Michael T. Boyce
Vice President Engineering

April 13, 2022
ET 22-0005

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

References:
1) Letter ET 21-0004 dated September 29, 2021, from S. L. Smith, WCNOC, to USNRC, License Amendment Request – Diesel Generator Completion Time Extension for Technical Specification 3.8.1, "AC Sources – Operating"

2) Electronic mail dated February 23, 2022, from S. A. Lee, USNRC, to J. Turner, WCNOC, "Request for additional information - Wolf Creek request to revise diesel generator completion time (EPID: L-2021-LLA-0173)"

Subject: Docket No. 50-482: Response to Request for Additional Information Regarding License Amendment Request – Diesel Generator Completion Time Extension for Technical Specification 3.8.1, "AC Sources – Operating"

Commissioners and Staff:

Reference 1 provided the Wolf Creek Nuclear Operating Corporation (WCNOC) application for an amendment to the technical specifications (TS) for the Wolf Creek Generating Station (WCGS). The proposed amendment would modify WCGS TS 3.8.1, "AC Sources – Operating," by removing requirements associated with the Sharpe Station gensets and extend the Completion Time for one inoperable diesel generator (DG) from 72 hours to 14 days based on the availability of a supplemental power source (i.e., Station Blackout DG System). Reference 2 provided a request for additional information (RAI) related to the license amendment request.

Attachment I provides WCNOC's response to the RAI. Attachment II contains proposed markups of WCGS TS 3.8.1 which supersede the TS markups provided in Reference 1. Attachment III contains proposed markups of the WCGS TS 3.8.1 Bases (for information only) which supersede the TS Bases markups provided in Reference 1.

The information provided in this submittal does not expand the scope of the application and does not impact the significance hazards consideration determination presented in Reference 1. In accordance with 10 CFR 50.91, “Notice for public comment; State consultation,” Section (b)(1), a copy of this amendment application is being provided to the designated Kansas State official.

The letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-8831 x8687, or Ron Benham at (620) 364-4204.

Sincerely,

Michael T. Boyce

MTB/rlt

Attachment I: Response to Request for Additional Information Regarding License Amendment Request – Diesel Generator Completion Time Extension for Technical Specification 3.8.1, “AC Sources – Operating”
Attachment II: Revised WCGS Technical Specification 3.8.1 Pages (Markup)
Attachment III: Revised WCGS Technical Specification 3.8.1 Bases Pages (Markup) (for information only)

cc: S. S. Lee (NRC), w/a
S. A. Morris, (NRC), w/a
K. S. Steves (KDHE), w/a
G. E. Werner (NRC), w/a
Senior Resident Inspector (NRC), w/a

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Michael T. Boyce, of lawful age, being first duly sworn upon oath says that he is Vice President Engineering of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the contents thereof; that he has executed the same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By: MTBoyce
Michael T. Boyce
Vice President Engineering

SUBSCRIBED and sworn to before me this 13th day of April, 2022.

Cindy Novinger
Notary Public

NOTARY PUBLIC - State of Kansas
CINDY NOVINGER
My Appt. Expires 7/8/2022

Expiration Date July 8, 2022

Response to Request for Additional Information Regarding License Amendment Request – Diesel Generator Completion Time Extension for Technical Specification 3.8.1, "AC Sources – Operating"

Reference 1 provided the Wolf Creek Nuclear Operating Corporation (WCNOC) application for an amendment to the technical specifications (TS) for the Wolf Creek Generating Station (WCGS). The proposed amendment would modify WCGS TS 3.8.1, "AC Sources – Operating," by removing requirements associated with the Sharpe Station gensets and extend the Completion Time for one inoperable diesel generator (DG) from 72 hours to 14 days based on the availability of a supplemental power source. At WCGS, the supplemental power source being credited is the Station Blackout (SBO) DG System. Reference 2 provided a request for additional information (RAI) related to the license amendment request. The NRC request is provided in italics.

RAI EEEB-1

Section 2.3.1 of Attachment I to the LAR describes the proposed TS changes to Conditions A, B, C, and H of TS 3.8.1.

As stated in Section 2.3.1.2 of Attachment I to the LAR, the licensee proposed to add a new Required Action B.2 to verify the availability of the required SBO DGs:

CONDITION	*REQUIRED ACTION*		*COMPLETION TIME*
B. One DG inoperable.	*AND*		
	B.2	*Verify the required Station Blackout (SBO) DGs are available.*	*1 hour AND Once per 8 hours thereafter*

As stated in Section 2.3.1.3 of Attachment I to the LAR, the licensee proposed to revise Condition C to reflect the unavailability of the required SBO DG(s) when a DG is inoperable.

CONDITION	*REQUIRED ACTION*	*COMPLETION TIME*
C. Required Action B.2 and associated Completion Time not met.	*C.1 Restore DG to OPERABLE status or restore required SBO to available status.*	*72 hours from discovery of unavailability of required SBO DGs* *<u>OR</u>* *24 hours from discovery of Condition B entry = [≥] 48 hours concurrent with unavailability of required SBO DGs*

As stated in Section 2.3.1.3 of Attachment I to the LAR, the licensee proposed to revise Condition H to reflect the changes to Condition B. Attachment IV to the LAR shows the licensee's proposed revision to Condition H:

H. Required Action and associated Completion Time of Condition A, C, D, E, F, or G not met. *<u>OR</u>* *Required Actions B.1, B.3, B.4.1, B.4.2, and B.5 and associated Completion Time not met.*	*H.1*	*Be in MODE 3.* *<u>AND</u>*	*6 hours*
	H.2	*Be in MODE 5.*	*36 hours*

Section 2.3.1.2 of Attachment I to the LAR states:

> *Unavailability of the required SBO DGs does not, by itself, result in the LCO not being met.*

However, BTP 8-8 states, in part, that the plant should start shutting down the unit within 24 hours if the supplemental source becomes unavailable any time during the extended AOT.

The licensee used "<u>OR</u>" to connect the two CTs for Condition C, meaning these CTs apply alternatively. The first alternate CT states "72 hours from discovery of unavailability of required SBO DGs." The NRC staff understands that if the SBO DGs becomes unavailable during the extended CT, the DG could remain inoperable for an additional 72 hours instead

of 24 hours from discovery of unavailability of SBO DGs before the plant would enter Condition H to start shutting down when the DG cannot be restored to operable status. This does not appear consistent with the recommendations of BTP 8-8.

The licensee proposed an alternate Required Action C.1 to "restore required SBO DGs to available status" within the alternate CTs of Condition C. The NRC staff understands that the plant would continue operating (1) with an inoperable DG and unavailable SBO DGs for more than 24 hours up to 72 hours after discovery of SBO DGs unavailability during the extended CT instead of shutting down after 24 hours, as recommended by BTP 8-8, and (2) with an inoperable DG for a period of up to 14 days including a 72-hour period of SBO DGs unavailability after restoring the SBO DGs to available status. This also does not appear consistent with the recommendations of BTP 8-8.

Please address the following:

a. *Provide justifications for (1) the proposed first CT (72 hours from discovery of unavailability of required SBO DGs) of Condition C and (2) the proposed alternate Required Action C.1 to "restore required SBO DGs to available status," each of which would allow the plant continued operation with an inoperable DG for more than 24 hours up to 72 hours after discovery of SBO DGs unavailability during the extended CT. Alternatively, provide TS CT that would allow 24 hours of continued operation from discovery of SBO DGs unavailability, consistent with BTP 8-8.*

b. *The proposed CT for Required Action C.1 does not appear to require appropriate remedial measures within an appropriate time when the LCO is not met. In addition, the proposed CT appears too long compared to the CT recommended by BTP 8-8. Please provide a discussion of other remedial measures, taken in CTs shorter than 24 hours, that may be appropriate.*

Response to RAI EEEB-1

a. WCNOC is proposing to revise the new Condition C as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action B.2 and associated Completion Time not met.	C.1 Restore DG to OPERABLE status.	72 hours from Condition B entry OR 24 hours from Condition B entry ≥ 48 hours concurrent with unavailability of required SBO DGs

	OR		
	C.2	Restore required SBO DGs to available status.	72 hours from Condition B entry OR 24 hours from Condition B entry ≥ 48 hours concurrent with unavailability of required SBO DGs

Attachment II contains proposed markups of WCGS TS 3.8.1 which supersede the TS markups provided in Reference 1. Attachment III contains proposed markups of the WCGS TS 3.8.1 Bases (for information only) which supersede the TS Bases markups provided in Reference 1.

In Reference 1, WCNOC had originally proposed Condition C as follows:

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. Required Action B.2 and associated Completion Time not met.	C.1	Restore DG to OPERABLE status or restore required SBO DGs to available status.	72 hours from discovery of unavailability of required SBO DGs OR 24 hours from discovery of Condition B entry ≥ 48 hours concurrent with unavailability of required SBO DGs

TS Section 1.3, “Completion Times,” states, in part:

> The Completion Time is the amount of time allowed for completing a Required Action. It is referenced to the **discovery** [emphasis added] of a situation (e.g., inoperable equipment or variable not within limits) that requires entering an ACTIONS Condition unless otherwise specified, providing the unit is in a MODE or specified condition stated in the Applicability of the LCO.

As such, the Completion Time of "72 hours from discovery of unavailability of required SBO DGs" would start a new 72 hour clock at the time it was discovered that a required SBO DG was unavailable. This could allow up to 120 hours from initial DG inoperability to restore either the DG or the required SBO DG after the discovery of an unavailable required SBO DG. A review of the Catawba Nuclear Station Safety Evaluation for Amendment Nos. 304 and 300 (Reference 3) and the McGuire Nuclear Station Safety Evaluation for Amendment Nos. 314 and 293 (Reference 4) determined that the NRC position is that the 72 hour Completion Time must be met upon discovery of an unavailable required SBO DG. The new proposed changes to Condition C would require restoring the inoperable DG or unavailable required SBO DG within 72 hours of entry into Condition B (declaring the DG inoperable) or within 24 hours of discovering the required SBO DG is unavailable if the DG had been inoperable for ≥ 48 hours. The 24 hour Completion Time takes into account the capacity and capability of the remaining AC source, a reasonable time for repairs, and low probability of a design basis accident (DBA) occurring during this period.

The use of the logical connector "OR" in the Completion Time allows for alternative choices, only one of which must be performed. In Reference 1, a regulatory commitment was made that the extended Completion Time (14 days) for an inoperable DG will be used no more than once in an 18-month period on a per DG basis to perform DG planned maintenance. Additionally, Section 3.7 of Attachment I of Reference 1, identified that WCNOC has developed the practice of scheduling work for only 50 percent of the Completion Time for planned maintenance. Provided below are some example applications of the new proposed Condition C/Required Actions/Completion Times.

1. A DG is declared inoperable for voluntary planned maintenance (not using the extended Completion Time allowance) and it is scheduled for 36 hours or less. Condition B is entered and the Required Actions of Condition B taken. While performing Required Action B.2, a required SBO DG is determined to be unavailable at 16 hours after initial entry into Condition B. Condition C is entered and the 72 hour Completion Time is applied from the initial entry into Condition B.

2. An unplanned DG outage occurs when the 'B' DG is declared inoperable when it is identified that the 'B' DG room supply fan tripped and it was identified that the motor needed to be replaced. It was determined that it would take approximately 90 hours to replace the fan motor and restore the 'B' DG to OPERABLE status. While performing Required Action B.2, a required SBO DG is determined to be unavailable at 58 hours after initial entry into Condition B. Condition C is entered and the 24 hour Completion Time is applicable for restoring the 'B' DG to OPERABLE status or returning the required SBO DG to available status.

From the above, use of the 24 hour Completion Time is utilized for those cases when the extended Completion Time is applicable consistent with the guidance in Branch Technical Position (BTP) 8.8, "Onsite (Emergency Diesel Generators) and Offsite Power Sources Allowed Outage Time Extensions."

The RAI indicates that proposed Required Action C.1 would allow the plant to continue operating with an inoperable DG for a period of up to 14 days including a 72 hour period of required SBO DG unavailability after restoring the required SBO DG(s) to available status. TS Section 1.3, "Completion Times," states, in part:

> Required Actions must be completed prior to the expiration of the specified Completion Time. An ACTIONS Condition remains in effect and the Required Actions apply until the Condition no longer exists or the unit is not within the LCO Applicability.
>
> If situations are discovered that require entry into more than one Condition at a time within a single LCO (multiple Conditions), the Required Actions for each Condition must be performed within the associated Completion Time.

These TS requirements in Section 1.3 specify that upon entry into Condition B for an inoperable DG, the clock for the 14 day Completion Time is started and the DG must be restored to OPERABLE status by the end of the 14 days. If a required SBO DG was determined to be unavailable at 13 days and 20 hours after the entry into Condition B for an inoperable DG, Condition C would be entered and Required Action C.2 allows 24 hours to restore the DG to OPERABLE status. However, proposed Required Action B.5 would still have to be met and the DG restored to OPERABLE status at the end of the 14 days. If the DG were not restored to OPERABLE status within the 14 day Completion Time, then Condition H would be entered and a plant shutdown initiated.

b. The response to this item is encompassed in the response to item a. of the RAI.

RAI EEEB-2

Section 3.4.1 of Attachment I to the LAR states:

> *The SBO DG System includes three non-safety related Kohler 3250 kW DGs and one Power Equipment Center (PEC).*

Section 3.4.2 of Attachment I to the LAR states:

> *Three DGs sufficiently power all LOOP [loss of offsite power] loads. An engineering evaluation was performed utilizing the Electrical Transient Analysis Program (ETAP) to perform load flow, short circuit, and motor starting analyses for LOOP scenarios. Calculation XX-E-022 and the engineering evaluation determined that two SBO DGs can successfully start the minimum required safe shutdown loads with sufficient starting voltages provided the loads are manually started with at least 30 seconds provided between starts.*

BTP 8-8 recommends that the supplemental power source capable of supplying the LOOP loads to bring the unit to a cold shutdown be provided as a backup to a single inoperable EDG in case of a LOOP event concurrent with a failure of the remaining DG during the extended AOT.

Provide a summary of the evaluation performed to determine that two SBO DGs can successfully start the minimum required safe shutdown loads with sufficient starting voltages to bring the unit to cold shutdown during an SBO, consistent with the recommendation of BTP 8-8.

Response to RAI EEEB-2

Section 3.4.2 of Reference 1 identified that Calculation XX-E-022, “SBO Diesel Generators – AC System Analysis,” and an engineering evaluation was performed utilizing the Electrical Transient Analysis Program (ETAP) to perform load flow, short circuit, and motor starting analyses for loss

of offsite power (LOOP) scenarios. Calculation XX-E-022 has been revised to incorporate information from the engineering evaluation and other Calculation Change Notices and includes an update to Version 18.1.1 N of the ETAP software.

