.2	12.0	10.9	16.2	12.0	10.9	16.2	59.9	54.5
52-2F-43	SFPP2	Alt Feed Spent Fuel Pit Pp 22	See Assumption 3.2.9	75	HP				R	P			0%											
52-2F-44	CCWAP1	CCW Pp21 Aux Lube Oil Pp		0.5	HP	72.3%	66.6%	0.46	R	M	0.5	NP	100%										0.5	0.6
52-2F-45	TRPI	Rod Position Indication Reg Xfmr TRPI		10	KVA		80.0%	0.48	Z	A			100%	8.0	6.0	10.0	9.7	7.3	12.1	9.7	7.3	12.1	8.0	6.0
52-2F-46	SI-8808A	Accum Injection Cold Loop		5.2	HP				R	V			0%											
52-2F-47	TSC	Technical Support Center Alt Feed	See Assumption 3.2.9	167	KVA		80.0%	0.48	K	P		C	71%										149.6	112.2
52-2F-48	SI-8802A	SI Pp 21 Discharge (Hot Leg)		2	HP				R	V			0%											
52-2F-49	SI-8821A	SI Pp 21 Discharge (Cold Leg)		1	HP				R	V			0%											
52-2F-50	BATP1	Boric Acid Transfer Pp21 (FAST)		15	HP	89.4%	89.0%	0.46	R	I	13	NP	87%	5.4	2.8	6.1	5.8	2.9	6.5	5.6	2.9	6.3	12.5	6.4
52-2F-51	TRY24	Instr Reg Xfmr Inv UPS 24 (Alt Bypass)	See Assumption 3.2.9	20	KVA	81.0%	80.0%	0.48	K	P		C	80%										19.8	14.8
52-2F-52	ED231	Battery Charger 231	See Assumption 3.2.13	76.6	KVA	94.6%	74.0%	0.48	K	P		C	20%										59.9	54.5
52-2F-53	Spare								-	-			0%											
52-2F-54	FW-LCV-113/115	AFW Pp Disch Hdr Level Control S/G 23/24		0.66	HP				R	V			0%											
52-2F-55	Spare								-	-			0%											
52-2F-56	MPF56	DG23 Aux Pnl A		47	KVA		85.0%	0.48	R	I		C	40%	8.0	5.0	9.4	8.5	5.3	10.0	8.3	5.2	9.6	40.0	24.8
52-2F-57	Spare								-	-			0%											
52-2F-58	TH1A	Boric Acid Heat Trace		30	KVA		100.0%	0.21	Z	I		OP	67%	10.1		10.1	12.2		12.2	12.2		12.2	30.0	
52-2F-59	IY21	Nuclear Instrument UPS 21		20	KVA	57.2%	80.0%	0.48	K	A		C	80%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	28.0	21.0
52-2F-60	AP1	Charging Pp21 Aux Lube Oil Pp		2	HP	71.1%	85.0%	0.46	R	M	2	NP	100%										2.1	1.3
52-2F-61	EPCB2	Control Rm Ventilation "B" Train		80	KVA		89.9%	0.48	R	A		C	63%	45.3	22.1	50.4	48.1	23.4	53.5	47.1	23.0	52.4	71.9	35.0
52-2F-62	TRY21	Instr Reg Xfmr Inv UPS 21 (Bypass)		20	KVA	81.0%	80.0%	0.48	K	A			0%										19.8	14.8
52-2F-63	SI-8923A	SI Pp 21 Suction From RWST		1	HP				R	V			0%											
52-2F-64	Spare								-	-			0%											
52-2F-65	Spare								-	-			0%											
52-2F-66	Spare								-	-			0%											
52-2F-67	TRY22	Instr Reg Xfmr Inv UPS 22 (Alt Bypass)	See Assumption 3.2.9	20	KVA				K	P			0%											
52-2F-68	SFPP1	Alt Feed Spent Fuel Pit Pp 21	See Assumption 3.2.9	100	HP				R	P			0%											
	Bus Total													568	483	746	603	512	791	592	503	777		
															Power Factor	76%		Power Factor	76%			76%		
	DG Total													2604	1550	3030	2762	1638	3211	2710	1609	3151		
															Power Factor	85.9%		Power Factor	86.0%			86.0%		
													Operating Margin	148	403		45	413		79	424			
														5.4%			1.6%			2.8%				
													Design Margin	646	403		653	433		584	424			
														19.9%			16.7%			17.7%				

Table 6: DG 21 Unit 2 Bus G

Breaker	Load ID	Load Description	Notes	Nameplate Rating	Nameplate Units (KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	LOOP Coincident with LOCA: Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	Rated Load KW	Rated Load KVAR
Unit 2 4.16 kV Bus G																								
52-HG-06	ASP2	Aux Saltwater Pp 22		400	HP	92.7%	88.8%	4.00	R	A	465	C	118%	374.2	193.8	421.4	397.1	205.6	447.2	389.4	201.6	438.5	321.9	166.7
52-HG-07	CSP1	Containment Spray Pp 21		400	HP	93.4%	90.9%	4.00	R	A	440	C	110%	351.4	161.1	386.6	372.9	171.0	410.3	365.7	167.7	402.3	319.5	146.5
52-HG-08	RHRP1	Residual Heat Removal Pp 21		400	HP	93.7%	93.5%	4.00	R	A	413	C	103%	328.8	124.7	351.7	348.9	132.4	373.2	342.1	129.8	365.9	318.5	120.8
52-HG-09	CCP2	Charging Pp 22	See Assumption 3.2.19	600	HP	94.2%	90.5%	4.00	R	A	650	C	108%	514.5	241.9	568.6	546.0	256.7	603.4	535.4	251.7	591.6	475.2	223.4
52-HG-10		Load Center Xfmr & Cable Losses	See Assumption 3.2.8	3250	KVA		34.0%		K	A		A	3%	33.2	91.7	97.5	33.2	91.7	97.5	33.2	91.7	97.5	1105.0	3056.4
52-HG-11	CCP3	Charging Pp 23		600	HP	95.0%	92.1%	4.00	R	L	434	C	72%										471.2	199.3
52-HG-12	CCWP2	Component Cooling Water Pp 22		400	HP	95.0%	89.0%	4.00	R	A	425	C	106%	333.7	171.0	375.0	354.2	181.4	397.9	347.3	177.9	390.2	314.1	160.9
	Bus Total													1936	884	2172	2052	1039	2300	2013	1020	2257		
															Power Factor	89%			89%			89%		
Unit 2 480 V Bus G																								
52-2G-00	*THG*	*480 Bus G Loadcenter Xfmr Fans*	See Assumption 3.2.14	3	KVA		90.0%	0.24	R	A		A	0%										2.7	1.3
52-2G-01	CFC2-3	Containment Fan Cooler 23		100	HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-2G-02	CFC2-5	Containment Fan Cooler 25		100	HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-2G-04	BATP2	Boric Acid Transfer Pp 22 (FAST)		15	HP	89.4%	89.0%	0.46	R	I	13	C	87%	5.4	2.8	6.1	5.8	2.9	6.5	5.6	2.9	6.3	12.5	6.4
52-2G-05	SI-8808D	Accum 24 Inject to Cold Loop 4		5.2	HP				R	V	5.2		100%											
52-2G-06	RHRSP2	RHR Sump Pp 22		1.5	HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-2G-07	SI-8808B	Accum 22 Inject to Cold Loop 2		5.2	HP				R	V	5.2		100%											
52-2G-08	BOPAC1	TG Bearing Oil Pp		60	HP	90.2%	84.1%	0.46	R	A	60	NP	100%	49.6	31.9	59.0	52.7	33.9	62.6	51.6	33.2	61.4	49.6	31.9
52-2G-09	CVCS-8106	CHG Pp 21 and 22 Miniflow Vlv 2		1	HP				R	V			0%											
52-2G-10	CVCS-8108	Normal CHG to Regen. HX Stop Vlv 2		1	HP				R	V			0%											
52-2G-11	LCV-112C	Volume Control Tank Outlet Vlv 2		0.67	HP				R	V			0%											
52-2G-12	SI-8809A	RHR Inject to Loops 1 and 2 Hot Leg		5.2	HP				R	V			0%											
52-2G-13	SI-8801B	CHG Inject Outlet Vlv 2		2.6	HP				R	V			0%											
52-2G-14	SI-8805B	CHG Pp Refuel Water Supply Vlv 2		1.33	HP				R	V			0%											
52-2G-15	RHR-8700A	RHR PP 21 Suction Vlv		1.6	HP				R	V			0%											
52-2G-16	SI-8804A	RHR Discharge to CHG Pp		3.2	HP				R	V			0%											
52-2G-17	2S-1	Supply Fan S1 Fuel Handling Bldg.		25	HP	87.8%	83.1%	0.46	R	A	25	NP	100%	21.2	14.2	25.6	22.5	15.1	27.1	22.1	14.8	26.6	21.2	14.2
52-2G-18	RHRSPP4	RHR Sump Pp 24		1.5	HP	78.0%	63.0%	0.46	R	I	1.5	NP	100%	0.7	0.9	1.1	0.8	0.9	1.2	0.7	0.9	1.2	1.4	1.8
52-2G-19	EPCE2	Control Rm Ventilation "E" Train Alt.	See Assumption 3.2.9	80	KVA		90.0%	0.46	R	P		C	63%										72.0	34.9
52-2G-20	Spare								-	-			0%											
52-2G-21	CS-9001A	Spray PP 21 Discharge Stop Vlv 1		2	HP				R	V			0%											
52-2G-22	TRY23	Nuclear Instrument Xfmr 23 (Alt Bypass)		20	KVA	81.0%	80.0%	0.48	K	P			0%										19.8	14.8
52-2G-23	FCV-363	RCP Cooling Water Return Iso. Vlv 2		0.13	HP				R	V			0%											
52-2G-24	SI-8835	SI Pp Discharge Cold Leg		2	HP				R	V			0%											
52-2G-25	RHR-8701	RHR Suction from Loop 4 Hot Leg Vlv 2		2.6	HP				R	V			0%											
52-2G-26	CVCS-8100	RCP Seal Water Return Iso Vlv		0.67	HP				R	V			0%											
52-2G-27	SI-8803B	Charging Injection Supply Vlv 2		2.6	HP				R	V			0%											
52-2G-28	FCV-431	CCW HX Outlet Vlv		1.6	HP				R	V			0%											
52-2G-29	FCV-641A	RHR PP 21 Recirc Vlv		0.7	HP				R	V			0%											
52-2G-30	TLE21	Emergency Lighting Xfmr TLE21		25	KVA		80.0%	0.48	K	A		C	60%	12.0	9.0	15.0	12.0	9.0	15.0	12.0	9.0	15.0	20.0	15.0
52-2G-31	MPG31	DG21 Aux Pnl A		47	KVA		85.0%	0.48	R	I		C	40%	8.0	5.0	9.4	8.5	5.3	10.0	8.3	5.2	9.8	40.0	24.8
52-2G-32	BATHA2	Boric Acid Tank 22 Heater A		7.5	KVA		100.0%	0.48	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-2G-33	TPRM21	Radiation Monitoring Sys Xfmr 1		15	KVA		80.0%	0.48	K	A		C	80%	9.6	7.2	12.0	9.6	7.2	12.0	9.6	7.2	12.0	12.0	9.0
52-2G-34	CEL83/TH210	Containment H2 Monitor Panel PM210		3	KVA		85.0%	0.48	Z	I		NP	85%	1.1	0.7	1.3	1.3	0.8	1.5	1.3	0.8	1.5	2.6	1.6
52-2G-35	IY22	Nuclear Instrument UPS 22		20	KVA	57.2%	80.0%	0.48	K	A			80%	*22.4*	*16.8*	*28.0*	*22.4*	*16.8*	*28.0*	*22.4*	*16.8*	*28.0*	28.0	21.0
52-2G-36	FCV-356	RCP Comp CLG Water Supply Vlv		0.13	HP				R	V			0%											
52-2G-37	FCV-658	Ext H2 Recombiner CHPS 2-2 Isol Vlv		1.9	HP				R	V			0%											
52-2G-38	TLE26	Emergency Lighting Xfmr TLE26		25	KVA		80.0%	0.48	K	A		C	58%	11.6	8.7	14.5	11.6	8.7	14.5	11.6	8.7	14.5	20.0	15.0
52-2G-39	RY11	Containment Rad Monitor Pp RY11		1.5	HP	65.6%	82.0%	0.46	R	A	1.5	NP	100%	1.7	1.2	2.1	1.8	1.3	2.2	1.8	1.2	2.2	1.7	1.2
52-2G-40	DFOTP2	Diesel Fuel Transfer Pp 2		5	HP	87.8%	85.0%	0.46	R	I	5	NP	100%	2.1	1.3	2.5	2.3	1.4	2.7	2.2	1.4	2.6	4.2	2.6