Calculation XX-E-022 provides the analysis which demonstrates the capability of two of the three installed SBO DGs to successfully start the minimum required safe shutdown LOOP loads (5581 kW) with sufficient starting voltages. In addition, other cases are performed within this calculation to identify the full capabilities of the SBO DGs.

Analytical Results

The ETAP configurations (scenarios) were run and analyzed to verify that buses and loads met the acceptance criteria during load flow, short circuit, and motor starting conditions.

Load Flow

1. Load flow cases were analyzed to identify if the cables could sufficiently supply LOOP loads without exceeding rated ampacity.

    a. Load flow reports show the following loading on the cables feeding the NB01 and NB02 buses.

	PB05 to NB01	**PB05 to NB02**
All LOOP Loads	869.9 A @ 4078 V	888.8 A @ 4078 V
Reduced LOOP Loading	771.7 A @ 4078 V	790.5 A @ 4078 V

    b. The loading for All LOOP loads is slightly above the “Total Load on Diesel Generator” from Drawing E-11005 (Figure 1). This difference is due to the fact that ETAP will only accept an integer as a loading percentage, and all medium voltage motors were modeled with a load slightly higher than in Drawing E-11005.

    c. Drawing E-11005 adjusts the total loading for over-frequency conditions as well as cable losses. The total adjusted loading calculated by multiplying the cable loading by the ratio of total load (kW) on the SBO DG (frequency adjusted, with cable losses) to the total unadjusted load (kW) on the SBO DG from Drawing E-11005 is as follows:

	PB05 to NB01	**PB05 to NB01 Maximum Ampacity**	**PB05 to NB02**	**PB05 to NB02 Maximum Ampacity**
All LOOP Loads	899.5 A @ 4078 V (917.6 A @ 4160 V)*	921.4A @ 4160V	919.0 A @ 4078 V (937.5 A @ 4160 V)*	914.7 A @ 4160V
All LOOP Loads	899.5 A @ 4078 V (881.7 A @ 4160 V)**	921.4A @ 4160V	919.0 A @ 4078 V (900.9 A @ 4160 V)**	914.7 A @ 4160V

*Conservatively assumes all loads are static.
**Assumes all loads are constant kVA.

d. Per the Project Cable Ampacity Calculation, the maximum recommended capacity for the cables from PB05 to NB01 is 921.4 Amps and from PB05 to NB02 is 914.7 Amps. Based on the loading adjustment information from Drawing E-11005 and the relationship between the ETAP loading and non-adjusted loading from Drawing E-11005, it is determined that the resultant loading adjusted for frequency and cable losses may exceed the maximum recommended capacity of the cables for LOOP loading. Note that in the first table above, all loads are assumed to be static which is conservative while in the second table above all loads are assumed to be constant kVA loads. While assuming all loads to be static is conservative, it is still possible that the maximum ampacity is exceeded with all LOOP loads on bus NB02. Procedure SYS KU-122, "Energizing NB02 from Station Blackout Diesel Generators," includes precautions/limitations for cable overload. The cable overload limits apply to the cable between breaker PB00508 and NB0114 or breaker PB00509 and NB0214. A cable overload alarm will actuate Main Control Board alarm 00-020F, SBO DG SYSTEM TROUBLE, at ≥ 850 Amps. SBO breaker PB00508/PB00509 will trip open at ≥ 936 Amps. Alarm response procedure 00-020F, "SBO DG System Trouble," directs the operator to consider reducing load to below 850 Amps.

e. Caution should be used when approaching the maximum ampacity. Suggested loading and operator actions to minimize the loading on the feeder cables are provided in plant procedures. The alarms for these cables are set at 850A but the actual loading is expected to reach 863A for LOOP loading. SBO DG KU01B is operating slightly above its rating while SBO DG KU01A does not exceed its rating. This is due to the impedance difference in the cables from the generators to bus PB05 which results from the difference in cable lengths. Per the Kohler Factory Tests Reports, the maximum operating power is 3318 kW. SBO DG KU01B does not exceed the maximum operating power of 3318 kW in any case.

2. A load flow case was analyzed to ensure 480V load centers/motor control centers (LC/MCC) voltages did not exceed or fall below the acceptance criteria in steady state conditions immediately following a loss of offsite power to Bus NB02 with loss of coolant accident (LOCA) conditions and after all of the required loads have been placed back in service. All LC and MCC voltages remained within the acceptance criteria.

Short Circuit

Short Circuit cases were analyzed to ensure the SBO DGs could be tested while connected to the utility source. Short circuit reports show that the NB01 and NB02 bus can be fully loaded with three SBO DGs connected to one bus and in operation without reaching the rated fault current value of any equipment. This is the bounding case. A summary of Class 1E buses included is shown in Figure 2.

Motor Starting

1. Motor starting cases were analyzed to ensure the bus and motor voltages remained within the acceptance criteria when sequencing loads.

   a. All bus and motor voltages remained within the acceptance criteria. See Tables 1, 2 and 3 for a summary of motor starting voltages.

Table 1: WCGS Safe Shutdown Loads, Time & Sequence, and Starting Voltage Results

Time Start	Load Name	ETAP Load ID	Voltage Criteria	Starting Voltage	Margin	Sequence Number
0.5	Hydrogen Mixing Fan	DCGN03B FAST	80%	87.63%	7.63%	0 (Dead Bus)
0.5	Hydrogen Mixing Fan	DCGN03D FAST	80%	89.05%	9.05%	0 (Dead Bus)
30.5	Essential Service Water (ESW) Pump House Supply Fan	DCGD01B	65%	75.17%	10.17%	1
30.5	ESW Traveling Water Screens	DFEF01B	65%	75.08%	10.08%	1
30.5	ESW Pump	DPEF01B	75%	75.52%	0.52%	1
38.5	ESW Pump Strainer	DFEF02B	85%	98.04%	13.04%	1a (See Note 2)
60.5	Component Cooling Water Pump	DPEG01B	75%	87.54%	12.54%	2
60.5	Component Cooling Water Pump Room Cooler	DSGL11B	65%	77.19%	12.19%	2
90.5	Instrument and Service Air Compressor	DCKA01B	75%	80.05%	5.05%	3
120.5	Centrifugal Charging Pump	DPBG05B	70%	87.46%	17.46%	4
120.5	Centrifugal Charging Pump Room Cooler	DSGL12B	65%	83.17%	18.17%	4
150.5	Containment Fan Cooler	DSGN01B SLOW	65%	88.11%	23.11%	5
180.5	Containment Fan Cooler	DSGN01D SLOW	65%	85.36%	20.36%	6
Note 1	Hydrogen Mixing Fan	DCGN03B FAST	80%	Note 1	-	7
Note 1	Hydrogen Mixing Fan	DCGN03D FAST	80%	Note 1	-	7
210.5	Auxiliary Feed Water Pump	DPAL01B	75%	81.95%	6.95%	8
210.5	Auxiliary Feed Water Pump Room Cooler	DSGF02B	65%	72.50%	7.50%	8
240.5	Backup Pressurizer Heaters	Press Htr Grp "B" #1 - #10	-	-	-	9
270.5	Control Rod Drive Mechanism Cooling Fan	DCGN01B	85%	88.23%	3.23%	10
300.5	Spent Fuel Pool Cooling Pump	DPEC01B	65%	84.32%	19.32%	11
300.5	Spent Fuel Pool Pump Room Cooler	DSGG04B	65%	81.69%	16.69%	11
330.5	Residual Heat Removal (RHR) Pump	DPEJ01B	75%	83.78%	8.78%	12
330.5	RHR Pump Room Cooler	DSGL10B	65%	78.45%	13.45%	12

Note 1: Hydrogen Mixing Fans are started with the dead bus loads at T = 0.5 seconds.
Note 2: ESW Pump Strainer (DFEF02B) is started 8 seconds after the ESW pump (DPEF01B) to allow for sufficient starting voltage. The acceleration time of the ESW pump is 4 seconds at 100% voltage. To account for lower than 100% voltage, a staggered time of 8 seconds was selected.

Additional Comments:

1. Dead bus loads are started at T = 0.5 seconds in the ETAP model. All subsequent sequences are staggered 30 seconds apart. (Sequence 1 loads are started at T = 30.5 seconds, Sequence 2 at T = 60.5 seconds, etc.)

2. Battery Chargers NK22, NK24, NK26 loading are updated in the ETAP model to match drawing E-11005. Because they are represented as lumped loads and cannot be started in the ETAP study case, they are at steady state throughout the entire study case.

3. Inverters NN12 and NN14 are converted from single phase motors to three phase motors in the ETAP model and are started with the dead bus loads at T = 0.5 seconds.

4. Hydrogen mixing fans (DCGN03B and DCGN03D) are started with the dead bus loads at T = 0.5 seconds. Because they have sufficient voltage to start, they are not started again in Sequence 7, meaning that Sequence 8 loads are started 30 seconds after Sequence 6.

5. ESW Pump House Supply Fan (DCGD01B) is started at T = 30.5 seconds in Sequence 1 (it is not started as a dead bus load).

Table 2: Dead Bus Loads Immediately Started When Bus NB01 and NB02 Energized

Dead Bus Loads started at T = 0.5s	Load Description
NG02A MOVs	MOV Loads
NG02B MOVs	MOV Loads
NG04C MOVs	MOV Loads
NG06E MOVs	MOV Loads
XNG02A	Distribution Panel Loads
XNG02B	Distribution Panel Loads
XNG04C	Distribution Panel Loads
XNG04D	Distribution Panel Loads
XNG06E	Distribution Panel Loads
DCGM01B	Diesel Generator Building Supply Fans
DPKJ03B	EDG Lube Oil/Keep Warm Pumps
DPKJ02B	EDG Rocker Arm Pre-Lube Pumps
NN12/NN14*	480/120V NN Inverter BCTV
XQB51	Standby AC Lighting
XQB60	Standby AC Lighting
XQB70	Standby AC Lighting
XQB85	Standby AC Lighting
XQB95	Standby AC Lighting
XPN08A	Non-Class 1E Instrument AC Power
EGD01B	ESW Pump House Heaters
EGD01D	ESW Pump House Heaters
EGD01F	ESW Pump House Heaters
EGD01H	ESW Pump House Heaters

*Single phase motor converted to three phase for the motor starting ETAP study case.

Table 3: Battery Chargers

Lumped loads assumed steady state at T = 0 (are not started in the motor starting study case)	Load Description
NK026	125VDC Swing Battery Chargers
NK022	125VDC Battery Chargers
NK024	125VDC Battery Chargers

2. Motor starting cases were analyzed to ensure that the bus and motor voltages remained within the overvoltage acceptance criteria when the largest load was removed.

   a. Motor starting reports show that the removal of the largest load on the system when all other loads are run in steady state does not increase any bus or motor voltages to above 110% of rated voltage.

   b. Motor starting cases were analyzed to ensure the bus and motor voltages did not drop below the acceptance criteria while bus NB02 is powered solely by SBO DGs in various LOCA loading conditions when the ESW or Auxiliary Feedwater Pumps are started.

Conclusion

SBO Case – 2 SBO DGs Supplying LOOP Loads

1. It is concluded that two SBO DGs can successfully start the minimum required safe shutdown loads with sufficient starting voltages to bring the unit to cold shutdown during an SBO, consistent with BTP 8-8.

2. Voltage Drop and Recovery Time: The load sequencing indicated in Figure 3 does not cause a voltage drop which exceeds the acceptance criteria when two SBO DGs are connected to LOOP loads.

3. Overvoltage Recovery: When the SBO DGs are fully loaded and the largest load is removed, the motor and bus voltages remain within acceptance criteria when two SBO DGs are operating.

4. Frequency Drop and Recovery Time: All of the loading steps stated in Kohler Generator Sizing Summary for LOOP loading conditions do not cause a frequency drop of more than 5%, and therefore meet acceptance criteria. The largest frequency drop stated in the Kohler Generator Sizing Summary is 1.86%. Therefore, the frequency does not need to recover in order to meet acceptance criteria.

5. Fault Current Rating: The cases evaluated to analyze fault current contributions of the SBO DGs show that, when connected to the grid and all loads are energized, the fault current does not exceed the rated fault current at any equipment.

6. Loading of Cables: The Reduced LOOP loading case allows the cables to be loaded under the maximum capacity. Operating all LOOP loads requires the cables feeding the NB02 bus to be loaded beyond their maximum capacity when all loads are conservatively assumed to be static. A Main Control Board alarm and trip of the applicable breaker provides for cable protection. The limitation is acceptable. Operations by procedure SYS-KU-122, will maintain loading on the cable feeding NB02 below 850 A. Alarm response procedures provides guidance for a Cable Overload Alarm.