Table 6: DG 21 Unit 2 Bus G

Breaker	Load ID	Load Description	Notes	Nameplate Rating	Nameplate Units (KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	LOOP Coincident with LOCA: Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	Rated Load KW	Rated Load KVAR
52-2G-41	CCWAP2	CCW Aux. Lube Oil Pp 2-2		0.5	HP	72.3%	66.6%	0.46	R	M	0.5	NP	100%										0.5	0.6
52-2G-42	ED22	Battery Charger 22		76.6	KVA	94.6%	74.0%	0.48	K	A		C	20%	12.0	10.9	16.2	12.0	10.9	16.2	12.0	10.9	16.2	59.9	54.5
52-2G-43	TY21	Instr Backup Xfmr TY21		7.5	KVA		80.0%	0.48	K	P			0%										6.0	4.5
52-2G-44	LCV-106	S/G AFWr Supply Vlv 21		0.33	HP				R	V			0%											
52-2G-45	RHR-8716A	RHX 21 to RC Loop 1&2 Hot Leg		5.3	HP				R	V			0%											
52-2G-46	*RCS-8000B*	*Pressurizer Power Relief Vlv 2*		0.7	HP				R	V			0%											
52-2G-47	FCV-439	S/G 2-2 FW Isol Vlv		5.3	HP				R	V			0%											
52-2G-48	CS-9003A	RHR Pp 21 To Spray Hdrs 1&3		3.3	HP				R	V			0%											
52-2G-49	*RMS-120*	*Radiation Monitoring Sys Xfmr (Future)*		7.5	KVA			0.48	K	-			0%											
52-2G-50	TH2A	Boric Acid Heat Trace Xfmr TH2A		30	KVA		100.0%	0.48	Z	I		C	63%	9.5		9.5	11.4		11.4	11.4		11.4	30.0	
52-2G-51	BATHA1	Boric Acid Tank 21 Heater A		7.5	KVA		100.0%	0.48	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-2G-52	PWMUP2	Primary Water Make Up Pp 22		15	HP	86.9%	89.6%	0.46	R	I	15	NP	100%	6.4	3.2	7.2	6.8	3.4	7.6	6.7	3.3	7.5	12.9	6.4
52-2G-53	S-2-2	Containment H2 Purge Sys. Fan 22	See Assumption 3.2.12	7.5	HP	85.5%	89.0%	0.46	R	P	7.5	NP	100%										6.5	3.4
52-2G-54	SW-2-9	ASW Pp 22 Gate Operator 29		4	HP				R	V			0%											
52-2G-55	CS-8994A	Spray Additive Tank TK Outlet Vlv 1		0.7	HP				R	V			0%											
52-2G-56	RHR-8703	RHR Recirc to Hot Loop 1& 2		5.2	HP				R	V			0%											
52-2G-57	CVCS-8104	Emergency Borate Vlv		0.7	HP				R	V			0%											
52-2G-58	SI-8982A	Cont Recirc Sump Outlet Vlv 1		5.3	HP				R	V			0%											
52-2G-59	EH30	Charcoal Filter Preheater		54	KVA		100.0%	0.48	Z	P			100%										54.0	
52-2G-60	E-102	ASW Pp 22 Vault Exhaust Fan E-102		1	HP	87.8%	85.0%	0.46	R	A	1	NP	100%	0.8	0.5	1.0	0.9	0.6	1.1	0.9	0.5	1.0	0.8	0.5
52-2G-61	TY26	Instrument Transformer TY26		15	KVA		85.0%	0.48	K	A		C	57%	7.3	4.5	8.6	7.3	4.5	8.6	7.3	4.5	8.6	12.8	7.9
52-2G-62	MPG62	DG22 Aux Pnl B		32.5	KVA		85.0%	0.48	R	I		C	95%	13.1	8.1	15.4	13.9	8.6	16.4	13.7	8.5	16.1	27.6	17.1
52-2G-63	2S-68	4KVVital Bus G Supply Fan S68		1.5	HP	87.6%	85.0%	0.46	R	A	1.5	NP	100%	1.3	0.8	1.5	1.4	0.8	1.6	1.3	0.8	1.6	1.3	0.8
52-2G-64	AP2	Chg PP 22 Aux Lube Oil Pp		2	HP	84.6%	77.6%	0.46	R	M	2	NP	100%										1.8	1.4
52-2G-65	*S-33*	*Supply Fan S33 Aux. Bldg*		60	HP	90.4%	86.4%	0.46	R	A	60	NP	100%	49.5	28.9	57.3	52.5	30.6	60.8	51.5	30.0	59.6	49.5	28.9
52-2G-66	SFPP1	Spent Fuel Pit PP21	See Assumption 3.2.10	100	HP	92.0%	90.5%	0.46	R	P	90	C	90%										81.1	38.1
52-2G-67	EHRS-1	Internal H2 Recombiner Sys Group 1	See Assumption 3.2.11	75	KVA		100.0%	0.48	Z	P			0%										75.0	
52-2G-68	LCV-107	S/G 22 AFW Supply Valve		0.33	HP				R	V			0%											
52-2G-69	LCV-108	S/G 23 AFW Supply Valve		0.33	HP				R	V			0%											
52-2G-70	LCV-109	S/G 24 AFW Supply Valve		0.33	HP				R	V			0%											
52-2G-71	TRY22	Instr Reg Xfmr Inv UPS 22 (Bypass)		20	KVA	81.0%	80.0%	0.48	K	A		C	0%										19.8	14.8
52-2G-72	EPPH22	Pressurizer Htr Group 22 Alt Supply	*See Assumption 3.2.9*	483	KVA		100.0%	0.48	Z	P		OP	100%										483.0	
52-2G-73	Spare								-	-			0%											
52-2G-74	TRY21	Instr Reg Xfmr Inv UPS 21 (Alt Bypass)		20	KVA	81.0%	80.0%	0.48	K	P		C	80%										19.8	14.8
		Bus Total												422	418	594	446	440	626	439	433	616		
															Power Factor	71%			71%			71%		
		DG Total												2368	1402	2743	2498	1479	2903	2452	1453	2850		
															Power Factor	85.9%			86.0%			86.0%		
													Operating Margin	394	368		309	394		337	386			
														14.3%			11.0%			12.1%				
													Design Margin	892	366		817	394		841	386			
														27.5%			24.6%			25.6%				