Figure 1

SAFETY-RELATED LOADS

LOAD DESCRIPTION	NAMEPLATE LOAD RATING		REFER NOTES	ACCIDENT TYPE [1]	TIME TO START (SEC) [2]	NE001 KW LOADING [3] < 30 MIN. [4]	NE001 30 MIN. - 2 HRS [5]	NE001 2 HRS - 24 HRS [5]	NE001 24 HRS - 7 DAYS [5]	NE001 > 7 DAYS [6]	EQUIPMENT NO. / BUS NUMBER / LOAD SHED - SIS [7] / LOAD SHED - LOOP [7]		NE002 KW LOADING [3] < 30 MIN. [4]	NE002 30 MIN. - 2 HRS [5]	NE002 2 HRS - 24 HRS [5]	NE002 24 HRS - 7 DAYS [5]	NE002 > 7 DAYS [6]	WORST CASE KVAR LOADING [8]
4160 VOLT LOADS																		
Component Cooling Water Pumps	HP/KW/KVA	700	9	LOOP	17 / 17	506.93	506.93	506.93	506.93	506.93	DPEG01A	DPEG01B	506.93	506.93	506.93	506.93	506.93	353.84
				MSLB		506.93	533.10	533.10	533.10	533.10	NB001	NB002	506.93	533.10	533.10	533.10	533.10	372.11
	Brake HP	672		LOCA		506.93	533.10	533.10	533.10	533.10	-	-	506.93	533.10	533.10	533.10	533.10	372.11
	Freq. Adj.	1.0303		SLOCA		506.93	533.10	533.10	533.10	533.10	UV1A	UV2A	506.93	533.10	533.10	533.10	533.10	372.11
Component Cooling Water Pumps	HP/KW/KVA	700	9	LOOP	MANUAL	0	0	0	0	0	DPEG01C	DPEG01D	0	0	0	0	0	0
				MSLB		0	0	0	0	0	NB001	NB002	0	0	0	0	0	0
	Brake HP	672		LOCA		506.93	533.10	533.10	533.10	533.10	-	-	506.93	533.10	533.10	533.10	533.10	372.11
	Freq. Adj.	1.0303		SLOCA		0	0	0	0	0	UV1B	UV2B	0	0	0	0	0	0
Containment Spray Pumps	HP/KW/KVA	500		LOOP	- / -	0	0	0	0	0	DPEN01A	DPEN01B	0	0	0	0	0	0
				MSLB	NOTE 10	404.06	404.06	404.06	0	0	NB001	NB002	404.06	404.06	404.06	0	0	173.34
	Brake HP	505		LOCA		404.06	404.06	404.06	0	0	-	-	404.06	404.06	404.06	0	0	173.34
	Freq. Adj.	1.0303		SLOCA		0	0	0	0	0	UV1A	UV2A	0	0	0	0	0	0
Residual Heat Removal Pumps	HP/KW/KVA	500		LOOP	MANUAL	0	381.60	381.60	381.60	381.60	DPEJ01A	DPEJ01B	0	381.60	381.60	381.60	381.60	167.13
				MSLB	22 / 22	262.35	262.35	0	381.60	381.60	NB001	NB002	262.35	262.35	0	381.60	381.60	167.13
	Brake HP	510		LOCA		405.45	405.45	405.45	381.60	381.60	-	-	405.45	405.45	405.45	381.60	381.60	177.57
	Freq. Adj.	1.0303		SLOCA		262.35	262.35	381.60	381.60	381.60	UV1A	UV2A	262.35	262.35	381.60	381.60	381.60	167.13
Essential Service Water Pumps	HP/KW/KVA	1750		LOOP	32 / 37	1509.16	1509.16	1509.16	1509.16	1509.16	DPEF01A	DPEF01B	1509.16	1509.16	1509.16	1509.16	1509.16	773.17
				MSLB		1509.16	1509.16	1509.16	1509.16	1509.16	NB001	NB002	1509.16	1509.16	1509.16	1509.16	1509.16	773.17
	Brake HP	1872		LOCA		1509.16	1509.16	1509.16	1509.16	1509.16	-	-	1509.16	1509.16	1509.16	1509.16	1509.16	773.17
	Freq. Adj.	1.0303		SLOCA		1509.16	1509.16	1509.16	1509.16	1509.16	UV1A	UV2A	1509.16	1509.16	1509.16	1509.16	1509.16	773.17
Centrifugal Charging Pumps	HP/KW/KVA	600		LOOP	12 / 12	384.47	384.47	384.47	384.47	384.47	DPBG05A	DPBG05B	384.47	384.47	384.47	384.47	384.47	164.94
				MSLB		540.22	540.22	384.47	384.47	384.47	NB001	NB002	540.22	540.22	384.47	384.47	384.47	218.57
	Brake HP	680		LOCA		545.84	545.84	545.84	384.47	384.47	-	-	545.84	545.84	545.84	384.47	384.47	220.84
	Freq. Adj.	1.0303		SLOCA		540.22	540.22	384.47	384.47	384.47	-	-	540.22	540.22	384.47	384.47	384.47	218.57
Safety Injection Pumps	HP/KW/KVA	450		LOOP	- / -	0	0	0	0	0	DPEM01A	DPEM01B	0	0	0	0	0	0
				MSLB	17 / 17	370.04	370.04	0	0	0	NB001	NB002	370.04	370.04	0	0	0	176.06
	Brake HP	460		LOCA		370.04	370.04	370.04	348.32	348.32	-	-	370.04	370.04	370.04	348.32	348.32	176.06
	Freq. Adj.	1.0303		SLOCA		370.04	370.04	348.32	348.32	348.32	UV1A	UV2A	370.04	370.04	348.32	348.32	348.32	176.06
Auxiliary Feed Water Pumps	HP/KW/KVA	800		LOOP	42 / 42	551.49	551.49	551.49	551.49	551.49	DPAL01A	DPAL01B	551.49	551.49	551.49	551.49	551.49	322.85
				MSLB		551.49	551.49	551.49	551.49	551.49	NB001	NB002	551.49	551.49	551.49	551.49	551.49	322.85
	Brake HP	690		LOCA		551.49	551.49	551.49	551.49	551.49	-	-	551.49	551.49	551.49	551.49	551.49	322.85
	Freq. Adj.	1.0303		SLOCA		551.49	551.49	551.49	551.49	551.49	UV1A	UV2A	551.49	551.49	551.49	551.49	551.49	322.85
(ALL REMAINING LOADS ARE 480 VOLT)																		
125 VDC Swing Battery Chargers	HP/KW/KVA	1	12	LOOP	12 / 12	1.00	1.00	1.00	1.00	1.00	NK025	NK026	1.00	1.00	1.00	1.00	1.00	4.56
				MSLB		1.00	1.00	1.00	1.00	1.00	NG001	NG004	1.00	1.00	1.00	1.00	1.00	4.56
	Brake HP	N/A		LOCA		1.00	1.00	1.00	1.00	1.00	-	-	1.00	1.00	1.00	1.00	1.00	4.56
	Freq. Adj.	1		SLOCA		1.00	1.00	1.00	1.00	1.00	-	-	1.00	1.00	1.00	1.00	1.00	4.56
MCC Distribution Panels	HP/KW/KVA	45		LOOP	12 / 12	25.03	25.03	25.03	25.03	25.03			25.15	25.15	25.15	25.15	25.15	12.18
				MSLB		25.03	25.03	25.03	25.03	25.03	MCC	MCC	25.15	25.15	25.15	25.15	25.15	12.18
	Brake HP	N/A		LOCA		25.03	25.03	25.03	25.03	25.03	-	-	25.15	25.15	25.15	25.15	25.15	12.18
	Freq. Adj.	1.01		SLOCA		25.03	25.03	25.03	25.03	25.03	-	-	25.15	25.15	25.15	25.15	25.15	12.18
Motor Operated Valves	HP/KW/KVA	85/86.6		LOOP	12 / 12	65.73	0	0	0	0			63.54	0	0	0	0	42.04
				MSLB		65.73	0	0	0	0	MCC	MCC	63.54	0	0	0	0	42.04
	Brake HP	N/A		LOCA		65.73	0	0	0	0	-	-	63.54	0	0	0	0	42.04
	Freq. Adj.	1.01		SLOCA		65.73	0	0	0	0	-	-	63.54	0	0	0	0	42.04
125 Volt Battery Chargers	HP/KW/KVA	39		LOOP	12 / 12	46.47	46.47	46.47	46.47	46.47	NK021	NK022	46.47	46.47	46.47	46.47	46.47	44.79
				MSLB		46.47	46.47	46.47	46.47	46.47	NG001	NG004	46.47	46.47	46.47	46.47	46.47	44.79
	Brake HP	N/A		LOCA		46.47	46.47	46.47	46.47	46.47	-	-	46.47	46.47	46.47	46.47	46.47	44.79
	Freq. Adj.	1		SLOCA		46.47	46.47	46.47	46.47	46.47	-	-	46.47	46.47	46.47	46.47	46.47	44.79
125 Volt Battery Chargers	HP/KW/KVA	39		LOOP	12 / 12	46.47	46.47	46.47	46.47	46.47	NK023	NK024	46.47	46.47	46.47	46.47	46.47	44.79
				MSLB		46.47	46.47	46.47	46.47	46.47	NG003	NG002	46.47	46.47	46.47	46.47	46.47	44.79
	Brake HP	N/A		LOCA		46.47	46.47	46.47	46.47	46.47	-	-	46.47	46.47	46.47	46.47	46.47	44.79
	Freq. Adj.	1		SLOCA		46.47	46.47	46.47	46.47	46.47	-	-	46.47	46.47	46.47	46.47	46.47	44.79
Containment Coolers	HP/KW/KVA	150/75		LOOP	47 / 47	118.34	118.34	118.34	118.34	118.34	DSGN01A	DSGN01B	118.34	118.34	118.34	118.34	118.34	57.32
				MSLB		40.36	40.36	40.36	40.36	118.34	NG001	NG002	40.36	40.36	40.36	40.36	118.34	111.62
	Brake HP	146/46		LOCA		40.36	40.36	40.36	40.36	40.36	-	-	40.36	40.36	40.36	40.36	40.36	111.62
	Freq. Adj.	1.0303		SLOCA		40.36	40.36	40.36	40.36	40.36	-	-	40.36	40.36	40.36	40.36	40.36	111.62
Containment Coolers	HP/KW/KVA	150/75		LOOP	47 / 47	118.34	118.34	118.34	118.34	118.34	DSGN01C	DSGN01D	118.34	118.34	118.34	118.34	118.34	57.32
				MSLB		40.36	40.36	40.36	40.36	118.34	NG003	NG004	40.36	40.36	40.36	40.36	118.34	111.62
	Brake HP	146/46		LOCA		40.36	40.36	40.36	40.36	40.36	-	-	40.36	40.36	40.36	40.36	40.36	111.62
	Freq. Adj.	1.0303		SLOCA		40.36	40.36	40.36	40.36	40.36	-	-	40.36	40.36	40.36	40.36	40.36	111.62
Hydrogen Analyzer Pump	HP/KW/KVA	1		LOOP	MANUAL	0	0	0	0	0	SGS02A	SGS02B	0	0	0	0	0	0
				MSLB		0	0	0	0	0	NG001B	NG002B	0	0	0	0	0	0
	Brake HP	0.333		LOCA		0	0.36	0.36	0.36	0.36	-	-	0	0.36	0.36	0.36	0.36	0.57
	Freq. Adj.	1.0303		SLOCA		0	0.36	0.36	0.36	0.36	-	-	0	0.36	0.36	0.36	0.36	0.57
GK Compensatory Fans	HP/KW/KVA	75		LOOP	MANUAL	0	0	0	0	0	-	-	0	0	0	0	0	0
				MSLB		0	0	0	0	0	NG001A	NG002A	0	0	0	0	0	0
	Brake HP	N/A		LOCA		0	8.14	8.14	8.14	8.14	-	-	0	8.14	8.14	8.14	8.14	6.32
	Freq. Adj.	1.00		SLOCA		0	8.14	8.14	8.14	8.14	-	-	0	8.14	8.14	8.14	8.14	6.32
Hydrogen Mixing Fans	HP/KW/KVA	50/25		LOOP	12 / 12	22.36	22.36	22.36	22.36	22.36	DCGN03A	DCGN03B	22.36	22.36	22.36	22.36	22.36	24.44
				MSLB		9.30	9.30	9.30	9.30	22.36	NG001B	NG002B	9.30	9.30	9.30	9.30	22.36	26.68
	Brake HP	26.6/9.3		LOCA		9.30	9.30	9.30	9.30	9.30	-	-	9.30	9.30	9.30	9.30	9.30	26.68
	Freq. Adj.	1.0303		SLOCA		9.30	9.30	9.30	9.30	9.30	-	-	9.30	9.30	9.30	9.30	9.30	26.68
Hydrogen Mixing Fans	HP/KW/KVA	50/25		LOOP	12 / 12	22.36	22.36	22.36	22.36	22.36	DCGN03C	DCGN03D	22.36	22.36	22.36	22.36	22.36	24.44
				MSLB		9.30	9.30	9.30	9.30	22.36	NG001B	NG002B	9.30	9.30	9.30	9.30	22.36	26.68
	Brake HP	26.6/9.3		LOCA		9.30	9.30	9.30	9.30	9.30	-	-	9.30	9.30	9.30	9.30	9.30	26.68
	Freq. Adj.	1.01		SLOCA		9.30	9.30	9.30	9.30	9.30	-	-	9.30	9.30	9.30	9.30	9.30	26.68
ESW Traveling Water Screens	HP/KW/KVA	3		LOOP	52 / 57	2.96	2.96	2.96	2.96	2.96	DFEF01A	DFEF01B	2.96	2.96	2.96	2.96	2.96	1.56
				MSLB		2.96	2.96	2.96	2.96	2.96	NG005E	NG006E	2.96	2.96	2.96	2.96	2.96	1.56
	Brake HP	-		LOCA		2.96	2.96	2.96	2.96	2.96	-	-	2.96	2.96	2.96	2.96	2.96	1.56
	Freq. Adj.	1.01		SLOCA		2.96	2.96	2.96	2.96	2.96	-	-	2.96	2.96	2.96	2.96	2.96	1.56
Aux. Bldg. Penetration Room Coolers	HP/KW/KVA	30	13	LOOP	MANUAL	22.09	22.09	22.09	22.09	22.09	DSGL15A	DSGL15B	22.09	22.09	22.09	22.09	22.09	30.15
				MSLB	12 / 12	22.09	22.09	22.09	22.09	22.09	NG001B	NG002B	22.09	22.09	22.09	22.09	22.09	30.15
	Brake HP	25		LOCA		22.09	22.09	22.09	22.09	22.09	-	-	22.09	22.09	22.09	22.09	22.09	30.15
	Freq. Adj.	1.0303		SLOCA		22.09	22.09	22.09	22.09	22.09	-	-	22.09	22.09	22.09	22.09	22.09	30.15
Emerg. Exhaust Heating Coils	HP/KW/KVA	37	14	LOOP	MANUAL	0	0	0	0	0	EGG10A	EGG10B	0	0	0	0	0	0
				MSLB	12 / 12	37.00	37.00	37.00	37.00	37.00	NG003C	NG004C	37.00	37.00	37.00	37.00	37.00	0
	Brake HP	N/A		LOCA		37.00	37.00	37.00	37.00	37.00	-	-	37.00	37.00	37.00	37.00	37.00	0
	Freq. Adj.	1		SLOCA		37.00	37.00	37.00	37.00	37.00	-	-	37.00	37.00	37.00	37.00	37.00	0
Emerg. Exhaust Fans	HP/KW/KVA	25	13	LOOP	MANUAL	0	0	0	0	0	DCGG02A	DCGG02B	0	0	0	0	0	0
				MSLB	12 / 12	20.45	20.45	20.45	20.45	20.45	NG003C	NG002B	20.45	20.45	20.45	20.45	20.45	21.16
	Brake HP	24.0		LOCA		20.45	20.45	20.45	20.45	20.45	-	-	20.45	20.45	20.45	20.45	20.45	21.16
	Freq. Adj.	1.0303		SLOCA		20.45	20.45	20.45	20.45	20.45	-	-	20.45	20.45	20.45	20.45	20.45	21.16