Table 7: DG 22 Unit 2 Bus H

Breaker	Load ID	Load Description	Notes	Nameplate Rating Units (KVA/HP)	Nameplate Efficiency (%)	Nameplate Power Factor (%)	Nameplate Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	LOOP Coincident with LOCA 60.0 Hz 100% V KW	KVAR	KVA	61.2 Hz 110% V KW	KVAR	KVA	60.8 Hz 110% V KW	KVAR	KVA	Rated Load KW	KVAR
Unit 2 4.16 kV Bus H																							
52-HH-08	AFWP2	Aux Feedwater Pp 22		600 HP	95.5%	90.5%	4.00	R	A	600	C	100%	468.7	220.3	517.9	497.4	233.8	549.6	487.7	229.2	538.9	468.7	220.3
52-HH-09	CSP2	Containment Spray Pp 22		400 HP	93.4%	90.9%	4.00	R	A	440	C	110%	351.4	161.1	386.6	372.9	171.0	410.3	365.7	167.7	402.3	319.6	146.5
52-HH-10	THH	Load Center Xfmr & Cable Losses	See Assumption 3.2.8	3250 KVA		34.0%	-	K	A		A	3%	33.2	91.7	97.5	33.2	91.7	97.5	33.2	91.7	97.5	1105.0	3058.4
52-HH-11	RHRP2	Residual Heat Removal Pp 22		400 HP	93.7%	93.4%	4.00	R	A	421	C	105%	335.2	128.2	358.9	355.7	136.1	380.8	348.8	133.4	373.4	316.5	121.6
52-HH-12	CCWP3	Component Cooling Water Pp 23		400 HP	95.0%	89.0%	4.00	R	A	425	C	106%	333.7	171.0	375.0	354.2	181.4	397.9	347.3	177.9	390.2	314.1	160.9
52-HH-15	SIP2	Safety Injection Pp 22		400 HP	94.0%	90.4%	4.00	R	A	393	C	98%	311.9	147.5	345.0	331.0	156.5	366.1	324.5	153.5	359.0	317.4	150.1
	Bus Total												1834	920	2052	1944	971	2173	1907	953	2132		
														Power Factor	89%			89%			89%		
Unit 2 480 V Bus H																							
52-2H-00	TIS-THH10	480 Bus H Loadcenter Xfmr Fans	See Assumption 3.2.14	3 KVA	—	90.0%	0.24	R	A		A	0%										2.7	1.3
52-2H-01	CFC2-4	Containment Fan Cooler 24		100 HP	91.4%	54.2%	0.46	R	A	103	C	103%	84.1	130.3	155.1	89.2	138.3	164.6	87.5	135.6	161.4	81.6	126.6
52-2H-06	CS-9003B	RHR PP 22 to Spray HDRs 2 & 4		3.2 HP				R	V			0%											
52-2H-07	Spare							-	-			0%											
52-2H-08	2S-2	FHB Supply Fan S-2		25 HP	87.6%	83.1%	0.46	R	A	25	C	100%	21.2	14.2	25.6	22.5	15.1	27.1	22.1	14.8	26.6	21.2	14.2
52-2H-10	TG2	FW PP 22 Turning Gear		1 HP	58.0%	85.0%	0.46	R	A	1	NP	100%	1.3	0.8	1.5	1.4	0.8	1.6	1.3	0.8	1.6	1.3	0.8
52-2H-11	CS-9001B	Spray PP 22 Disch Stop Vlv 1		2 HP				R	V			0%											
52-2H-12	SI-8982B	Cont Recirc Sump Outlet Vlv 2		5.3 HP				R	V			0%											
52-2H-13	Spare							-	-			0%											
52-2H-14	SI-8808C	Accum 23 Inject to Cold Loop 3		5.2 HP				R	V			0%											
52-2H-15	FCV-641B	RHR PP 22 Recirc Vlv		0.7 HP				R	V			0%											
52-2H-16	FCV-355	Comp Cooling Header C Isolation Vlv		1 HP				R	V			0%											
52-2H-17	FCV-357	RCB Barrier CCW Return		0.7 HP				R	V			0%											
52-2H-18	FCV-749	RCP Bearing Oil Cooling Return Vlv 1		0.25 HP				R	V			0%											
52-2H-19	RHR-8702	RHR Suction from Loop 4 Hot Leg Vlv 1		2.6 HP				R	V			0%											
52-2H-20	SI-8976	SI Pp Suction from Refuel Water		1.4 HP				R	V			0%											
52-2H-21	E-46	480V Swgr Exhaust Fan E46		50 HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.6	27.5	49.8	39.9	26.4
52-2H-22	TLE23	Emergency Ltg. Xfmr. TLE23		25 KVA		80.0%	0.48	K	A		C	112%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	20.0	15.0
52-2H-23	MPH23	DG21 Aux Pnl A		47 KVA		85.0%	0.48	R	I		C	40%	8.0	5.0	9.4	8.5	5.3	10.0	8.3	5.2	9.8	40.0	24.8
52-2H-24	S-34	Aux Bldg Supply Fan S-34		60 HP	90.2%	84.1%	0.46	R	A	60	C	100%	49.6	31.9	59.0	52.7	33.9	62.6	51.6	33.2	61.4	49.6	31.9
52-2H-25	SI-8804B	RHR HX 22 to SI Pp Suction		3.2 HP				R	V			0%											
52-2H-26	SI-8802B	SI PP 22 Discharge Hot Leg		2 HP				R	V			0%											
52-2H-27	CVCS-8112	RCP Seal Water Return Isolation Vlv 2		0.67 HP				R	V			0%											
52-2H-28	FCV-440	Steam Gen 23 FW In Isolation Vlv		5.3 HP				R	V			0%											
52-2H-29	RHR-8716B	RHX 22 to RC Loop 1 & 2 Hot Leg		5.3 HP				R	V			0%											
52-2H-30	FCV-37	AFW Turb 21 Lead 2 Steam Supply Vlv		1.3 HP				R	V			0%											
52-2H-31	SI-8821B	SI Pp 22 Discharge Cold Leg Loop		1 HP				R	V			0%											
52-2H-32	SI-8807B	RHR Discharge to SI Pp		0.67 HP				R	V			0%											
52-2H-33	RCS-8000C	Pressurizer Power Relief Vlv 23		0.7 HP				R	V			0%											
52-2H-34	ED232	Battery Charger 232		76.6 KVA	94.6%	74.0%	0.48	K	A		C	20%	12.0	10.9	16.2	12.0	10.9	16.2	12.0	10.9	16.2	56.9	54.5
52-2H-35	EHRS-2	Internal H2 Recombiner Sys Group 2	See Assumption 3.2.11	75 KVA		100.0%	0.48	Z	P			0%										75.0	
52-2H-36	CCWAP3	CCW PP 23 Aux Lube Oil Pp		0.5 HP	87.6%	85.0%	0.46	R	M	0.5	C	100%										0.4	0.3
52-2H-37	2S-67	Vital 4KV Swgr Bus H Supply Fan		1.5 HP	84.0%	80.0%	0.46	R	A	1.5	C	100%	1.3	1.0	1.7	1.4	1.1	1.8	1.4	1.0	1.7	1.3	1.0
52-2H-38	Spare							-	-			0%											
52-2H-39	TLE25	Emergency Ltg. Xfmr. TLE25		25 KVA		80.0%	0.48	K	A		C	48%	9.6	7.2	12.0	9.6	7.2	12.0	9.6	7.2	12.0	20.0	15.0
52-2H-40	CS-8994B	Spray Additive Tank Outlet Vlv 2		0.7 HP				R	V			0%											
52-2H-41	FCV-495	ASW Pp 22 Crosstie Vlv		1 HP				R	V			0%											
52-2H-42	FCV-496	ASW Pp 21 Crosstie Vlv		1 HP				R	V			0%											
52-2H-43	RHR-8700B	RHR Pp 22 Suction Vlv		1.6 HP				R	V			0%											
52-2H-44	SI-8974B	SI Pp Recirc Stop Vlv		1 HP				R	V			0%											
52-2H-45	SI-8809B	RHR Inject to Loop 3 & 4 Hot Leg		5.2 HP				R	V			0%											
52-2H-46	S-46	Aux Bldg Swgr Rm Supply Fan S-46		50 HP	93.4%	83.4%	0.46	R	A	50	NP	100%	39.9	26.4	47.9	42.4	28.0	50.8	41.6	27.5	49.8	39.9	26.4
52-2H-47	TRY23	Instr Reg Xfmr Inv UPS 23 (Bypass)		20 KVA	81.0%	80.0%	0.48	K	A		C	0%										19.8	14.8