SAFETY-RELATED LOADS

LOAD DESCRIPTION	NAMEPLATE LOAD RATING		REFER NOTES	ACCIDENT TYPE [1]	TIME TO START (SEC) [2]	NE001 KW LOADING [3] < 30 MIN. [4]	NE001 30 MIN. - 2 HRS [5]	NE001 2 HRS - 24 HRS [5]	NE001 24 HRS - 7 DAYS [5]	NE001 > 7 DAYS [6]	EQUIPMENT NO. / BUS NUMBER / LOAD SHED - SIS [7] / LOAD SHED - LOOP [7]		NE002 KW LOADING [3] < 30 MIN. [4]	NE002 30 MIN. - 2 HRS [5]	NE002 2 HRS - 24 HRS [5]	NE002 24 HRS - 7 DAYS [5]	NE002 > 7 DAYS [6]	WORST CASE KVAR LOADING [8]
Control Room Filtration Fans	HP/KW/KVA	5	13	LOOP	MANUAL	0	0	0	0	0	DCGK03A	DCGK03B	0	0	0	0	0	0
				MSLB	12 / 12	4.04	4.04	4.04	4.04	4.04	NG003C	NG004C	4.04	4.04	4.04	4.04	4.04	4.38
	Brake HP	4.15		LOCA		4.04	4.04	4.04	4.04	4.04	-	-	4.04	4.04	4.04	4.04	4.04	4.38
	Freq. Adj.	1.0303		SLOCA		4.04	4.04	4.04	4.04	4.04	-	-	4.04	4.04	4.04	4.04	4.04	4.38
Control Room A/C Compressors	HP/KW/KVA	40		LOOP	42 / 42	38.50	38.50	38.50	38.50	38.50	DSGK04AA	DSGK04BA	38.50	38.50	38.50	38.50	38.50	23.86
				MSLB		38.50	38.50	38.50	38.50	38.50	NG001	NG002	38.50	38.50	38.50	38.50	38.50	23.86
	Brake HP	N/A		LOCA		38.50	38.50	38.50	38.50	38.50	-	-	38.50	38.50	38.50	38.50	38.50	23.86
	Freq. Adj.	1.01		SLOCA		38.50	38.50	38.50	38.50	38.50	-	-	38.50	38.50	38.50	38.50	38.50	23.86
Control Room A/C Fans	HP/KW/KVA	40		LOOP	42 / 42	22.86	22.86	22.86	22.86	22.86	DSGK04AB	DSGK04BB	22.86	22.86	22.86	22.86	22.86	17.74
				MSLB		22.86	22.86	22.86	22.86	22.86	NG001	NG002	22.86	22.86	22.86	22.86	22.86	17.74
	Brake HP	27.4		LOCA		22.86	22.86	22.86	22.86	22.86	-	-	22.86	22.86	22.86	22.86	22.86	17.74
	Freq. Adj.	1.0303		SLOCA		22.86	22.86	22.86	22.86	22.86	-	-	22.86	22.86	22.86	22.86	22.86	17.74
Class 1E Equipment A/C Compressors	HP/KW/KVA	35	26	LOOP	42 / 42	28.20	28.20	28.20	28.20	28.20	DSGK05AA	DSGK05BA	28.20	28.20	28.20	28.20	28.20	17.48
				MSLB		28.20	28.20	28.20	28.20	28.20	NG001A	NG002A	28.20	28.20	28.20	28.20	28.20	17.48
	Brake HP	N/A		LOCA		28.20	28.20	28.20	28.20	28.20	-	-	28.20	28.20	28.20	28.20	28.20	17.48
	Freq. Adj.	1.01		SLOCA		28.20	28.20	28.20	28.20	28.20	-	-	28.20	28.20	28.20	28.20	28.20	17.48
Class 1E Equipment A/C Fans	HP/KW/KVA	15		LOOP	42 / 42	8.12	8.12	8.12	8.12	8.12	DSGK05AB	DSGK05BB	8.12	8.12	8.12	8.12	8.12	6.97
				MSLB		8.12	8.12	8.12	8.12	8.12	NG001A	NG002A	8.12	8.12	8.12	8.12	8.12	6.97
	Brake HP	9.65		LOCA		8.12	8.12	8.12	8.12	8.12	-	-	8.12	8.12	8.12	8.12	8.12	6.97
	Freq. Adj.	1.0303		SLOCA		8.12	8.12	8.12	8.12	8.12	-	-	8.12	8.12	8.12	8.12	8.12	6.97
Diesel Generator Bldg. Supply Fans	HP/KW/KVA	100		LOOP	12 / 12	72.31	72.31	72.31	72.31	72.31	DCGM01A	DCGM01B	72.31	72.31	72.31	72.31	72.31	93.45
				MSLB		72.31	72.31	72.31	72.31	72.31	NG003	NG004	72.31	72.31	72.31	72.31	72.31	93.45
	Brake HP	86.5		LOCA		72.31	72.31	72.31	72.31	72.31	-	-	72.31	72.31	72.31	72.31	72.31	93.45
	Freq. Adj.	1.0303		SLOCA		72.31	72.31	72.31	72.31	72.31	-	-	72.31	72.31	72.31	72.31	72.31	93.45
EDG Lube Oil / Keep Warm Pumps	HP/KW/KVA	20		LOOP	12 / 12	16.02	16.02	16.02	16.02	16.02	DPKJ03A	DPKJ03B	16.02	16.02	16.02	16.02	16.02	10.43
				MSLB		16.02	16.02	16.02	16.02	16.02	NG003D	NG004D	16.02	16.02	16.02	16.02	16.02	10.43
	Brake HP	-		LOCA		16.02	16.02	16.02	16.02	16.02	-	-	16.02	16.02	16.02	16.02	16.02	10.43
	Freq. Adj.	1.0303		SLOCA		16.02	16.02	16.02	16.02	16.02	-	-	16.02	16.02	16.02	16.02	16.02	10.43
EDG Rocker Arm Pre-Lube Pumps	HP/KW/KVA	0.5		LOOP	12 / 12	0.51	0.51	0.51	0.51	0.51	DPKJ02A	DPKJ02B	0.51	0.51	0.51	0.51	0.51	1.04
				MSLB		0.51	0.51	0.51	0.51	0.51	NG003D	NG004D	0.51	0.51	0.51	0.51	0.51	1.04
	Brake HP	0.5		LOCA		0.51	0.51	0.51	0.51	0.51	-	-	0.51	0.51	0.51	0.51	0.51	1.04
	Freq. Adj.	1.0303		SLOCA		0.51	0.51	0.51	0.51	0.51	-	-	0.51	0.51	0.51	0.51	0.51	1.04
Emergency Fuel Oil Transfer Pumps	HP/KW/KVA	2.5	15	LOOP	12 / 12	1.80	1.80	1.80	1.80	1.80	DPJE01A	DPJE01B	1.80	1.80	1.80	1.80	1.80	1.35
				MSLB		1.80	1.80	1.80	1.80	1.80	NG003D	NG004D	1.80	1.80	1.80	1.80	1.80	1.35
	Brake HP	N/A		LOCA		1.80	1.80	1.80	1.80	1.80	-	-	1.80	1.80	1.80	1.80	1.80	1.35
	Freq. Adj.	1.0303		SLOCA		1.80	1.80	1.80	1.80	1.80	-	-	1.80	1.80	1.80	1.80	1.80	1.35
Fuel Pool Pump Room Coolers	HP/KW/KVA	3	16	LOOP	MANUAL	0	2.44	2.44	2.44	2.44	DSGG04A	DSGG04B	0	2.44	2.44	2.44	2.44	2.82
				MSLB		0	2.44	2.44	2.44	2.44	NG003C	NG004C	0	2.44	2.44	2.44	2.44	2.82
	Brake HP	2.55		LOCA		0	2.44	2.44	2.44	2.44	-	-	0	2.44	2.44	2.44	2.44	2.82
	Freq. Adj.	1.0303		SLOCA		0	2.44	2.44	2.44	2.44	-	-	0	2.44	2.44	2.44	2.44	2.82
Spent Fuel Pool Cooling Pumps	HP/KW/KVA	150		LOOP	MANUAL	0	98.90	98.90	98.90	98.90	DPEC01A	DPEC01B	0	98.90	98.90	98.90	98.90	71.13
				MSLB		0	98.90	98.90	98.90	98.90	NG001	NG002	0	98.90	98.90	98.90	98.90	71.13
	Brake HP	124		LOCA		0	98.90	98.90	98.90	98.90	-	-	0	98.90	98.90	98.90	98.90	71.13
	Freq. Adj.	1.0303		SLOCA		0	98.90	98.90	98.90	98.90	UV1A	UV2A	0	98.90	98.90	98.90	98.90	71.13
Aux. Feed Water Pump Room Coolers	HP/KW/KVA	10		LOOP	42 / 42	8.51	8.51	8.51	8.51	8.51	SGF02A	SGF02B	8.51	8.51	8.51	8.51	8.51	13.99
				MSLB		8.51	8.51	8.51	8.51	8.51	NG001B	NG004C	8.51	8.51	8.51	8.51	8.51	13.99
	Brake HP	9.1		LOCA		8.51	8.51	8.51	8.51	8.51	-	-	8.51	8.51	8.51	8.51	8.51	13.99
	Freq. Adj.	1.0303		SLOCA		8.51	8.51	8.51	8.51	8.51	-	-	8.51	8.51	8.51	8.51	8.51	13.99
Centrifugal Charging Pump Room Coolers	HP/KW/KVA	10	16	LOOP	12 / 12	9.17	9.17	9.17	9.17	9.17	DSGL12A	DSGL12B	9.17	9.17	9.17	9.17	9.17	15.06
				MSLB		9.17	9.17	9.17	9.17	9.17	NG001A	NG002A	9.17	9.17	9.17	9.17	9.17	15.06
	Brake HP	9.8		LOCA		9.17	9.17	9.17	9.17	9.17	-	-	9.17	9.17	9.17	9.17	9.17	15.06
	Freq. Adj.	1.0303		SLOCA		9.17	9.17	9.17	9.17	9.17	-	-	9.17	9.17	9.17	9.17	9.17	15.06
Safety Injection Pump Room Coolers	HP/KW/KVA	10	16	LOOP	N/A	0	0	0	0	0	DSGL09A	DSGL09B	0	0	0	0	0	0
				MSLB	17 / 17	7.49	7.49	7.49	7.49	7.49	NG001A	NG002A	7.49	7.49	7.49	7.49	7.49	15.28
	Brake HP	7.6		LOCA		7.49	7.49	7.49	7.49	7.49	-	-	7.49	7.49	7.49	7.49	7.49	15.28
	Freq. Adj.	1.0303		SLOCA		7.49	7.49	7.49	7.49	7.49	-	-	7.49	7.49	7.49	7.49	7.49	15.28
Comp. Cooling Water Pump Room Coolers	HP/KW/KVA	15	16	LOOP	17 / 17	9.13	9.13	9.13	9.13	9.13	DSGL11A	DSGL11B	9.13	9.13	9.13	9.13	9.13	11.87
				MSLB		9.13	9.13	9.13	9.13	9.13	NG003C	NG004C	9.13	9.13	9.13	9.13	9.13	11.87
	Brake HP	10.4		LOCA		9.13	9.13	9.13	9.13	9.13	-	-	9.13	9.13	9.13	9.13	9.13	11.87
	Freq. Adj.	1.0303		SLOCA		9.13	9.13	9.13	9.13	9.13	-	-	9.13	9.13	9.13	9.13	9.13	11.87
Residual Heat Removal Pump Room Coolers	HP/KW/KVA	10	16	LOOP	MANUAL	0	7.49	7.49	7.49	7.49	DSGL10A	DSGL10B	0	7.49	7.49	7.49	7.49	15.28
				MSLB	22 / 22	7.49	7.49	7.49	7.49	7.49	NG001A	NG002A	7.49	7.49	7.49	7.49	7.49	15.28
	Brake HP	7.6		LOCA		7.49	7.49	7.49	7.49	7.49	-	-	7.49	7.49	7.49	7.49	7.49	15.28
	Freq. Adj.	1.0303		SLOCA		7.49	7.49	7.49	7.49	7.49	-	-	7.49	7.49	7.49	7.49	7.49	15.28
Containment Spray Pump Room Coolers	HP/KW/KVA	10	16	LOOP	N/A	0	0	0	0	0	DSGL13A	DSGL13B	0	0	0	0	0	0
				MSLB	27 / 27	7.49	7.49	7.49	7.49	0	NG001A	NG002A	7.49	7.49	7.49	7.49	0	15.28
	Brake HP	7.6		LOCA		7.49	7.49	7.49	7.49	0	-	-	7.49	7.49	7.49	7.49	0	15.28
	Freq. Adj.	1.0303		SLOCA		0	0	0	0	0	-	-	0	0	0	0	0	0
ESW Pump House Supply Fans	HP/KW/KVA	20	16	LOOP	32 / 37	14.45	14.45	14.45	14.45	14.45	DCGD01A	DCGD01B	14.45	14.45	14.45	14.45	14.45	10.42
				MSLB		14.45	14.45	14.45	14.45	14.45	NG005E	NG006E	14.45	14.45	14.45	14.45	14.45	10.42
	Brake HP	17.34		LOCA		14.45	14.45	14.45	14.45	14.45	-	-	14.45	14.45	14.45	14.45	14.45	10.42
	Freq. Adj.	1.0303		SLOCA		14.45	14.45	14.45	14.45	14.45	-	-	14.45	14.45	14.45	14.45	14.45	10.42
Control Room Pressurization System Heaters	HP/KW/KVA	5	14	LOOP	MANUAL	0	0	0	0	0	FGK02A	FGK02B	0	0	0	0	0	0
				MSLB	12 / 12	5.00	5.00	5.00	5.00	5.00	NG001A	NG002A	5.00	5.00	5.00	5.00	5.00	0
	Brake HP	N/A		LOCA		5.00	5.00	5.00	5.00	5.00	-	-	5.00	5.00	5.00	5.00	5.00	0
	Freq. Adj.	1		SLOCA		5.00	5.00	5.00	5.00	5.00	-	-	5.00	5.00	5.00	5.00	5.00	0
Control Room Pressurization System Fans	HP/KW/KVA	7.5	13	LOOP	MANUAL	0	0	0	0	0	DCGK04A	DCGK04B	0	0	0	0	0	0
				MSLB	12 / 12	3.74	3.74	3.74	3.74	3.74	NG001A	NG002A	3.74	3.74	3.74	3.74	3.74	1.96
	Brake HP	4.2		LOCA		3.74	3.74	3.74	3.74	3.74	-	-	3.74	3.74	3.74	3.74	3.74	1.96
	Freq. Adj.	1.0303		SLOCA		3.74	3.74	3.74	3.74	3.74	-	-	3.74	3.74	3.74	3.74	3.74	1.96
ESW Strainers	HP/KW/KVA	1.3	15	LOOP	152 / 157	1.69	1.69	1.69	1.69	1.69	DFEF02A	DFEF02B	1.69	1.69	1.69	1.69	1.69	1.05
				MSLB		1.69	1.69	1.69	1.69	1.69	NG005E	NG006E	1.69	1.69	1.69	1.69	1.69	1.05
	Brake HP	1.3		LOCA		1.69	1.69	1.69	1.69	1.69	-	-	1.69	1.69	1.69	1.69	1.69	1.05
	Freq. Adj.	1.01		SLOCA		1.69	1.69	1.69	1.69	1.69	-	-	1.69	1.69	1.69	1.69	1.69	1.05
480/120V NN Inverter BCTV	HP/KW/KVA	7.5	24	LOOP	12 / 12	10.36	10.36	10.36	10.36	10.36	NN11/NN13	NN12/NN14	10.27	10.27	10.27	10.27	10.27	5.49
				MSLB		10.36	10.36	10.36	10.36	10.36	NG001A	NG002A	10.27	10.27	10.27	10.27	10.27	5.49
	Brake HP	N/A		LOCA		10.36	10.36	10.36	10.36	10.36	-	-	10.27	10.27	10.27	10.27	10.27	5.49
	Freq. Adj.	1		SLOCA		10.36	10.36	10.36	10.36	10.36	-	-	10.27	10.27	10.27	10.27	10.27	5.49
TOTAL SAFETY RELATED LOADS:				LOOP		3684.8	4109.5	4109.5	4109.5	4109.5	PF:	85.9%	3682.7	4109.6	4109.6	4109.6	4109.6	2445.0
				MSLB		4787.7	4849.4	4061.3	4038.8	4213.4	PF:	84.7%	4785.5	4849.5	4061.3	4038.9	4213.5	3037.4
				LOCA		4936.4	5006.7	5006.7	4395.7	4388.2	PF:	85.3%	4934.2	5006.7	5006.7	4395.7	4388.2	3057.0
				SLOCA		4376.1	4446.4	4388.2	4388.2	4388.2	PF:	84.1%	4373.9	4446.4	4388.2	4388.2	4388.2	2855.7

NON-SAFETY RELATED LOADS

LOAD DESCRIPTION	NAMEPLATE LOAD RATING		REFER NOTES	ACCIDENT TYPE [1]	TIME TO START (SEC) [2]	NE001 KW LOADING [3] < 30 MIN. [4]	NE001 30 MIN. - 2 HRS [5]	NE001 2 HRS - 24 HRS [5]	NE001 24 HRS - 7 DAYS [5]	NE001 > 7 DAYS [6]	EQUIPMENT NO. / BUS NUMBER / LOAD SHED - SIS [7] / LOAD SHED - LOOP [7]		NE002 KW LOADING [3] < 30 MIN. [4]	NE002 30 MIN. - 2 HRS [5]	NE002 2 HRS - 24 HRS [5]	NE002 24 HRS - 7 DAYS [5]	NE002 > 7 DAYS [6]	WORST CASE KVAR LOADING [8]
Instrument Air Compressors [25]	HP/KW/KVA	250		LOOP	MANUAL	193.10	193.10	193.10	193.10	193.10	DCKA01A	DCKA01B	193.10	193.10	193.10	193.10	193.10	129.76
				MSLB		193.10	193.10	193.10	193.10	193.10	NG003	NG004	193.10	193.10	193.10	193.10	193.10	129.76
	Brake HP	250		LOCA		193.10	193.10	193.10	193.10	193.10	S-1	S-2	193.10	193.10	193.10	193.10	193.10	129.76
	Freq. Adj.	1.01		SLOCA		193.10	193.10	193.10	193.10	193.10	UV1B	UV2B	193.10	193.10	193.10	193.10	193.10	129.76
CRDM Cooling Fans	HP/KW/KVA	34.5		LOOP	MANUAL	0	23.31	23.31	23.31	23.31	DCGN01D	DCGN01B	0	23.31	23.31	23.31	23.31	12.01
				MSLB		0	23.31	23.31	23.31	23.31	NG001B	NG002B	0	23.31	23.31	23.31	23.31	12.01
	Brake HP	29.1		LOCA		0	0	0	0	0	S-1	S-2	0	0	0	0	0	0
	Freq. Adj.	1.0303		SLOCA		0	0	0	0	0	-	-	0	0	0	0	0	0
Boric Acid Transfer Pumps	HP/KW/KVA	15.5		LOOP	MANUAL 30 MIN.	0	11.60	11.60	11.60	11.60	DPBG02A	DPBG02B	0	11.60	11.60	11.60	11.60	7.01
				MSLB		0	11.60	11.60	11.60	11.60	NG001A	NG002A	0	11.60	11.60	11.60	11.60	7.01
	Brake HP	-		LOCA		0	11.60	11.60	11.60	11.60	S-1	S-2	0	11.60	11.60	11.60	11.60	7.01
	Freq. Adj.	1.0303		SLOCA		0	11.60	11.60	11.60	11.60	-	-	0	11.60	11.60	11.60	11.60	7.01
Back Up Pressurizer Heaters	HP/KW/KVA	692		LOOP	MANUAL 60 MIN.	0	692.40	692.40	692.40	0	TBB03	TBB03	0	692.40	692.40	692.40	0	0
				MSLB		0	692.40	692.40	692.40	0	PG021	PG022	0	692.40	692.40	692.40	0	0
	Brake HP	-		LOCA		0	0	0	0	0	S-1	S-2	0	0	0	0	0	0
	Freq. Adj.	1		SLOCA		0	692.40	692.40	692.40	0	UV1B	UV2B	0	692.40	692.40	692.40	0	0
Standby AC Lighting	HP/KW/KVA	75		LOOP	12 / 12	46.25	46.25	46.25	46.25	46.25	-	-	56.01	56.01	56.01	56.01	56.01	0
				MSLB	MANUAL	0	46.25	46.25	46.25	46.25	MCC	MCC	0	56.01	56.01	56.01	56.01	0
	Brake HP	-		LOCA		0	46.25	46.25	46.25	46.25	S-1	S-2	0	56.01	56.01	56.01	56.01	0
	Freq. Adj.	1		SLOCA		0	46.25	46.25	46.25	46.25	-	-	0	56.01	56.01	56.01	56.01	0
Non Class 1E Instrument AC Power	HP/KW/KVA	30		LOOP	12 / 12	21.60	21.60	21.60	21.60	21.60	XPN07A	XPN08A	21.60	21.60	21.60	21.60	21.60	10.46
				MSLB		21.60	21.60	21.60	21.60	21.60	NG001B	NG002B	21.60	21.60	21.60	21.60	21.60	10.46
	Brake HP	N/A		LOCA		21.60	21.60	21.60	21.60	21.60	-	-	21.60	21.60	21.60	21.60	21.60	10.46
	Freq. Adj.	1		SLOCA		21.60	21.60	21.60	21.60	21.60	-	-	21.60	21.60	21.60	21.60	21.60	10.46
125 Volt Battery Chargers	HP/KW/KVA	39		LOOP	MANUAL 2 HR.	0	46.47	46.47	46.47	46.47	PK021	PK022	0	46.47	46.47	46.47	46.47	44.79
				MSLB		0	46.47	46.47	46.47	46.47	NG001	NG004	0	46.47	46.47	46.47	46.47	44.79
	Brake HP	N/A		LOCA		0	46.47	46.47	46.47	46.47	S-1	S-2	0	46.47	46.47	46.47	46.47	44.79
	Freq. Adj.	1		SLOCA		0	46.47	46.47	46.47	46.47	UV1B	UV2B	0	46.47	46.47	46.47	46.47	44.79
125 Volt Battery Chargers	HP/KW/KVA	39		LOOP	MANUAL 2 HR.	0	46.47	46.47	46.47	46.47	PK023	PK024	0	46.47	46.47	46.47	46.47	44.79
				MSLB		0	46.47	46.47	46.47	46.47	NG001	NG004	0	46.47	46.47	46.47	46.47	44.79
	Brake HP	N/A		LOCA		0	46.47	46.47	46.47	46.47	S-1	S-2	0	46.47	46.47	46.47	46.47	44.79
	Freq. Adj.	1		SLOCA		0	46.47	46.47	46.47	46.47	UV1B	UV2B	0	46.47	46.47	46.47	46.47	44.79
250 Volt Battery Charger	HP/KW/KVA	52		LOOP	MANUAL 2 HR.						NOTE 17	PJ031	0	61.95	61.95	61.95	61.95	59.72
				MSLB								NG002	0	61.95	61.95	61.95	61.95	59.72
	Brake HP	-		LOCA								S-2	0	61.95	61.95	61.95	61.95	59.72
	Freq. Adj.	1		SLOCA								UV2B	0	61.95	61.95	61.95	61.95	59.72
ESW Pumphouse Heaters	HP/KW/KVA	25	15, 18	LOOP	12 / 12	25.00	25.00	25.00	25.00	25.00	EGD01A	EGD01B	25.00	25.00	25.00	25.00	25.00	0
				MSLB	MANUAL	0	25.00	25.00	25.00	25.00	NG005E	NG006E	0	25.00	25.00	25.00	25.00	0
	Brake HP	N/A		LOCA		0	25.00	25.00	25.00	25.00	S-1	S-2	0	25.00	25.00	25.00	25.00	0
	Freq. Adj.	1		SLOCA		0	25.00	25.00	25.00	25.00	-	-	0	25.00	25.00	25.00	25.00	0
ESW Pumphouse Heaters	HP/KW/KVA	15	15, 18	LOOP	12 / 12	15.00	15.00	15.00	15.00	15.00	EGD01C	EGD01D	15.00	15.00	15.00	15.00	15.00	0
				MSLB	MANUAL	0	15.00	15.00	15.00	15.00	NG005E	NG006E	0	15.00	15.00	15.00	15.00	0
	Brake HP	N/A		LOCA		0	15.00	15.00	15.00	15.00	S-1	S-2	0	15.00	15.00	15.00	15.00	0
	Freq. Adj.	1		SLOCA		0	15.00	15.00	15.00	15.00	-	-	0	15.00	15.00	15.00	15.00	0
ESW Pumphouse Heaters	HP/KW/KVA	15	15, 18	LOOP	12 / 12	15.00	15.00	15.00	15.00	15.00	EGD01E	EGD01F	15.00	15.00	15.00	15.00	15.00	0
				MSLB	MANUAL	0	15.00	15.00	15.00	15.00	NG005E	NG006E	0	15.00	15.00	15.00	15.00	0
	Brake HP	N/A		LOCA		0	15.00	15.00	15.00	15.00	S-1	S-2	0	15.00	15.00	15.00	15.00	0
	Freq. Adj.	1		SLOCA		0	15.00	15.00	15.00	15.00	-	-	0	15.00	15.00	15.00	15.00	0
ESW Pumphouse Heaters	HP/KW/KVA	15	15, 18	LOOP	12 / 12	15.00	15.00	15.00	15.00	15.00	EGD01G	EGD01H	15.00	15.00	15.00	15.00	15.00	0
				MSLB	MANUAL	0	15.00	15.00	15.00	15.00	NG005E	NG006E	0	15.00	15.00	15.00	15.00	0
	Brake HP	N/A		LOCA		0	15.00	15.00	15.00	15.00	S-1	S-2	0	15.00	15.00	15.00	15.00	0
	Freq. Adj.	1		SLOCA		0	15.00	15.00	15.00	15.00	-	-	0	15.00	15.00	15.00	15.00	0
Count Lab Analyzers	HP/KW/KVA	9.6		LOOP	MANUAL	8.64	8.64	8.64	8.64	8.64	XSJ01	-	0	0	0	0	0	4.18
				MSLB		8.64	8.64	8.64	8.64	8.64	NG001	-	0	0	0	0	0	4.18
	Brake HP	N/A		LOCA		8.64	8.64	8.64	8.64	8.64	S-1	-	0	0	0	0	0	4.18
	Freq. Adj.	1		SLOCA		8.64	8.64	8.64	8.64	8.64	-	-	0	0	0	0	0	4.18
TOTAL NON-SAFETY RELATED LOADS:				LOOP		339.6	1159.8	1159.8	1159.8	467.4	PF:	96.9%	340.7	1222.9	1222.9	1222.9	530.5	312.7
				MSLB		223.3	1159.8	1159.8	1159.8	467.4	PF:	96.9%	214.7	1222.9	1222.9	1222.9	530.5	312.7
				LOCA		223.3	444.1	444.1	444.1	444.1	PF:	96.9%	214.7	507.2	507.2	507.2	507.2	300.7
				SLOCA		223.3	1136.5	1136.5	1136.5	444.1	PF:	86.0%	214.7	1199.6	1199.6	1199.6	507.2	300.7
TOTAL AUTO-CONNECTED LOADS: [20]				LOOP		3809.2	3743.5	3743.5	3743.5	3743.5	PF:	86.9%	3808.2	3744.7	3744.7	3744.7	3744.7	2173.1
				MSLB		4809.3	4769.7	3981.6	3959.1	4133.7	PF:	85.1%	4807.1	4769.7	3981.6	3959.1	4133.7	2973.9
				LOCA		**4958.0**	**4918.4**	**4918.4**	**4307.4**	**4299.9**	PF:	85.7%	**4955.8**	**4918.4**	**4918.4**	**4307.4**	**4300.0**	**2986.6**
				SLOCA		4397.7	4358.1	4299.9	4299.9	4299.9	PF:	84.5%	4395.5	4358.2	4300.0	4300.0	4300.0	2785.3
TOTAL LOAD ON DIESEL GENERATOR: [21]				LOOP		4024.4	5269.4	5269.4	5269.4	4577.0	PF:	88.8%	4023.4	5332.5	5332.5	5332.5	4640.1	2757.7
				MSLB		5011.0	**6009.3**	5221.1	5198.7	4680.9	PF:	87.6%	5000.2	**6072.4**	5284.2	5261.8	4744.0	3350.1
				LOCA		**5159.7**	5450.8	**5450.8**	4839.8	**4832.3**	PF:	85.4%	**5148.9**	5513.9	**5513.9**	4902.9	**4895.4**	**3357.7**
				SLOCA		4599.4	5582.9	5524.7	**5524.7**	4832.3	PF:	87.3%	4588.6	5646.0	5587.8	**5587.8**	4895.4	3156.4
TOTAL LOAD ON DIESEL GENERATOR: [21, 22] (Frequency Adjusted)				LOOP		4131.1	5391.3	5391.3	5391.3	4698.9	PF:	88.8%	4130.0	5454.4	5454.4	5454.4	4762.0	2828.1
				MSLB		5150.1	**6152.6**	5340.6	5317.5	4804.7	PF:	87.5%	5139.3	6215.7	5403.7	5380.6	4867.8	3438.5
				LOCA		**5303.3**	5597.9	5597.9	4968.4	**4960.7**	PF:	85.4%	5292.5	5661.0	5661.0	5031.5	5023.8	3446.1
				SLOCA		4726.1	5713.1	**5653.1**	**5653.1**	4960.7	PF:	87.2%	4715.2	5776.2	5716.2	5716.2	5023.8	3238.7
TOTAL LOAD ON DIESEL GENERATOR: [21, 22, 23] (Frequency Adjusted, with Cable Losses)				LOOP		4172.4	5445.2	5445.2	5445.2	4745.9	PF:	89.0%	4171.3	5509.0	5509.0	5509.0	4809.6	2828.1
				MSLB		5201.6	**6214.1**	5394.0	5370.6	4852.7	PF:	87.7%	5190.6	**6277.9**	5457.7	5434.4	4916.5	3438.5
				LOCA		**5356.3**	5653.9	**5653.9**	5018.1	**5010.3**	PF:	85.6%	**5345.4**	5717.7	5717.7	5081.8	**5074.0**	**3446.1**
				SLOCA		4773.3	5770.2	5709.6	**5709.6**	5010.3	PF:	87.4%	4762.4	5834.0	**5773.4**	**5773.4**	5074.0	3238.7
ASSOCIATED DIESEL GENERATOR RATINGS: [4, 5, 6]						7441.0	6821.0	6821.0	6821.0	6201.0			7441.0	6821.0	6821.0	6821.0	6201.0	
PERCENT MARGIN FROM GENERATOR RATING: [21]						30.66	11.90	20.09	19.00	22.07			30.80	10.98	19.16	18.08	21.05	
PERCENT MARGIN AT OVER-FREQUENCY w/CABLE LOSSES: [22, 23]						28.02	8.90	17.11	16.29	19.20			28.16	7.96	15.36	15.36	18.17	