Table 7: DG 22 Unit 2 Bus H

LOOP Coincident with LOCA

Breaker	Load ID	Load Description	Notes	Nameplate Rating	Units (KVA/HP)	Efficiency (%)	Power Factor (%)	Voltage (kV)	Load Type (R/K/Z)	Demand Category (A/P/I/L/M/V/S)	Mechanical Load, (bhp)	Load Basis	Demand Factor (%)	60.0 Hz 100% V KW	60.0 Hz 100% V KVAR	60.0 Hz 100% V KVA	61.2 Hz 110% V KW	61.2 Hz 110% V KVAR	61.2 Hz 110% V KVA	60.8 Hz 110% V KW	60.8 Hz 110% V KVAR	60.8 Hz 110% V KVA	Rated Load KW	Rated Load KVAR
52-2H-48	2E-2	Overall Exhaust Fan E-2		150	HP	92.1%	90.5%	0.46	R	A	160	C	107%	129.6	60.9	143.2	137.5	64.6	152.0	134.9	63.4	149.0	121.5	57.1
52-2H-49	MPH49	DG23 Aux Pnl B		32.5	KVA		85.0%	0.48	R	I		C	95%	13.1	8.1	15.4	13.9	8.6	16.4	13.7	8.5	16.1	27.8	17.1
52-2H-50	Spare								-	-			0%											
52-2H-51	E-2-2	Containment H2 Purge Sys Fan 2-2	See Assumption 3.2.12	7.5	HP	84.5%	85.0%	0.46	R	-	7.5	C	100%										6.6	4.1
52-2H-52	IY24	Nuclear Instrument UPS 24		20	KVA	57.2%	80.0%	0.48	K	A		C	80%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	28.0	21.0
52-2H-53	Spare								-	-			0%											
52-2H-54	TH1B	Boric Acid Heat Trace Xfmr TH1B		30	KVA		100.0%	0.48	Z	I		C	64%	9.6		9.6	11.6		11.6	11.6		11.6	30.0	
52-2H-55	EPCD2	Control Rm Ventilation "D" Train		80	KVA		90.0%	0.48	R	A		C	63%	45.4	22.0	50.4	48.1	23.3	53.5	47.2	22.9	52.4	72.0	34.9
52-2H-56	(FUTURE)	Rad. Mon. Sys. Xfmr. (FUTURE)		7.5	KVA			0.48	K	-			0%											
52-2H-57	CEL82/TH209	Containment H2 Monitoring Pnl. PM209		3	KVA		65.0%	0.46	Z	I		NP	100%	1.3	0.8	1.5	1.5	1.0	1.8	1.5	1.0	1.8	2.6	1.6
52-2H-58	BATHB2	Boric Acid Tank 22 Heater B		7.5	KVA		100.0%	0.48	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-2H-59	BATHB1	Boric Acid Tank 21 Heater B		7.5	KVA		100.0%	0.48	Z	I		NP	100%	3.8		3.8	4.5		4.5	4.5		4.5	7.5	
52-2H-60	ED221	Battery Charger 221	See Assumption 3.2.13	76.6	KVA	84.8%	74.0%	0.48	K	P		C	20%										69.9	54.6
52-2H-61	TPRM22	Rad. Mon. Sys. Xfmr. 2		15	KVA		80.0%	0.48	K	A		C	80%	9.6	7.2	12.0	9.6	7.2	12.0	9.6	7.2	12.0	12.0	9.0
52-2H-62	Spare								-	-			0%											
52-2H-63	TH2B	Boric Acid Heat Trace Xfmr TH2B		30	KVA		100.0%	0.48	Z	I		C	63%	9.5		9.5	11.4		11.4	11.4		11.4	30.0	
52-2H-64	IY23	Nuclear Instrument UPS 23		20	KVA	57.2%	80.0%	0.48	K	A		C	80%	22.4	16.8	28.0	22.4	16.8	28.0	22.4	16.8	28.0	28.0	21.0
52-2H-65	DFOTP1	Diesel Fuel Transfer PP 1		5	HP	86.0%	85.0%	0.46	R	I	5	NP	100%	2.2	1.3	2.6	2.3	1.4	2.7	2.3	1.4	2.7	4.3	2.7
52-2H-66	TCR	Com. Rm. Transformer	See Assumption 3.2.9	15	KVA		80.0%	0.48	K	A		NP	50%	6.0	4.5	7.5	6.0	4.5	7.5	6.0	4.5	7.5	12.0	9.0
52-2H-67	Spare								-	-			0%											
52-2H-68	TRY25	Instrument AC Regulating Xfmr TRY25		15	KVA		85.0%	0.48	K	A		C	80%	10.2	6.3	12.0	10.2	6.3	12.0	10.2	6.3	12.0	12.8	7.9
52-2H-69	LCV-110/111	S/G 21 & 22 AFW Supply Valves		0.66	HP				R	V			0%											
52-2H-70	2E-6	Iodine Removal Fan E-6		75	HP	91.8%	87.8%	0.46	R	A	76	C	100%	60.9	33.2	69.4	64.7	35.3	73.7	63.4	34.6	72.2	60.9	33.2
52-2H-71	SI-8923B	SI PP 22 Raw Water Supply		1	HP				R	V			0%											
52-2H-72	FCV-868	Ext. H2 Recombiner CHPS 2-2 Isol Vlv		0.7	HP				R	V			0%											
52-2H-73	FCV-859	Ext. H2 Recombiner CHPS 2-1 Isol Vlv		1.9	HP				R	V			0%											
52-2H-74	EPPH23	Pressurizer Heater Group 23	See Assumption 3.2.9	483	KVA		100.0%	0.48	Z	P		C	78%										483.0	
52-2H-76	TPH	Loadcenter PJ1G Xfmr. TPH	Abandoned n Place	5	KVA		80.0%	0.48	K	-			0%										4.0	3.0
52-2H-77	Spare								-	-			0%											
52-2H-78	Spare								-	-			0%											
52-2H-79	SFPP22	Spent Fuel Pit Pp 22	See Assumption 3.2.10	75	HP	92.0%	90.5%	0.46	R	P	75	NP	100%										60.8	28.6
52-2H-81	EPCA2	Control Rm Ventilation "A" Train Alt.	See Assumption 3.2.9	80	KVA		90.0%	0.46	R	P		C	63%										72.0	34.9
52-2H-82	TRY24	Instr Reg Xfmr Inv UPS 24 (Bypass)		20	KVA	81.0%	80.0%	0.48	K	A		C	0%										19.8	14.8
52-2H-83	Spare								-	-			0%											
	Bus Total													639	449	781	675	471	823	665	464	811		
															Power Factor	82%			82%			82%		
	DG Total													2473	1369	2827	2620	1442	2990	2572	1417	2937		
															Power Factor	87.5%			87.6%			87.6%		
													Operating Margin	279	486		188	523		217	512			
														10.1%			6.7%			7.8%				
													Design Margin	777	486		695	523		721	512			
														23.9%			21.0%			21.9%				

Table 18-6. General Effect of Voltage and Frequency Variation on Induction-motor Characteristics

Characteristic	Alternating-current (induction) motors			
	Voltage		Frequency	
	110%	90%	105%	95%
Torque:*				
Starting and maximum running	Increase 21%	Decrease 19%	Decrease 10%	Increase 11%
Speed:†				
Synchronous	No change	No change	Increase 5%	Decrease 5%
Full load	Increase 1%	Decrease 1.5%	Increase 5%	Decrease 5%
Per cent slip	Decrease 17%	Increase 23%	Little change	Little change
Efficiency:				
Full load	Increase 0.5 to 1 point	Decrease 2 points	Slight increase	Slight decrease
¾ load	Little change	Little change	Slight increase	Slight decrease
½ load	Decrease 1 to 2 points	Increase 1 to 2 points	Slight increase	Slight decrease
Power factor:				
Full load	Decrease 3 points	Increase 1 point	Slight increase	Slight decrease
¾ load	Decrease 4 points	Increase 2 to 3 points	Slight increase	Slight decrease
½ load	Decrease 5 to 6 points	Increase 4 to 5 points	Slight increase	Slight decrease
Current:				
Starting	Increase 10 to 12%	Decrease 10 to 12%	Decrease 5 to 6%	Increase 5 to 6%
Full load	Decrease 7%	Increase 11%	Slight decrease	Slight increase
Temperature rise	Decrease 3 to 4 C	Increase 6 to 7 C	Slight decrease	Slight increase
Maximum overload capacity	Increase 21%	Decrease 19%	Slight decrease	Slight increase
Magnetic noise	Slight increase	Slight decrease	Slight decrease	Slight increase

* The starting and maximum running torque of a-c induction motors will vary as the square of the voltage.

† The speed of a-c induction motors will vary directly with the frequency.

Typical frequencies are 90, 120, 180, 240, and 360 c, giving motor speeds of 5,400, 7,200, 10,800, 14,400, and 21,600, respectively, with two-pole motors. Motors for such operation must be of special design. Typical applications include textile machinery, woodworking machinery, and portable tools.

85. Temperature Rise. The standard temperature rises of the windings of squirrel-cage and wound-rotor induction motors are:

Size	Fractional hp				Integral hp					
Class of insulation	A		B		A		B		H	
Method of measurement	T	R	T	R	T	R	T	R	T	R
General-purpose motors	40	50	..	..	40	50				
Other open motors	50	60	70	80	50	60	70	80	110	125
Totally enclosed nonventilated	55	65	75	85	55	65	75	85	115	130
Totally enclosed fan-cooled	55	65	75	85	55	60	75	80	115	125
Smaller than 42-frame	..	65	..	85						

Where two methods of temperature measurement are listed, a temperature rise within the values listed in the table, measured by either the thermometer method (T) or the resistance method (R), demonstrates conformity with the standard. The values listed for the thermometer method (T) are usually used for nameplate marking, irrespective of the method of measurement actually used.

Very large motors (2,000 hp and above) are usually provided with resistance-type detector coils embedded in the windings for determining their temperature rise, in which case the allowable temperature rise is 10°C higher than that of the thermometer method.

General-purpose motors[1,2] rated 40°C rise are always given a "service factor"; e.g., the manufacturer guarantees successful operation at 1.15 times rated load, but the temperature rise may be higher, and the efficiency and power factor may be lower than normal.

Standard service factors[2] are 1.4 for motors rated $\frac{1}{20}$ to ⅛ hp, 1.35 for ⅙ to ⅓ hp, 1.25 for ½ to 1 hp, 1.20 for 1½ to 2 hp, and 1.15 for motors 3 hp and larger, for fractional horsepower, and Design A, B, C, and F integral-horsepower motors.

Open motors rated 40°C rise, and dripproof motors, if rated 40°C rise, by thermometer (or the equivalent) are usually given a "service factor" of 1.15; i.e., the manufacturer guarantees successful operation at 1.15 times rated load without injurious heating, although the efficiency and power factor may vary slightly from the rated load values.