NOTES

1 All Accident Types are evaluated concurrant with a Loss of Offsite Power (LOOP).

2 The start times shown include both 12 sec. for the Diesel to come up to speed and voltage after DG start signal and the time when the sequencer starts the load. In the event that a LOCA is present without bus undervoltage, 12 sec. must be subtracted from the start times shown.

3 All loads are determined from the load tables and notes on Drawing E-11005A.

4 0-30 minutes - This time period would cover when immediate/intermittent loads such as MOVs would be energized. The generator set rating for this time period is 7441 kW.

5 30 minutes to 7 days - This intermediate time period would cover Hot Standby operations during a LOOP, operations during a Main Steam Line Break (MSLB), and would also cover the injection and recirculation phases during a Large Break LOCA, or Small Break LOCA (SLOCA). The generator set rating for this time period is 6821 kW.

6 Greater than 7 days - This time period would cover cold shutdown operations during a LOOP, operations during a Main Steam Line Break (MSLB), and would also cover an extended recirculation phase during a LOCA or SLOCA. The generator set rating for this time period is 6201 kW.

7 "UV" signals shed both safety and non-safety related loads upon loss of voltage on D/G buses. The "S" signal originates within the Load Shedder-Sequencer Panel. This signal is a derivative of the safety injection signal (SIS) and serves to trip those non-1E loads connected to the Class 1E buses on the occurrence of an SIS.

8 Worst case KVAR loading for each component is obtained from the load tables of E-11005A.

9 Sequencer starts one of the two component cooling water pumps in each load group and 5 seconds later starts the 2nd (standby) pump in the same load group provided the first pump failed to start.

10 Containment Spray Pump starts at 27 secs if a CSAS is present at 27 sec. Containment Spray Pump starts at 52 secs if a CSAS is not present at 27 secs.

11 Not Used.

12 Power values shown for NK25/NK26 represent the charger with no DC output load. When the Swing Charger is switched into service, its load becomes that of the charger it replaced.

13 Starts automatically from an SIS/CRVIS/FBVIS signal.

14 Starting will be interlocked with its respective fan.

Starts and/or stops automatically by a signal from pressure, level, or temperature switch, or manually operated when required.

Starting of a pump room cooler will be interlocked with its respective pump motor breaker in the automatic mode.

The 250 Volt Battery Charger load applies only to NE002.

Under certain circumstances this load may be connected to the bus and since it is not shed, this load must be considered as starting at 12 sec.

The various Overall Power Factor (PF) values were determined by using the Overall Maximum KW Loading for each separate grouping of 10 cases (5 time periods x 2 EDGs) and the associated Total Worst-Case KVAR Loading.

-----(Note 19 is not referenced in the above Table.)-----

The "Total Auto-Connected Load" includes all loads that are automatically sequenced back on to the diesel generator, together with all loads that could be automatically re-energized. Auto-Connected Loads do not include manually initiated loads.

21 The Total Load is the sum of the Total Safety Related Loads and Total Non-Safety Related Loads. The maximum Total Load for each Time Period is indicated by double-outlined cells with bold-face type. The values in these cells are used to determine the associated Diesel Generator margins.

22 The operating frequency of the EDG is not maintained at an exact 60 Hz. During over-frequency conditions, EDG loading increases by the cube of the frequency due to pumps and fans and directly proportional to the frequency for constant torque loads. The EDG frequency will be maintained between 59.4 Hz and 60.6 Hz. The worst case EDG loading will be at a frequency of 60.6 Hz (60 x 1.01).

LOAD	FREQUENCY ADJUSTMENT FACTOR
Pump/Fan Loads (Frequency Cubed):	1.0303
Constant Torque Loads (Frequency Direct):	1.01
Constant Loads (No Change due to Frequency):	1.00

23 An additional 1% has been conservatively added to each Frequency Adjusted loading condition to account for the effects of cable losses.

24 One inverter is operating at No Load and one Inverter is operating at Full Load. The loading provided is the total loading for both Inverters

25 An alternate model motor is approved with slightly different ratings (either may be installed at any given time). Shown details pertain to the worst case motor. See E-11005A for additional motor details.

26 The loads included in the "TOTAL LOAD ON DIESEL GENERATOR (Frequency Adjusted, with Cable Losses)" for the LOOP loads "Medium Time" are the same loads allowed to be loaded on the PB SBO DG KU01A, KU01B and KU01C. All the loads are manually loaded and managed per Operations procedures.

LEGEND

- Non-shaded cells denote loads that are automatically sequenced.
- Shaded cells denote loads that are manually loaded.
- Double-outlined cells denote maximum total load for each time period.
- Control cell to enter frequency for determining effect on loading.

USAR FIG. 8.3-2

DC7 10/26/2021

ESSENTIAL DRAWING			
☑ REVISED ☐ ISSUED	INCORP. CHG. DOC. CR 10007548	CHANGE PKG. NO.	
REVISION NOTES			
WOLF CREEK NUCLEAR OPERATING CORPORATION		ELECTRONIC APPROVAL	
LIST OF LOADS SUPPLIED BY EMERGENCY DIESEL GENERATOR			
SCALE: NONE	DRAWING NUMBER: E-11005	REV: 63	

22 x 34 D SIZE

Figure 2

WCNOC Bus Name	Bus Voltage	Mom. Rating (1/2 Cycle) (kA)	Rated Short Circuit Current (kA)	SC1 1DGNB1					SC1 2DGNB1					SC1 3DGNB1					SC1 1DGNB2					SC1 2DGNB2				
				1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)
NB01	4160	66	44.68	43.198	34.55	28.648	35.88	26.019	48.650	26.29	32.407	27.47	28.832	53.859	18.40	36.073	19.26	31.595	37.341	43.42	24.800	44.49	23.157	37.342	43.42	24.801	44.49	23.158
NB02	4160	66	44.68	40.569	38.53	26.630	40.40	24.960	40.569	38.53	26.630	40.40	24.961	40.569	38.53	26.630	40.40	24.961	46.395	29.70	30.475	31.79	27.821	51.824	21.48	34.226	23.40	30.631
PB05	4160	66	44.68	38.671	41.41	26.744	40.14	24.331	44.692	32.28	30.648	31.41	27.222	50.678	23.22	34.557	22.66	30.116	40.785	38.20	28.184	36.92	25.778	46.795	29.10	32.089	28.18	28.670
LC NG01	480	N/A	30			25.899	13.67	20.788			26.108	12.97	20.990			26.275	12.42	21.156			25.619	14.60	20.537			25.619	14.60	20.537
LC NG02	480	N/A	30			25.614	14.62	20.710			25.614	14.62	20.710			25.614	14.62	20.710			25.862	13.79	20.931			26.050	13.17	21.111
LC NG03	480	N/A	30			25.494	15.02	20.909			25.695	14.35	21.104			25.854	13.82	21.264			25.226	15.91	20.667			25.226	15.91	20.667
LC NG04	480	N/A	30			25.633	14.56	20.485			25.633	14.56	20.485			25.633	14.56	20.485			25.863	13.79	20.690			26.037	13.21	20.857
LC PG21	480	N/A	30			15.702	47.66	15.558			15.807	47.31	15.663			15.889	47.04	15.749			15.562	48.13	15.427			15.562	48.13	15.427
LC PG22	480	N/A	30			15.736	47.55	15.615			15.763	47.46	15.615			15.736	47.55	15.615			15.861	47.13	15.731			15.955	46.82	15.825
MCC NG01A	480	N/A	25			23.586	5.66	19.194			23.756	4.98	19.364			23.890	4.44	19.503			23.359	6.56	18.981			23.359	6.56	18.981
MCC NG01B	480	N/A	25			17.804	28.78	14.934			17.895	28.42	15.033			17.966	28.14	15.114			17.683	29.27	14.809			17.683	29.27	14.809
MCC NG02A	480	N/A	25			21.767	12.93	17.988			21.767	12.93	17.988			21.767	12.93	17.988			21.938	12.25	18.150			22.067	11.73	18.282
MCC NG02B	480	N/A	25			14.173	43.31	12.003			14.173	43.31	12.003			14.173	43.31	12.003			14.237	43.05	12.072			14.285	42.86	12.126
MCC NG03C	480	N/A	25			19.520	21.92	16.585			19.632	21.47	16.703			19.720	21.12	16.800			19.370	22.52	16.436			19.370	22.52	16.436
MCC NG03D	480	N/A	25			19.314	22.74	16.564			19.425	22.30	16.683			19.514	21.95	16.781			19.163	23.35	16.414			19.163	23.35	16.414
MCC NG04C	480	N/A	25			18.778	24.89	15.791			18.778	24.89	15.791			18.778	24.89	15.791			18.895	24.42	15.909			18.983	24.07	16.004
MCC NG04D	480	N/A	25			19.542	21.83	16.430			19.542	21.83	16.430			19.542	21.83	16.430			19.670	21.32	16.558			19.767	20.93	16.662
MCC NG05E	480	N/A	25			6.269	74.93	6.083			6.284	74.86	6.099			6.296	74.81	6.112			6.248	75.01	6.063			6.248	75.01	6.063
MCC NG06E	480	N/A	25			6.157	75.37	5.975			6.157	75.37	5.975			6.157	75.37	5.975			6.174	75.30	5.992			6.188	75.25	6.005

WCNOC Bus Name	Bus Voltage	Mom. Rating (1/2 Cycle) (kA)	Rated Short Circuit Current (kA)	SC1 3DGNB2					SC1 3DGNB1A					SC1 3DGNB2A					SC NSAFP A					SC NSAFP B				
				1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	largin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)
NB01	4160	66	44.68	37.342	43.42	24.801	44.49	23.158	58.764	10.96	37.551	15.96	31.595	42.265	35.96	26.27	41.19	23.158	58.246	11.75	37.432	16.22	31.595	40.919	38.00	25.783	42.29	23.158
NB02	4160	66	44.68	57.009	13.62	37.880	15.22	33.388	45.408	31.20	28.108	37.09	24.961	61.856	6.28	39.35	11.91	33.388	44.087	33.20	27.613	38.20	24.961	61.348	7.05	39.238	12.18	33.388
PB05	4160	66	44.68	52.774	20.04	35.999	19.43	31.564	54.241	17.82	35.809	19.85	30.116	56.180	14.88	37.22	16.69	31.564	54.290	17.74	35.797	19.88	30.116	56.273	14.74	37.222	16.69	31.564
LC NG01	480	N/A	30			25.619	14.60	20.537			26.387	12.04	21.156			25.833	13.89	20.537			26.380	12.07	21.156			25.782	14.06	20.537
LC NG02	480	N/A	30			26.201	12.66	21.260			25.804	13.99	20.710			26.303	12.32	21.260			25.758	14.14	20.710			26.297	12.34	21.260
LC NG03	480	N/A	30			25.226	15.91	20.667			25.961	13.46	21.264			25.431	15.23	20.667			25.955	13.48	21.264			25.383	15.39	20.667
LC NG04	480	N/A	30			26.177	12.74	20.995			25.809	13.97	20.485			26.272	12.43	20.995			25.767	14.11	20.485			26.266	12.45	20.995
LC PG21	480	N/A	30			15.562	48.13	15.427			15.945	46.85	15.749			15.670	47.77	15.427			15.941	46.86	15.749			15.644	47.85	15.427
LC PG22	480	N/A	30			16.030	46.57	15.902			15.832	47.23	15.615			16.082	46.39	15.902			15.809	47.30	15.615			16.079	46.40	15.902
MCC NG01A	480	N/A	25			23.359	6.56	18.981			23.981	4.07	19.503			23.533	5.87	18.981			23.976	4.10	19.503			23.492	6.03	18.981
MCC NG01B	480	N/A	25			17.683	29.27	14.809			18.014	27.94	15.114			17.776	28.89	14.809			18.011	27.96	15.114			17.754	28.98	14.809
MCC NG02A	480	N/A	25			22.170	11.32	18.390			21.898	12.41	17.988			22.241	11.04	18.390			21.867	12.53	17.988			22.236	11.05	18.390
MCC NG02B	480	N/A	25			14.322	42.71	12.171			14.223	43.11	12.003			14.348	42.61	12.171			14.211	43.16	12.003			14.347	42.61	12.171
MCC NG03C	480	N/A	25			19.370	22.52	16.436			19.779	20.88	16.800			19.486	22.06	16.436			19.776	20.90	16.800			19.458	22.17	16.436
MCC NG03D	480	N/A	25			19.163	23.35	16.414			19.573	21.71	16.781			19.279	22.88	16.414			19.570	21.72	16.781			19.251	22.99	16.414
MCC NG04C	480	N/A	25			19.053	23.79	16.082			18.868	24.53	15.791			19.101	23.60	16.082			18.847	24.61	15.791			19.098	23.61	16.082
MCC NG04D	480	N/A	25			19.844	20.62	16.747			19.641	21.44	16.430			19.897	20.41	16.747			19.617	21.53	16.430			19.894	20.42	16.747
MCC NG05E	480	N/A	25			6.248	75.01	6.063			6.305	74.78	6.112			6.264	74.94	6.063			6.304	74.78	6.112			6.260	74.96	6.063
MCC NG06E	480	N/A	25			6.198	75.21	6.016			6.170	75.32	5.975			6.205	75.18	6.016			6.167	75.33	5.975			6.205	75.18	6.016