86. Time Rating.[4] Most motors are rated on a "continuous" basis; i.e., they will carry their rated load continuously without exceeding the rated temperature rise. Certain special types of motor, however, are given "short-time" ratings such as 15 min, ½ h, or 1 h, indicating that they can carry their rated load for these periods of time, after which they must be allowed to cool to room temperature. In some cases a motor is given several different ratings, each for a different period of time. Short-time rated motors are used on loads of an intermittent nature, the time rating being chosen to give motor-heating equivalent to that produced by the actual duty cycle of the load.

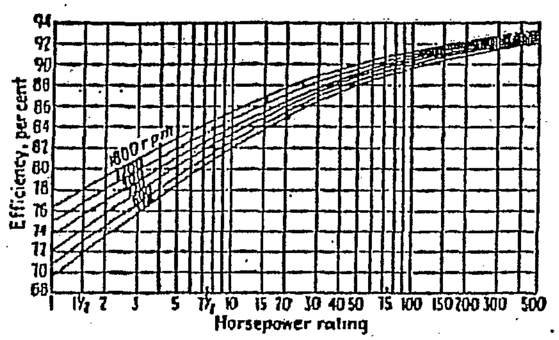

Fig. 18-29a. Full-load efficiencies of Design B squirrel-cage motors, 220- or 440-V 3-phase 60-c open type.

87. Efficiencies and Power Factors. Typical full-load efficiencies and power factors of standard Design B squirrel-cage induction motors are given in Figs. 18-29a and 18-29b, respectively. The variation of efficiency and power factor with load for a typical rating is shown in Fig. 18-31. The efficiencies of Design A motors are essentially the same, while those of Design C and wound-rotor motors are generally slightly lower, and those of Design D motors considerably lower. The power factors of Design A squirrel-cage induction motors are slightly higher, and those of Design C are slightly lower.

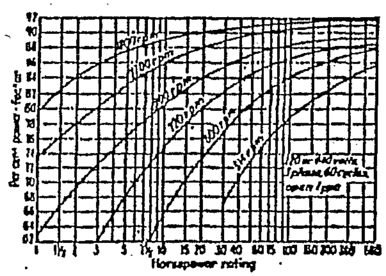

Fig. 18-29b. Full-load power factor of Design B squirrel-cage motors.

The efficiencies of all outputs will fall on a straight line on the nomograph of Fig. 18-30. Thus, if the efficiencies at any two loads are known, that of any other load is immediately obtained.

88. Full-load Current. With the efficiency and power factor of a 3-phase motor known, its full-load current may be calculated from the formula

$$\text{Full-load current} = \frac{746 \times \text{hp rating}}{1.73 \times \text{efficiency} \times \text{pf} \times \text{voltage}} \qquad (18\text{-}50)$$

[1] NEMA Motor and Generator Standards; *Publ.* MG1-1955.

[2] Alger, P. L., and Johnson, T. C. Rating of General Purpose Induction Motors; *Trans. AIEE*, September, 1939, Vol. 58, p. 445.

[3] Hildebrand, L. E. Duty Cycles and Motor Rating; *Trans. AIEE*, September, 1939, Vol. 58, p. 478.

[4] Report on General Principles for Rating of Electrical Apparatus for Short-time, Intermittent or

Calc. No. 15-DC
Rev. No. 2.0
Attachment A
Sheet 1 of 1

PG&E Calculation No. 9000040769, Revision 0

Design Calculation Cover Sheet

Unit(s): 1&2 File No.: ______ Responsible Group: NCFM Calculation No.: 9*40769

Design Calculation: ☒ YES ☐ NO System No.: 21, 63, 64 Quality Classification: Q

Structure, System or Component: Emergency Diesel Generators, 4kV System, 480V System

Subject: Calculation 9000040769 (M-1141) defines the limiting postulated accident that results in the worst case emergency diesel generator (EDG) loading and evaluates single failure criteria relative to EDG loading. In addition, this calculation establishes the design basis maximum steady state load demand for all rotating equipment that loads onto each EDG during the limiting accident analyzed by the DCPP Final Safety Analysis Report Update.

Computer/Electronic Calculation: ☐ YES ☒ NO

Computer ID	Application Name and Version	Date of Latest Installation/Validation Test

Registered Engineer Stamp: Complete A or B

A. Insert PE stamp or seal below:

REGISTERED PROFESSIONAL ENGINEER
RANJIT A. LOVELL
No. 22233
MECHANICAL
STATE OF CALIFORNIA

Expiration Date: 12-31-09

B. Insert stamp directing to the PE stamp or seal:

Update DCI promptly after approval.

Forward electronic calculation file to CCG for uploading to EDMS, only if the calculation is complete and can be used from EDMS.

Calculation No.: 9*40769

RECORD OF REVISIONS

Rev No.	Status	No. of Pages	Reason for Revision	Prepared By	LBIE Screen	LBIE	Check Method*	LBIE Approval		Checked	Supervisor	Registered Engineer	Owner's Acceptance per CF3.ID17
			Remarks	Signature/ LAN ID/ Date	Yes/ No/ NA	Yes/ No/ NA	Yes/ No/ NA	PSRC Mtg No.	PSRC Mtg Date	Signature LAN ID/ Date	Signature/ LAN ID/ Date	Signature/ LAN ID/ Date	Signature/ LAN ID/ Date
0	F	18	Initial issue.	DDC1 4/22/09	[X]Yes [ ] No [ ] N/A	[ ] Yes [X] No [ ] N/A	[X] A [ ] B [ ] C	N/A	N/A	RAL0 4/22/09	SPB8 4/23/09	RAL0 4/22/09	N/A
					[ ] Yes [ ] No [ ] N/A	[ ] Yes [ ] No [ ] N/A	[ ] A [ ] B [ ] C						
					[ ] Yes [ ] No [ ] N/A	[ ] Yes [ ] No [ ] N/A	[ ] A [ ] B [ ] C						
					[ ] Yes [ ] No [ ] N/A	[ ] Yes [ ] No [ ] N/A	[ ] A [ ] B [ ] C						

* Check Method: A = Detailed Check B = Alternate Method (note added pages) C = Critical Point Check

Input Reference		Output Reference	
Calc/Procedure No.	Comments	Calc/Procedure No.	Comments
M-786	Input of ESF Max BHP	15-DC	Output ESF Max BHP
M-1017	CCWP flows	125-DC	Output ESF Max BHP
STA-034	SIP/CCP corrected speed		
STA-027/N-060	SIP/CCP flow rates		

HVAC 89-34	Fan BHP		
M-854	AFWP BHP		
M-829	Misc Pump BHP		

LBIE Screen – Applicability Determination

1. Proposed Activity/Implementing Document No:	Unit:	Imp Doc Rev No:
9000040769 - Maximum EDG Mechanical Loading	☐ 1 ☐ 2 ☒ 1&2	0

Briefly describe what is being changed and why:

Calculation defines the limiting postulated accident that results in the worst case emergency diesel generator (EDG) loading and evaluates single failure criteria relative to EDG loading. In addition, this calculation establishes the design basis maximum steady state load demand for all rotating equipment that loads onto each EDG during the limiting accident analyzed by the DCPP Final Safety Analysis Report Update.

2. Applicability Determination (refer to TS3.ID2, Appendix 7.1 Section 2 for general guidance) Does the proposed activity **involve**:				Ref. TS3.ID2 Appendix 7.1
2.a	A change to the Facility/ISFSI Operating License (OL), Environmental Protection Plan (EPP) or Technical Specifications (TS)?	☐ Y	☒ N	Block 2.a
2.b	A change to the Quality Assurance Program?	☐ Y	☒ N	Block 2.b
2.c	A change to the Security Plan?	☐ Y	☒ N	Block 2.c
2.d	A change to the Emergency Plan?	☐ Y	☒ N	Block 2.d
2.e	A change to the Inservice Testing (IST) Program Plan?	☐ Y	☒ N	Block 2.e
2.f	A change to the Inservice Inspection (ISI) Program Plan?	☐ Y	☒ N	Block 2.f
2.g	A change to the Fire Protection Program?	☐ Y	☒ N	Block 2.g
2.h	A noncompliance with the Environmental Protection Plan or may create a situation adverse to the environment?	☐ Y	☒ N	Block 2.h
2.i	A change to the FSARU (including documents incorporated by reference) excluded from the requirement to perform a 50.59/72.48 review?	☐ Y	☒ N	Block 2.i
2.j	Maintenance that restores SSCs to their original or newly approved designed condition? (Check "No" if activity is related to ISFSI.)	☐ Y	☒ N	Block 2.j
2.k	A temporary alteration supporting maintenance that will be in effect during at-power operations for 90 days or less? (Check "No" if activity is related to ISFSI.)	☐ Y	☒ N	Block 2.k
2.l	Managerial or administrative procedure/process controlled under 10 CFR 50, App. B?	☐ Y	☒ N	Block 2.l
2.m	Regulatory commitment not covered by another regulatory based change process?	☐ Y	☒ N	Block 2.m
2.n	An impact to other plant specific programs (e.g., the ODCM) that are controlled by regulations, the OL, or TS?	☐ Y	☒ N	Block 2.n

3. Applicability Determination Conclusions:

☐ **A 10 CFR 50.59 or 72.48 screen is NOT required** because ALL aspects of the activity are controlled by one or more of the processes listed above, or have been approved by the NRC, or covered in full in another LBIE review.

☒ **A 10 CFR 50.59 or 72.48 screen will be completed** because some or all the aspects of the activity are not controlled by any of the processes listed above or cannot be exempted from the 10 CFR 50.59/72.48 screen.

4. Does the proposed activity involve a change to the plant where the change requires a safety assessment?	☐ Y	☒ N

5. Remarks: (Use this section to provide justification of determination in step 2 as needed.)

Preparer Signature: (Qual: TPROC or TLBIE)	Date: 4/22/09	Print Last Name: Christensen
Reviewer Signature: (Qual: TPROC or TLBIE)	Date: 4/22/09	Print Last Name: LOVELL

Refer to TS3.ID2, Section 6, for instructions on handling completed forms.