WCNOC Bus Name	Bus Voltage	Mom. Rating (1/2 Cycle) (kA)	Rated Short Circuit Current (kA)	SC NSAFPA 2G					SC NSAFPB 2G				
				1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)	1/2 Cycle	% Margin	1.5 to 4 Cycle	% Margin	30 Cycle (3 Phase)
NB01	4160	66	44.68	53.071	19.59	33.775	24.41	28.832	40.919	38.00	25.783	42.29	23.158
NB02	4160	66	44.68	44.087	33.20	27.613	38.20	24.961	56.195	14.86	35.594	20.34	30.631
PB05	4160	66	44.68	48.320	26.79	31.888	28.63	27.222	50.304	23.78	33.312	25.44	28.670
LC NG01	480	N/A	30			26.236	12.55	20.990			25.782	14.06	20.537
LC NG02	480	N/A	30			25.758	14.14	20.710			26.166	12.78	21.111
LC NG03	480	N/A	30			25.817	13.94	21.104			25.382	15.39	20.667
LC NG04	480	N/A	30			25.767	14.11	20.485			26.145	12.85	20.857
LC PG21	480	N/A	30			15.870	47.10	15.663			15.644	47.85	15.427
LC PG22	480	N/A	30			15.809	47.30	15.615			16.014	46.62	15.825
MCC NG01A	480	N/A	25			23.860	4.56	19.364			23.492	6.03	18.981
MCC NG01B	480	N/A	25			17.950	28.20	15.033			17.754	28.98	14.809
MCC NG02A	480	N/A	25			21.867	12.53	17.988			22.147	11.41	18.282
MCC NG02B	480	N/A	25			14.211	43.16	12.003			14.314	42.74	12.126
MCC NG03C	480	N/A	25			19.700	21.20	16.703			19.458	22.17	16.436
MCC NG03D	480	N/A	25			19.494	22.03	16.683			19.251	22.99	16.414
MCC NG04C	480	N/A	25			18.847	24.61	15.791			19.037	23.85	16.004
MCC NG04D	480	N/A	25			19.617	21.53	16.430			19.827	20.69	16.662
MCC NG05E	480	N/A	25			6.294	74.83	6.099			6.260	74.96	6.063
MCC NG06E	480	N/A	25			6.167	75.33	5.975			6.196	75.22	6.005

Figure 3

Seq.	TOTAL LOAD (kW)	TOTAL Current (p.f. = 0.85)	Procedure / Step	Load <Allow 30 seconds between starts.>	LOAD (kW)	Supporting Load / Current	LOAD (kW)	Supporting Load / Current	LOAD (kW)	Supporting Load / Current	LOAD (kW)
1	1,526.57	249.25	EMG C-0, Step 12c or OFN NB-030, step A28 (B28)	Essential Service Water Pump (PEF01A or B)	1,509.16	ESW Pump House Supply Fan (CGD01A or B)	14.45	ESW Traveling Water Screen (FEF01A or B)	2.96		
1a	1.69	0.28	n/a	ESW Pump Strainer (FEF02A or B)	1.69	Assumption: ESW Pump Strainer start is delayed 8 sec. (Based on no D/P across strainer for the first 8 seconds)					
2	2,042.63	333.52	OFN NB-030, step A29 (B29)	CCW Pump (PEG01A,B,C, or D) (506.93 amps)	506.93	CCW Pump Room Cooler (SGL11A or B)	9.13				
3	2,235.73	365.05	OFN NB-030, step A30 (B30)	Instrument Air Compressor (CKA01A or B)	193.10						
4	2,629.37	429.32	OFN NB-030, step D1	Centrifugal Charging Pump (PBG05A or B)	384.47	CCP Room Cooler SGL12A or B	9.17				
5	2,669.73	435.91	OFN NB-030, step A32 (B32)	Containment Fan Coolers (SGN01A or B) (SLOW)	40.36						
6	2,710.09	442.50	OFN NB-030, step A32 (B32)	Containment Fan Coolers (SGN01C or D) (SLOW)	40.36						
7	2,732.45	446.15	OFN NB-030, step A34 (B34)	Hydrogen Mixing Fans (Selected speed - Fast)	22.36						
8	3,292.46	537.59	OFN NB-030, step A36 (B36)	MD AFW Pump (PAL01A or B) < Operator discretion. >	551.50	MD AFW Pump Room Cooler (SGF02A or B)	8.51				
9	3,984.86	650.64	OFN NB-030, step A37 (B37)	PZR Heater B/U Group A or B	692.40						
10	4,008.17	654.45	OFN NB-030, step A38 (B38)	CRDM Fan (CGN01D or B)	23.31						
11	4,109.51	670.99	OFN NB-030, step A41 (B41)	SFP Cooling Pump (PEC01A or B)	98.90	SFP Cool Pump Rm Cooler (SGG04A or B)	2.44				
12	4,498.60	734.52	EMG ES-04, step 32	RHR Pump (PEJ01A or B)	381.60	RHR Pump Room Cooler (SGL10A or B)	7.49				

RAI STSB-1

The licensee's discussion regarding changes to Condition C does not contain information regarding the proposed TS non-logical connector "or" separating the component names in C.1. Please discuss whether a TS logical connector "OR" and associated formatting are appropriate for proposed changes to Required Action C.1.

Response to RAI STSB-1

The proposed changes to Condition C in the response to RAI EEEB-1 item a. above address this RAI.

RAI EMIB-1

Provide how the SBO diesel fuel oil tanks are replenished.

Response to RAI EMIB-1

Each SBO DG has an associated fuel oil tank capacity to provide a minimum of 24 hours of run time at full load.

The following are the SBO DG fuel oil tank limits:

- Low Level Alarm = 50% (14")
- Minimum level for the SBO mission time = 86% (23.5")
- SBO Mission Time Minimum Fuel Satisfied Light is lit at 90% (24.5")
- Critical High Level Alarm = 95% (26.07")

Surveillance procedures STN KU-010, "Station Blackout Diesel and Non-Safety AFW Pump Test," STN KU-001A, "SBO DG to NB01 Functional Test," and STN KU-001B, "SBO DG to NB02 Functional Test," include a restoration step to verify SBO DG fuel level greater than or equal to 91% (25").

Procedure CKL ZL-009, "Site Reading Sheets," checks on a daily basis, the SBO DG fuel level, verifies the SBO Mission Time Minimum Fuel Satisfied Light is lit, and the Critical High Level Alarm is not in alarm. If fuel level is < 91%, the Control Room Supervisor is notified and fuel oil is added in accordance with Procedure SYS KU-123, "Fueling Station Blackout Diesel Generators." Procedure SYS KU-123 provides the instructions to fill the SBO DG fuel oil tanks.

WCNOC maintains a fuel oil truck on site that is utilized for filling the SBO DG fuel oil tanks.

RAI EMIB-2

Provide the historical surveillance testing results for the SBO DGs.

Response to RAI EMIB-2

Section 3.4.5 in Attachment I of Reference 1 describes the periodic surveillance testing of the SBO DG System. The below tabulates the historical surveillance results for the SBO DGs. Note that for procedure STN KU-010, "Station Blackout Diesel and Non-Safety AFW Pump Test," the historical results are for the previous two years.

STN KU-010		
DATE PERFORMED	**COMPLETE/ PARTIAL**	**TEST DEFICIENCY/ADDITIONAL COMMENTS**
2/2/2022	Complete	
1/31/2022	Partial	Partial for 'B' SBO DG to support Work Order (WO) 21-470946-001.
1/5/2022	Complete	Also performed for post maintenance testing on 'A' SBO DG for annual maintenance under WO 21-474424-00.
1/5/2022	Partial	Unloaded test for 'A' SBO DG to support coolant flush.
12/10/2021	Partial	Partial for 'C' SBO DG to support WO 21-475640-006.
12/6/2021	Complete	
11/3/2021	Partial	Unloaded test for 'C' SBO DG for post maintenance testing following troubleshooting under WO 21-475640-00.
11/2/2021	Partial	Partial performance for loaded run of 'A' and 'B' SBO DGs. Section 8.3 not performed for 'C' SBO DG due to failure to start on 11/1/2021.
11/1/2021		Test was suspended when 'C' SBO DG failed to start.
10/4/2021	Complete	Louvers for the 'C' SBO DG were stuck or nonfunctional. Louvers were blocked open.
9/10/2021	Partial	Partial performance for 'C' SBO DG.
9/9/2021	Complete	'C' SBO DG tripped during performance.
8/2/2021	Complete	
7/6/2021	Complete	
6/7/2021	Complete	
4/10/2021	Complete	
5/14/2021	Complete	
3/10/2021	Complete	
2/3/2021	Complete	
1/4/2021	Complete	
12/8/2020	Complete	
11/2/2020	Complete	
10/6/2020	Complete	
9/10/2020	Complete	
8/3/2020	Complete	
7/7/2020	Complete	
6/9/2020	Complete	
5/6/2020	Complete	
4/6/2020	Complete	
3/12/2020	Complete	
2/4/2020	Complete	
1/8/2020	Complete	

STN KU-001A		
DATE PERFORMED	**COMPLETE/ PARTIAL**	**TEST DEFICIENCY/ADDITIONAL COMMENTS**
4/25/2014	Suspended	Breaker PB0508 tripped when operating breaker NB00113 (Step 8.2.15).
4/28/2014	Complete	
5/12/2018	Complete	
5/5/2021	Complete	

STN KU-001B		
DATE PERFORMED	**COMPLETE/ PARTIAL**	**TEST DEFICIENCY/ADDITIONAL COMMENTS**
4/20/2015	Complete	
11/15/2016	Complete	
10/27/2019	Complete	

RAI APLC-1: Seismic Risk Insights

Section 3.4.1, "SBO DG System Description," of Attachment I to the LAR describes the SBO DG system. This section states that the SBO DG system consists of a missile barrier located outside of the protected area that contains the equipment required to provide power during a station blackout event. This section also states that the missile barrier is constructed to provide protection from tornado winds and tornado generated missiles. During its review, the NRC staff noted that the LAR does not discuss the impact of a seismic event on the SBO DGs or missile barrier housing the SBO DGs.

Section 4.1, "External Hazards," of Attachment II to the LAR provides a qualitative discussion of the impact of a seismic event when a DG is out of service for the extended CT. This section describes the impact of a seismic event on the DGs and states that the DG building is seismically rugged.

Section 4.1 of Attachment II to the LAR states that the primary impact expected from a seismic event is a LOOP. This section also states that the seismically induced failures of the DGs are correlated, so one DG being out of service does not impact the seismic response. This section concludes that the change in risk associated with a DG being out of service for the extended CT is therefore equivalent to the change in risk from the internal events model for random failures.

Section 4.1 of Attachment II to the LAR does not discuss the impact of a seismic event on the SBO DGs. Based on the discussion in Section 3.4.1, of Attachment I to the LAR, the NRC staff notes that the SBO DGs may fail at lower seismic demands than the DGs. Specifically, a seismic event could result in a LOOP and a seismically induced correlated failure of all three SBO DGs without a corresponding loss of the DGs. In the context of the proposed change, this can result in a scenario involving a seismically induced LOOP combined with a seismically induced correlated failure of all SBO DGs and a random failure of the available DG with the other DG being out of service. In this scenario, it is unclear to the NRC staff that the change in seismic risk associated with a DG being out of service for the extended CT would be equivalent to the change in risk from the internal events model for random failures, as asserted in Section 4.1 of Attachment II to the LAR.

Please address the following:

a. *Discuss seismic risk insights associated with the SBO DGs, including consideration of the NRC staff identified scenario, to support the LAR.*

b. *Discuss consideration of risk mitigation actions to address seismic risk insights associated with the SBO DGs.*

Response to RAI APLC-1

a. The SBO DG System consists of a missile barrier located outside of the protected area that contains the necessary equipment required to provide reliable power to 4.16 kV Class 1E bus NB01 or NB02 during an SBO event, and to the non-safety auxiliary feedwater pump (NSAFP). The foundation slab is designed for dead loads, live loads, tornado wind and missile loads, and seismic loads according to the International Building Code (IBC 2000). The discussions regarding the SBO missile barrier being seismically rugged is due to the design of the structure to withstand tornado winds and tornado generated missiles with 2' exterior walls and 4' thick foundation The missile barrier IBC seismic load was calculated and found to be bounded by the structural design for the Wind and Tornado Missile Loading.

The WCGS Design Basis for seismic events is discussed in updated safety analysis report (USAR) Section 3.1.2, which states, in part:

> In the design and analysis performed for provision of protection of safety-related equipment from hazards and events (tornadoes, floods, missiles, pipe breaks, fires, and seismic events) which could reasonably be expected, the following assumptions were made:
>
> e. When evaluating the effects of any earthquake, no other major hazard or event is assumed, and no seismic Category I equipment is assumed to fail as a result of the earthquake. Certain nonseismic Category I components are designed and constructed to ensure that their failure will not reduce the functioning of a safety-related component to an unacceptable safety level. This criterion meets the intent of Regulatory Guide 1.29, Position C.2. Evaluation of component failure includes drop impact forces and secondary effects, such as spray and flooding from piping failure.