LBIE Screen – 10 CFR 50.59/72.48 Screen

1. Proposed Activity/Implementing Document No: 9000040769 - Maximum EDG Mechanical Loading	Unit: ☐ 1 ☐ 2 ☒ 1&2	Imp Doc Rev No: 0

Briefly describe what is being changed and why:

Initial issuance of this design calculation defines the limiting postulated accident that results in the worst case emergency diesel generator (EDG) loading and evaluates single failure criteria relative to EDG loading. In addition, this calculation establishes the design basis maximum steady state load demand for all rotating equipment that loads onto each EDG during the limiting accident analyzed by the DCPP Final Safety Analysis Report Update (FSARU).

2. The screen performed is for (check one or both as applicable):

☒ 10 CFR 50.59 (Facility Operating License)

☐ 10 CFR 72.48 (Independent Spent Fuel Storage Installation (ISFSI)

Identify SSC(s) described in the FSARU (including subcomponents) and the applicable section(s) in the FSARU affected by the proposed activity (use remarks section for overflow):

Emergency loads supplied by EDGS (Section 8.3.1.1.10) and emergency load listings (Tables 8.3-5 and 8.3-6)

Describe the design function(s) of the above identified SSC(s) directly or indirectly affected by this proposed activity (use remarks section for overflow):

M-1141 defines mechanical load BHP requirements listed in Tables 8.3-5 and 8.3-6. This calc may indirectly affect these values as it may be used to provide input to 15-DC and 125-DC which are the origin of these FSARU tables.

Determine whether the proposed activity/change, test, or experiment (CTE):			Ref. TS3.ID2 Appendix 7.8
2.a Involves a change to an SSC that adversely affects an FSARU described design function?	☐ Y	☒ N	Block 2.a
2.b Involves a change to a procedure that adversely affects how FSARU described SSC design functions are performed or controlled?	☐ Y	☒ N	Block 2.b
2.c Involves a change that adversely revises or replaces an FSARU described evaluation methodology that is used in establishing the design bases or that is used in the safety analyses?	☐ Y	☒ N	Block 2.c
2.d Involves a test or experiment not described in the FSARU, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the FSARU?	☐ Y	☒ N	Block 2.d
2.e Relies on a vendor 10 CFR 50.59 or 72.48 evaluation that has NOT been reviewed by the PSRC?	☐ Y	☒ N	Block 2.e

3. Justification, References, and Materials:

3.a Justification for the 10 CFR 50.59/72.48 screen determinations in steps 2.a thru 2.e:

2.a – This calculation does not change or alter the EDGs or any other electrical system SSCs as it only compiles maximum rotating equipment load requirements based on existing design inputs. Some of the affected loads listed in Tables 8.3-5 and 8.3-6 may increase or decrease based on the use of the results from this calculation in 15-DC and 125-DC. However, EDG loading margin impacts will be determined via 15-DC and 125-DC or equivalent calculations which will provide the basis for the appropriate FSARU changes.

2.b – The results of the calculation do change or impact any SSC design functions since it only list loads from existing design inputs and does not directly impact EDG loading margins.

2.c – The affected FSARU tables are load listings that do not involve or describe an evaluation methodology. Therefore, this design calculation does not impact or alter any FSARU described evaluation methodology.

2.d – This calculation does not involve any change in plant equipment, testing or operation.

2.e – There have been no vendor safety evaluations performed and none are required.

3.b List references used in this screen:

None

3.c List all materials attached to this screen:

LBIE Screen – 10 CFR 50.59/72.48 Screen

None

4. 10 CFR 50.59/72.48 Screen Conclusions:
   - ☒ **A 10 CFR 50.59/72.48 evaluation is NOT required** because ALL answers to steps 2.a thru. 2.e are NO.
   - ☐ **A 10 CFR 50.59/72.48 evaluation is to be completed** because one or more of the answers in steps 2.a thru. 2.e are YES, **Complete LBIE Sections 0, 1, and 3.**

5. Remarks (use this section to provide additional information as needed):
   None

Preparer Signature: (Qual: TLBIE) [signature]	Date: 4/22/09	Print Last Name: Christensen
Reviewer Signature: (Qual: TLBIE) [signature]	Date: 4/22/09	Print Last Name: Lovell

Refer to TS3.ID2, Section 6, for instructions on handling completed forms.

Record of Revision:

Rev. 0 - Initial issue.

1. Purpose

Consistent with the requirements of 10 CFR 50, Appendix A, General Design Criteria (GDC) 17, this design calculation defines the limiting postulated accident that results in the worst case emergency diesel generator (EDG) loading and evaluates single failure criteria relative to EDG loading. In addition, this calculation establishes the design basis maximum steady state load demand for all rotating equipment that load onto each EDG during the limiting accident analyzed by the DCPP Final Safety Analysis Report Update (FSARU).

2. Background

A non cited violation (NCV) of 10 CFR 50, Appendix B, Criterion III was issued in DCPP NRC Inspection Report 2008005 (Reference 12.1.1) for failing to maintain adequate design control measures for the EDGs. The NCV identified, in part, that DCPP did not analyze for all postulated accidents as required by GDC 17 nor assume a single limiting failure as required by GDC 17. This calculation will address these GDC 17 issues as part of the corrective actions for the apparent cause evaluation initiated for the NCV per Order 60010397. In addition, for the limiting FSARU accident, this calculation will determine the maximum steady state BHP requirement for each of the pumps and fans that load onto each EDG.

3. Assumptions

3.1. The highest BHP demand for each pump is assumed for the limiting accident regardless of the relative transient time at which the highest demand occurs.

3.2. For single pump operation, the highest BHP demand is used. For parallel pump operation for those pumps with shared discharge flow paths, lower BHP demands are used as appropriate.

3.3. For each set of pumps (e.g., SIPs 1-1, 1-2, 2-1 and 2-2), the vendor pump curve with the maximum BHP data and/or typical data will be used to conservatively determine maximum BHP demand for single and parallel pump operation for each pump in the set.

3.4. The scope of this calculation only includes normal steady state load demand from rotating equipment that is expected to operate during the limiting postulated accident. This calculation does not consider or include momentary/brief loads (e.g., automatic valve respositioning following a safety injection signal), elevated equipment starting loads, or manually started equipment loads.

4. Design Inputs

4.1. All BHP values are rated and/or pump runout values from Reference 12.1.2 except as noted.

4.2. The maximum ECCS injection profile CCP flow rates during parallel pump operation are 477.2 gpm and 477.6 gpm from Reference 12.1.3, Attachment 1B, pages 9 and 10.

4.3. The maximum CCP BHP speed corrected values are 637 BHP for parallel pump operation and 630 BHP for single pump operation from Reference 12.1.4.

4.4. The maximum CCP flow rate is less than or equal to 560 gpm per Reference 12.1.5, page 15.

4.5. The maximum ECCS injection profile SIP flow rates during parallel pump operation are 503.1 gpm and 508.8 gpm from Reference 12.1.3, Attachment 1B, pages 11 and 12.

4.6. The maximum SIP BHP speed uncorrected values are 383 BHP for parallel pump operation and 394 BHP for single pump operation from Reference 12.1.6.

4.7. The average SIP speed correction data are from Reference 12.1.7, sheet 6.

4.8. The maximum SIP flow rate is less than or equal to 675 gpm per Reference 12.1.5, page 16.

4.9. From full flow CCWP performance testing, maximum CCW heat exchanger flow rates are 10,823 gpm and 10,836 gpm per Reference 12.1.8, page ii.

5. Methodology

5.1. FSARU accident resulting in maximum steady state EDG loading

The FSARU analyzed event that maximizes the number and magnitude of EDG loads requires the following concurrent conditions:

A) Safety Injection Signal (SIS) initiation which starts all emergency safeguards features (ESF) loads except the containment spray pumps

B) Phase B (high-high containment pressure) isolation signal which starts the containment spray pumps

C) Loss of offsite power (LOOP) which initiates ESF load transfer to the EDGs

D) Minimum reactor coolant system (RCS) pressure which requires all ECCS pumps (including RHR) to inject at the maximum flow rates

The only FSARU analyzed events that will result in sufficient mass and energy release to containment to result in a Phase B isolation are large main feedwater system breaks (MFLB), main steam system breaks (MSLB), or RCS large break Loss of Coolant Accidents (LBLOCA). Table 5-1 summarizes the relative system pressure response of the RCS, steam generators (SGs), and containment for these accidents and the resulting load demand for the associated ESF pump components.

Table 5-1 – Comparison of FSARU Accident ESF Load Demands

	FSARU Accident		
System Response/ ESF Component (Press)	LBLOCA	MSLB	MFLB
RCS Pressure	↓	→	↑
SG Pressure	→	1 SG ↓ 3 SG →	1 SG ↓ 3 SG ↑
Containment Pressure	↑	↑	→
CCP (RCS)	↑	↑	→
SIP (RCS)	↑	→	→
RHRP (RCS)	↑	↓	↓
MDAFWP (SG)	→	1 SG ↑ 3 SG →	1 SG ↑ 3 SG →
CSP (Cont.)	→	→	→
CFCU (Cont.)	↑	↑	↑

↑ = Maximum → = Nominal ↓ = Minimum

All of these accidents will result in the same relative containment pressure response and load demand on the CS pumps and CFCUs. Although large secondary side breaks will result in significant SG depressurization and higher AFW flow, the RCS pressure remains above the SI pump discharge pressure and well above the RHR pump shutoff head. Although the large RCS breaks do not significantly depressurize the SGs, these breaks will result in a complete depressurization of the RCS and will result in all ECCS pumps injecting at the maximum flow rate. The minimum RCS pressure occurs following the largest analyzed LBLOCA as documented in FSARU Section 15.4.1. Each of these FSARU accidents including the LBLOCA analysis assume that a LOOP occurs and all EDGs load. Based on the above, the LBLOCA is the limiting FSARU analyzed event resulting in the maximum steady state EDG loading.

The theoretical maximum steady state loading for the EDGs would occur when the maximum number of electrical loads that can be transferred to the EDGs are simultaneously being powered by the EDGs and each load is operating at its maximum capacity. This loading configuration bounds all postulated events analyzed in the FSARU as Table 5-1 shows that it is not possible for all ESF components to experience runout (or near runout) conditions during any single accident.

5.2. BHP requirements for parallel and single pump operation during LBLOCA with LOOP

As discussed in Section 5.1, the theoretical maximum steady state loading for the EDGs would occur when the maximum number of loads that can be transferred to the EDGs are simultaneously being powered by the EDGs and each load is operating at its maximum capacity. This theoretical loading includes the assumption that each pump is operating at maximum load demand which occurs at pump runout. However, since the ECCS pumps and other ESF pumps operate in parallel through common discharge flow paths (in which system resistances are designed to balance pump performance and prevent excessive runout conditions), the flow from each pump is less than runout flow. Thus, the total load demand for two pumps operating in parallel is less than the total load demand for both pumps operating independently at runout. This conclusion does not apply for some pumps in which BHP drops off at high flow rates.

5.3. Single failure evaluation for EDG loading

The limiting failure in the context of this calculation is the single failure that maximizes the steady state demand on each EDG. As discussed in Section 5.2, the load demand for an ESF pump operating in parallel with another is normally maximized if the former is operating independently. Thus, the worst case single failure for each unit's EDGs is the assume failure of one EDG and the resultant load increase for each pair of operating EDGs. The total load increase on each of the two operating EDGs is the result of the collective load demand increases due to each ESF pump going to its maximum operating condition due to the loss of power to its counterpart on the failed EDG.

6. Acceptance Criteria

None. This calculation defines the design basis maximum steady state load demand for all rotating equipment components on each EDG of each unit assuming all EDGs are operating, and assuming two EDGs are operating and the third EDG fails for all combinations.

7. Calculation

7.1. BHP requirements for parallel and single pump operation during LBLOCA with LOOP

All BHP values used in this calculation are from Design Input 4.1 except as determined below.

CCPs – parallel pump operation

From Design Input 4.2, the maximum calculated CCP flow rates during parallel pump operation are 477.2 gpm and 477.6 gpm. Using a rounded up value of 478 gpm in the DCPP speed corrected data of the CCP vendor pump performance curve data with the maximum BHP curve (CCP 1-1) yields a value of 637 BHP (Design Input 4.3). This value is used for each CCP in parallel pump operation in both units.

CCPs – single pump operation

From Design Input 4.4, maximum CCP flow rate is less than or equal to 560 gpm. Using a rounded up value of 560 gpm in the DCPP speed corrected data in the CCP 1-1 vendor pump performance curve data yields a value of 630 BHP (Design Input 4.3). This value is used for each CCP in single pump operation in both units.

SIPs – parallel pump operation

From Design Input 4.5, the maximum calculated SIP flow rates during parallel pump operation are 503.1 gpm and 508.8 gpm. Using a rounded up value of 509 gpm in the SIP vendor pump performance curve with the maximum BHP curve (SIP 2-2) yields a value of 383 BHP (Design Input 4.6). Using 509 gpm in the SIP speed versus flow data from Design Input 4.7 yields a corrected speed of 3568 RPM. Applying the pump affinity rule to the SIP 2-2 vendor pump performance curve reference speed of 3570 RPM (typical for both unit's SIPs) with the corrected speed of 3568 RPM:

Corrected BHP = 383 * (3568/3570)^3 = 382.4

This value is rounded up to 383 BHP and is used for each SIP in parallel pump operation in both units.

SIPs – single pump operation

From Design Input 4.8, maximum SIP flow rate is less than or equal to 675 gpm. Since the SIP 2-2 vendor pump performance curve BHP values peak at 600 gpm and drops off slightly above that flow rate, the peak value of 394 BHP (Design Input 4.6) is used. Using 600 gpm in the SIP speed versus flow data from Design Input 4.7 yields a corrected speed of 3566 RPM. Applying the pump affinity rule to the SIP 2-2 vendor pump performance curve reference speed of 3570 RPM with the corrected speed of 3566 RPM:

Corrected BHP = 394 * (3566/3570)^3 = 392.7 BHP

This value is rounded up to 393 BHP and is used for each SIP in single pump operation in both units.

2 CCWPs with 2 CCW HXs

From Design Input 4.9 for the 100% pump performance case with all three CCWPs providing both CCW Heat Exchangers and Header C (CCW Flow Balance #12), the average of the heat exchanger flows is (10,823/10,836)/2 = 10,830 gpm. Using this value in the CCWP 2-1 vendor curve yields a value of 420 BHP. Since the maximum BHP from the CCWP 2-1 curve is bounded by 425 and this curve is typical for all CCWP vendor curves, 425 BHP is assumed for both units and is sufficiently conservative to encompass speed correction.

7.2. Single failure evaluation for EDG loading

Tables 7-1 and 7-2 lists the mechanical loads for each EDG in Unit 1 and Unit 2, respectively, based on its associated vital 4kV bus. Tables 7-3, 7-4 and 7-5 list the loads and loading totals for each of the unaffected Unit 1 4kV vital buses assuming a failure of the associated EDG for Bus F, Bus G, and Bus H, respectively. Tables 7-6, 7-7 and 7-8 list the loads for each of the unaffected Unit 2 4kV vital buses assuming a failure of the associated EDG for Bus F, Bus G, and Bus H, respectively.

8. Margin Assessment

There is no margin impact since this calculation establishes EDG loading design basis and therefore does not impact any margin.

9. Results

Taking the highest load total from each bus from Tables 7-1, 7-3, 7-4 and 7-5 yields the maximum Unit 1 mechanical loading total per vital 4kV bus as summarized in Table 9-1. The similar results for Unit 2 based on the highest load total from each bus from Tables 7-2, 7-6, 7-7 and 7-8 are presented in Table 9-2.

10. Conclusion

The maximum EDG mechanical loading for Unit 1 and for Unit 2 occurs on Bus F assuming a failure of Bus G. The maximum load is 3095 BHP for each unit.

11. Impact Evaluation

This calculation may be used to provide maximum steady state rotating equipment load demand input to electrical calculations (e.g., References 12.2.1 and 12.2.2).

12. References

12.1. Input

12.1.1. DCPP NRC Inspection Report 2008005, dated February 6, 2009.

12.1.2. Calculation M-786, "EDG Fuel Oil Storage," Revision 16.

12.1.3. Calculation STA-027, "Best Estimate ECCS Flow Profiles," Revision 0.

12.1.4. CCP 1-1 Performance Curve, Diablo Canyon 2 ½" RLIJ pump performance data dated 12/8/08, HydroAire Order No. NQ5648, PO #136834.

12.1.5. Calculation N-060, "ECCS STV V-15 Flow Limits," Revision 1.

12.1.6. Diablo Canyon Drawing DC663216-127-15, SIP 2-2 Performance Curve

12.1.7. STA-034, "SI Pump and Charging Pump Composite Curves," Revision 0.

12.1.8. Calculation M-1017, "CCW Flow Balancing," Revision 3.

12.2. Output

12.2.1. Calculation 15-DC, "(Unit 1) Diesel Generator Loading for 4160V Vital Bus Loads."

12.2.2. Calculation 125-DC, "(Unit 2) Diesel Generator Loading for 4160V Vital Bus Loads."

Tables

TABLE 7-1 - Unit 1 Vital 4kV Maximum Mechanical Loading (No EDG/Bus Failures)

Component	Load per component (BHP)	Maximum Load per Bus (BHP) Bus F	Bus G	Bus H
Centrifugal Charging Pumps	637	637	637	
Safety Injection Pumps	383	383		383
Containment Spray Pumps			435	440
Residual Heat Removal Pumps			410	424
Containment Fan Coolers	103	206	206	103
Component Cooling Water Pumps	425	425	425	425
Auxiliary Saltwater Pumps	465	465	465	
Auxiliary Feedwater Pumps	600	600		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		160
Supply Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	60
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	1.5	1.5
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0.5	0.5
Feedwater Pump Turning Gears	1	1		1
Makeup Water Transfer Pumps	31		31	31
Primary Water Makeup Pumps	15	15	15	
Boric Acid Transfer Pumps	13	13	13	
Diesel Fuel Transfer Pumps	5		5	5
Charging Pump Auxiliary Lube Oil Pumps	2	2	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**3085**	**2794**	**2834**

TABLE 7-2 - Unit 2 Vital 4kV Maximum Mechanical Loading (No EDG/Bus Failures)

Component	Load per component (BHP)	Maximum Load per Bus (BHP)		
		Bus F	Bus G	Bus H
Centrifugal Charging Pumps	637	637	637	
Safety Injection Pumps	383	383		383
Containment Spray Pumps	440		440	440
Residual Heat Removal Pumps			413	421
Containment Fan Coolers	103	206	206	103
Component Cooling Water Pumps	425	425	425	425
Auxiliary Saltwater Pumps	465	465	465	
Auxiliary Feedwater Pumps	600	600		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		160
Supply Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	60
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	1.5	1.5
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0.5	0.5
Feedwater Pump Turning Gears	1	1		1
Primary Water Makeup Pumps	15	15	15	
Boric Acid Transfer Pumps	13	13	13	
Diesel Fuel Transfer Pumps	5		5	5
Charging Pump Auxiliary Lube Oil Pumps	2	2	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**3085**	**2771**	**2800**

TABLE 7-3 - Unit 1 Vital 4kV Loading with Bus F Failure

Component	Load per component (BHP)	Maximum Load per Bus (BHP)		
		Bus F	Bus G	Bus H
Centrifugal Charging Pumps	630	0	630	
Safety Injection Pumps	393	0		393
Containment Spray Pumps			435	440
Residual Heat Removal Pumps			410	424
Containment Fan Coolers	103	0	206	103
Component Cooling Water Pumps	425	0	425	425
Auxiliary Saltwater Pumps	465	0	465	
Auxiliary Feedwater Pumps	600	0		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	0		160
Supply Fans (vital dc and low-voltage ac equipment)	50	0		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	0		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	0	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	0		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	60
Supply Fans (4kV Switchgear Rooms)	1.5	0	1.5	1.5
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0	0.5	0.5
Feedwater Pump Turning Gears	1	0		1
Makeup Water Transfer Pumps	31		31	31
Primary Water Makeup Pumps	15	0	15	
Boric Acid Transfer Pumps	13	0	13	
Diesel Fuel Transfer Pumps	5		5	5
Charging Pump Auxiliary Lube Oil Pumps	2	0	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**0**	**2787**	**2844**

TABLE 7-4 - Unit 1 Vital 4kV Loading with Bus G Failure

Component	Load per component (BHP)	Maximum Load per Bus (BHP) Bus F	Bus G	Bus H
Centrifugal Charging Pumps	630	630	0	
Safety Injection Pumps	383	383		383
Containment Spray Pumps			0	440
Residual Heat Removal Pumps			0	424
Containment Fan Coolers	103	206	0	103
Component Cooling Water Pumps	425	425	0	425
Auxiliary Saltwater Pumps	465	465	0	
Auxiliary Feedwater Pumps	600	600		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		160
Supply Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	0	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		0	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		0	60
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	0	1.5
Main Turbine-Generator Lube Oil Pump	60		0	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0	0.5
Feedwater Pump Turning Gears	1	1		1
Makeup Water Transfer Pumps	31		0	31
Primary Water Makeup Pumps	15	15	0	
Boric Acid Transfer Pumps	13	13	0	
Diesel Fuel Transfer Pumps	5		0	5
Charging Pump Auxiliary Lube Oil Pumps	2	2	0	
Containment Air and Gas Radiation Monitor Pump	1.5		0	
Total Load per Bus (BHP)		**3078**	**0**	**2834**

TABLE 7-5 - Unit 1 Vital 4kV Loading with Bus H Failure

Component	Load per component (BHP)	Maximum Load per Bus (BHP)		
		Bus F	Bus G	Bus H
Centrifugal Charging Pumps	637	637	637	
Safety Injection Pumps	393	393		0
Containment Spray Pumps			435	0
Residual Heat Removal Pumps			410	0
Containment Fan Coolers	103	206	206	0
Component Cooling Water Pumps	425	425	425	0
Auxiliary Saltwater Pumps	465	465	465	
Auxiliary Feedwater Pumps	600	600		0
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		0
Supply Fans (vital dc and low-voltage ac equipment)	50	50		0
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		0
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		0
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	0
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	0
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	1.5	0
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0.5	0
Feedwater Pump Turning Gears	1	1		0
Makeup Water Transfer Pumps	31		31	0
Primary Water Makeup Pumps	15	15	15	
Boric Acid Transfer Pumps	13	13	13	
Diesel Fuel Transfer Pumps	5		5	0
Charging Pump Auxiliary Lube Oil Pumps	2	2	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**3095**	**2794**	**0**

TABLE 7-6 - Unit 2 Vital 4kV Loading with Bus F Failure

Component	Load per component (BHP)	Maximum Load per Bus (BHP)		
		Bus F	Bus G	Bus H
Centrifugal Charging Pumps	630	0	630	
Safety Injection Pumps	393	0		393
Containment Spray Pumps	440		440	440
Residual Heat Removal Pumps			413	421
Containment Fan Coolers	103	0	206	103
Component Cooling Water Pumps	425	0	425	425
Auxiliary Saltwater Pumps	465	0	465	
Auxiliary Feedwater Pumps	600	0		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	0		160
Supply Fans (vital dc and low-voltage ac equipment)	50	0		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	0		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	0	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	0		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	60
Supply Fans (4kV Switchgear Rooms)	1.5	0	1.5	1.5
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0	0.5	0.5
Feedwater Pump Turning Gears	1	0		1
Primary Water Makeup Pumps	15	0	15	
Boric Acid Transfer Pumps	13	0	13	
Diesel Fuel Transfer Pumps	5		5	5
Charging Pump Auxiliary Lube Oil Pumps	2	0	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**0**	**2764**	**2810**

SUBJECT Maximum EDG Mechanical Loading

TABLE 7-7 - Unit 2 Vital 4kV Loading with Bus G Failure

Component	Load per component (BHP)	Maximum Load per Bus (BHP)		
		Bus F	Bus G	Bus H
Centrifugal Charging Pumps	630	630	0	
Safety Injection Pumps	383	383		383
Containment Spray Pumps	440		0	440
Residual Heat Removal Pumps			0	421
Containment Fan Coolers	103	206	0	103
Component Cooling Water Pumps	425	425	0	425
Auxiliary Saltwater Pumps	465	465	0	
Auxiliary Feedwater Pumps	600	600		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		160
Supply Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	0	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		0	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		0	60
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	0	1.5
Main Turbine-Generator Lube Oil Pump	60		0	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0	0.5
Feedwater Pump Turning Gears	1	1		1
Primary Water Makeup Pumps	15	15	0	
Boric Acid Transfer Pumps	13	13	0	
Diesel Fuel Transfer Pumps	5		0	5
Charging Pump Auxiliary Lube Oil Pumps	2	2	0	
Containment Air and Gas Radiation Monitor Pump	1.5		0	
Total Load per Bus (BHP)		**3078**	**0**	**2800**

SUBJECT Maximum EDG Mechanical Loading

TABLE 7-8 - Unit 2 Vital 4kV Loading with Bus H Failure

Component	Load per component (BHP)	Maximum Load per Bus (BHP)		
		Bus F	Bus G	Bus H
Centrifugal Charging Pumps	637	637	637	
Safety Injection Pumps	393	393		0
Containment Spray Pumps	440		440	0
Residual Heat Removal Pumps			413	0
Containment Fan Coolers	103	206	206	0
Component Cooling Water Pumps	425	425	425	0
Auxiliary Saltwater Pumps	465	465	465	
Auxiliary Feedwater Pumps	600	600		0
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		0
Supply Fans (vital dc and low-voltage ac equipment)	50	50		0
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		0
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		0
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	0
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	0
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	1.5	0
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0.5	0
Feedwater Pump Turning Gears	1	1		0
Primary Water Makeup Pumps	15	15	15	
Boric Acid Transfer Pumps	13	13	13	
Diesel Fuel Transfer Pumps	5		5	0
Charging Pump Auxiliary Lube Oil Pumps	2	2	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**3095**	**2771**	**0**

Table 9-1 - Unit 1 Maximum 4kV Loading

Component	Load per component (BHP)	Maximum Load per Bus (BHP)		
		Bus F	Bus G	Bus H
Centrifugal Charging Pumps	637	637	637	
Safety Injection Pumps	393	393		393
Containment Spray Pumps			435	440
Residual Heat Removal Pumps			410	424
Containment Fan Coolers	103	206	206	103
Component Cooling Water Pumps	425	425	425	425
Auxiliary Saltwater Pumps	465	465	465	
Auxiliary Feedwater Pumps	600	600		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		160
Supply Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	60
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	1.5	1.5
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0.5	0.5
Feedwater Pump Turning Gears	1	1		1
Makeup Water Transfer Pumps	31		31	31
Primary Water Makeup Pumps	15	15	15	
Boric Acid Transfer Pumps	13	13	13	
Diesel Fuel Transfer Pumps	5		5	5
Charging Pump Auxiliary Lube Oil Pumps	2	2	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**3095**	**2794**	**2844**

Table 9-2 - Unit 2 Maximum 4kV Loading

Component	Load per component (BHP)	Maximum Load per Bus (BHP) Bus F	Bus G	Bus H
Centrifugal Charging Pumps	630	637	637	
Safety Injection Pumps	393	393		393
Containment Spray Pumps	440		440	440
Residual Heat Removal Pumps			413	421
Containment Fan Coolers	103	206	206	103
Component Cooling Water Pumps	425	425	425	425
Auxiliary Saltwater Pumps	465	465	465	
Auxiliary Feedwater Pumps	600	600		600
Exhaust Fans (Auxiliary Bldg. including Fuel Handling Area)	160	160		160
Supply Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (vital dc and low-voltage ac equipment)	50	50		50
Exhaust Fans (Auxiliary Saltwater Pump Rooms)	1	1	1	
Fuel Handling Area Exhausts (Iodine Removal)	75	75		75
Supply Fans (Fuel Handling Area) - Fans S1 & S2	25		25	25
Supply Fans (Auxiliary Bldg.) Fans S31& S32	60		60	60
Supply Fans (4kV Switchgear Rooms)	1.5	1.5	1.5	1.5
Main Turbine-Generator Lube Oil Pump	60		60	
Auxiliary Lube Oil Pumps for Component Cooling Water Pumps	0.5	0.5	0.5	0.5
Feedwater Pump Turning Gears	1	1		1
Primary Water Makeup Pumps	15	15	15	
Boric Acid Transfer Pumps	13	13	13	
Diesel Fuel Transfer Pumps	5		5	5
Charging Pump Auxiliary Lube Oil Pumps	2	2	2	
Containment Air and Gas Radiation Monitor Pump	1.5		1.5	
Total Load per Bus (BHP)		**3095**	**2771**	**2810**