The SBO DGs are not credited in the event of a seismic event for design although they might be available. In the NRC scenario, a seismic event occurs that is strong enough to fail the SBO DGs but is not strong enough to fail the safety related DGs. This scenario occurs when one DG is in the extended Completion Time and the protected DG fails due to independent failure. This very specific scenario would have a very low probability of occurring during the 14 day timeframe of the extended Completion Time.

b. Based on the robust design of the SBO DG System missile barrier and buried utilities, the risk analysis performed did not identify any specific risk mitigation actions/compensatory measures to address seismic risk insights associated with the SBO DGs. However, the TSs and various procedures as discussed below verify the availability and readiness of the SBO DGs to supply either train of safety related loads.

Procedure CKL ZL-009, “Site Reading Sheets,” checks on a daily basis, the SBO DG fuel level and temperature, SBO various generator parameters (jacket water heater, control panel system lights, starting battery chargers, exhaust rain cap, crankcase oil level). The SBO Power Equipment Center (PEC) in the Switchgear Room checks on a daily basis the mobile unit charger lights, main charger voltage, room thermostat and temperature, and the MC4000 panel for alarms. The SBO Battery Room is checked daily for battery charging, battery leakage, battery connection corrosion, and room temperature. The SBO enclosures, PEC Control Panel and Switchgear area, and battery cubicle are checked daily for leaks, cleanliness, lighting, etc.

Procedure AI 22C-013, “Protected Equipment Program,” provides guidance for protecting equipment in order to minimize plant risk. The intent of protecting systems and components is to provide additional administrative barriers to guard against inadvertently rendering a component or system, which is important to unit risk and nuclear safety, inoperable or unavailable. Attachment A of this procedure provides examples of equipment that should be protected. With a DG inoperable, this procedure identifies the SBO DGs as equipment to be protected. Protected equipment and systems are to be clearly identified in the field to prevent inadvertent work on or near the protected equipment. Protected equipment is identified by such means as physical barriers or postings. The procedure specifies that upon posting of protected equipment and during Operations watchstander rounds, a check is made that there is nothing in the area (e.g., scaffolding) that could interfere with the functioning of the protected equipment.

When a DG is declared inoperable, the proposed Required Action B.2 requires verifying the availability of the required SBO DGs. The Completion Time associated with Required Action B.2 is 1 hour and once per 8 hours thereafter. The proposed TS Bases identifies in part that this verification includes verifying fuel oil tank level and supporting system parameters for starting and operating the required SBO DGs.

RAI APLC-2: Fire Risk Insights

Section 3.7, “Risk Management/Work Control and Scheduling,” of Attachment I to the LAR describes how the risk impact of maintenance, testing, and equipment outages is assessed. This section states that an On-Line Nuclear Safety and Generation Risk Assessment is completed for the current weekly schedule and that maintenance and testing activities added to the weekly schedule are assessed for their impact upon the existing On-Line Nuclear Safety and Generation Risk Assessment. This section also states that online daily maintenance and testing activities are planned, scheduled, and conducted in a manner to ensure both commercial and nuclear safety issues are assessed and the associated risks are managed. This section further states that risk assessment and management is accomplished, in part, by developing compensatory measures to manage and minimize the operational risks associated with planned or emergent activities that are categorized as risk significant.

Section 4.1, “External Hazards,” of Attachment II to the LAR provides a qualitative discussion of the impact of fire events when a DG is out of service for the extended CT. This section discusses that the fire risk associated with a DG being out of service for the extended CT will increase for areas where a fire can damage the capability to receive offsite power to the safeguards buses. This section states that the only area where an internal fire can cause a LOOP is the communications corridor. During its review, the NRC staff noted that the LAR does not discuss if the SBO DGs or their associated cables, including those supplying the safeguard buses, could

be affected by a fire in the communications corridor. Further, it is unclear to the staff if the On-Line Nuclear Safety and Generation Risk Assessment considers the risk of a fire in the communications corridor causing a LOOP.
Please address the following:

a. *Clarify if the On-Line Nuclear Safety and Generation Risk Assessment considers the risk of a fire in the communications corridor causing a LOOP.*

b. *Discuss fire risk insights associated with the communications corridor and the SBO DGs or their associated cables, including those supplying the safeguard buses, to support the LAR.*

c. *Discuss consideration of risk mitigation actions to address fire risk insights associated with the communications corridor.*

Response to RAI APLC-2

a. Procedure AP 22C-003, "On-Line Nuclear Safety and Generation Risk Assessment," specifies that the Fire Protection Group will review the On-Line Nuclear Safety and Generation Risk Assessment considering all maintenance and testing activities reflected in the schedule to determine their affect upon fire risk significant areas. The procedure identifies the fire risk significant components, affected fire areas, and pre-determined risk mitigating actions.

Calculation XX-E-013, "Post-Fire Safe Shutdown (PFSSD) Analysis," provides the assumptions and methodology utilized to determine which components and systems provide the functions necessary to achieve and maintain PFSSD. The calculation demonstrates WCGS's ability to achieve and maintain PFSSD in the event of a fire in any area of the plant. Appendix 2, "Fire Induced Loss of Off-Site Power," identifies the fire areas where a LOOP may be initiated by fire damage. In the event of a fire in the communications corridor (Fire Area CC-1/IPEEE fire areas CC-IF and CC-ID), PFSSD will be performed with equipment powered from NB01 and/or NB02. The train A DG will supply power to NB01. The train B DG will supply power to NB02.

A review of the cable routing associated with the SBO DG System identified three cables that could be affected by a fire in the communications corridor (RM 3402). Since the proposed 14 day Completion Time is based on the availability of two SBO DGs, AP 22C-003 will be revised to include the necessary risk mitigation actions/compensatory measures for Fire Area CC-1 associated with a DG being out of service.

The WCGS Individual Plant Examination of External Events (IPEEE) evaluation (Reference 5) indicates the only location in which a fire could cause a complete loss of offsite power event is the communications corridor. A fire in this area could damage cables causing a loss of power to both engineered safeguards features (ESF) transformers XNB01 and XNB02 as well as a loss of power from the #7 transformer, resulting in a station LOOP condition. Further, a partial LOOP was considered for several of the yard transformers and the turbine building general area. A fire in these areas is considered to fail one of the two main offsite power supplies.

b. The WCGS IPEEE evaluation (Reference 5) for internal fires at power determined that the likelihood of a fire resulting in a complete SBO is low. The risk insights show that there is only one location where a complete LOOP could occur (the communications corridor) and that the

ability of the plant to avoid a Licensing Basis SBO event from LOOP scenarios is dependent on the availability of the dedicated DG (SBO DGs are not credited in the Licensing Basis SBO event).

Since the completion of the IPEEE evaluation, WCNOC has installed the SBO DGs which are capable of being started, aligned to either safety bus, and are capable of supplying the necessary AC power to safe shutdown loads. The contribution from the SBO DGs to risk-reduction for otherwise SBO conditions is significant.

c. In procedure AP 10-106 "Fire Preplans," Appendix B shows that the fire loading in each of the areas in the communications corridor is low.

A review of the cable routing associated with the SBO DG System identified three cables that could be affected by a fire in the communications corridor (RM 3402). Since the proposed 14 day Completion Time is based on the availability of two SBO DGs, AP 22C-003 will be revised to include the necessary risk mitigation actions/compensatory measures for Fire Area CC-1 associated with a DG being out of service.

RAI APLC-3: Common Cause and Human Reliability Risk Insights

Section 3.4.2, "SBO DG – AC System Analysis," of Attachment I to the LAR describes an analysis of the SBO DGs. This section states that three SBO DGs can successfully power all LOOP loads and two SBO DGs can successfully power the minimum required safe shutdown loads provided the loads are manually started at least 30 seconds between starts. This section also states that plant operating procedures contain guidance for manually starting the safe shutdown loads. The NRC staff understands these statements to mean that a single SBO DG cannot successfully power the minimum required safe shutdown loads.

Section 5.11, "Risk Insights," of Attachment II to the LAR discusses the licensee's risk insights supporting this LAR. Based on its review of these risk insights, it is unclear to the NRC staff if the common-cause failure of SBO DGs and the human reliability to start the SBO DGs and power the safe shutdown loads were considered in the risk insights used to support the LAR.

Please address the following:

a. *Discuss how the common-cause failure of SBO DGs and the human reliability to start the SBO DGs and power the safe shutdown loads were included in the risk insights used to support the LAR.*

b. *Discuss consideration of risk mitigation actions to address risk insights associated with the common-cause failure of SBO DGs and the human reliability to start the SBO DGs and power the safe shutdown loads.*

Response to RAI APLC-3

a. The WCGS Probabilistic Risk Assessment (PRA) requires two out of three SBO DGs and an operator action to start and align the necessary SBO DGs to one safety bus for success (OPA-SBO-DG). Further, the WCGS PRA evaluates common cause failures (CCF) for combinations of two and three SBO DGs. As discussed in Attachment I to ET 21-0004 in Section 3.10.1.d, no new common cause failure mechanisms are created as a result of the proposed changes.

b. The risk analysis performed did not identify any specific risk mitigation actions/compensatory measures to address common cause and human reliability risks associated with the SBO DGs. However, the TSs and various procedures as discussed below verify the availability and readiness of the SBO DGs to supply either train of safety related loads. The periodic testing of the SBO DGs is discussed in Section 3.4.5 of Reference 1.

When a DG is declared inoperable, the proposed Required Action B.2 requires verifying the availability of the required SBO DGs. The Completion Time associated with Required Action B.2 is 1 hour and once per 8 hours thereafter. The proposed TS Bases identifies in part that this verification includes verifying fuel oil tank level and supporting system parameters for starting and operating the required SBO DGs.

Procedure CKL ZL-009, "Site Reading Sheets," checks on a daily basis, the SBO DG fuel level and temperature, SBO various generator parameters (jacket water heater, control panel system lights, starting battery chargers, exhaust rain cap, crankcase oil level). The SBO PEC in the Switchgear Room checks on a daily basis the mobile unit charger lights, main charger voltage, room thermostat and temperature, and the MC4000 panel for alarms. The SBO Battery Room is checked daily for battery charging, battery leakage, battery connection corrosion, and room temperature. The SBO enclosures, PEC Control Panel and Switchgear area, and battery cubicle are checked daily for leaks, cleanliness, lighting, etc.

Procedural guidance to address contingency issues is provided in the following procedures.

Procedures SYS KU-121, "Energizing NB01 from Station Blackout Diesel Generators," and SYS KU-122, "Energizing NB02 from Station Blackout Diesel Generators," provide guidance for:

- Normal remote starting and loading of the SBO DGs using the programmable logic control/human-machine interface (PLC/HMI) panel.

- Manual starting and loading of the SBO DGs if required based on a complete PLC/HMI panel failure.

- Locally starting one SBO DG on a loss of control power, which would re-establish control power to the other SBO DGs.

Procedure SYS KU-124, "SBO Generator Local or Manual Operations," provides for local operations for SBO DG starting and loading in the event remote start capability is lost. This procedure includes guidance for:

- Using the staged mobile PEC battery cart to jump start an SBO DG if the installed batteries fail.

- Each SBO DG is equipped with a "Battleswitch" to bypass normal engine and generator trips. Use of the Battleswitch is at the direction of the Site Emergency Manager to prevent or lessen the severity of reactor core damage.

- Resetting the PLC controls.

References:

1. WCNOC letter ET 21-0004 from S. L. Smith, WCNOC, to USNRC, "License Amendment Request – Diesel Generator Completion Time Extension for Technical Specification 3.8.1, "AC Sources – Operating"," September 29, 2021. ADAMS Accession No. ML21272A369.

2. Electronic mail from S. A. Lee, USNRC, to J. Turner, WCNOC, "Request for additional information - Wolf Creek Request for additional information - Wolf Creek request to revise diesel generator completion time (EPID: L-2021-LLA-0173)," February 23, 2022. ADAMS Accession No. ML22055A114.

3. Letter from M. Mahoney, USNRC, to T. Simril, Duke Energy Carolinas, LLC, "Catawba Nuclear Station, Units 1 and 2 – Issuance of Amendment Nos. 304 and 300 to Technical Specification 3.8.1, "AC Sources – Operating" (CAC NOS. MF9667, MF9668 MF9671, MF9672 and EPID NOS. L-2017-LLA-0256 and L-2017-LLA-0257)," August 27, 2019. ADAMS Accession No. ML19212A655.

4. Letter from M. Mahoney, USNRC, to T. D. Ray, Duke Energy Carolinas, LLC, "McGuire Nuclear Station, Units 1 and 2 – Issuance of Amendment Nos. 314 and 293 to Technical Specification 3.8.1, "AC Sources – Operating" (CAC NOS. MF9667, MF9668 MF9671, MF9672 and EPID NOS. L-2017-LLA-0256 and L-2017-LLA-0257)," June 28, 2019. ADAMS Accession No. ML19126A030.

5. Wolf Creek Generating Station, "Individual Plant Examination of External Events (IPEEE), June 1995."

Revised WCGS Technical Specification 3.8.1 Pages
(Markup)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	Declare required feature(s) with no offsite power available inoperable when its redundant required feature(s) is inoperable. AND	24 hours from discovery of no offsite power to one train concurrent with inoperability of redundant required feature(s)
	A.3 Restore offsite circuit to OPERABLE status.	----------NOTE------- A Completion Time of 10 days from discovery of failure to meet the LCO may be used with the 7 day Completion Time of Required Action B.4.2.2 for an inoperable DG. ---------- 72 hours AND 6 days from discovery of failure to meet LCO
B. One DG inoperable.	B.1 Perform SR 3.8.1.1 for the offsite circuit(s). AND	1 hour AND Once per 8 hours thereafter
	B.2 Verify the required Station Blackout (SBO) DGs are available. AND	1 hour AND Once per 8 hours thereafter

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.2 ----------NOTE---------- In MODES 1, 2, and 3, the turbine driven auxiliary feedwater pump is considered a required redundant feature. ---------- Declare required feature(s) supported by the inoperable DG inoperable when its required redundant feature(s) is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	AND	
	B.3.1 Determine OPERABLE DG is not inoperable due to common cause failure.	24 hours
	OR	
	B.3.2 ----------NOTE---------- The Required Action of B.3.2 is satisfied by the automatic start and sequence loading of the DG. ---------- Perform SR 3.8.1.2 for OPERABLE DG.	24 hours
	AND	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	~~----------NOTE----------~~ ~~Required Action B.4.2.1 and B.4.2.2 are only applicable for planned maintenance and may be used once per cycle per DG.~~ ~~----------~~ B.4.1 Restore DG to OPERABLE status. ~~OR~~ ~~B.4.2.1 Verify the required Sharpe Station gensets are available.~~ ~~AND~~ ~~B.4.2.2 Restore DG to OPERABLE status.~~	~~72 hours~~ AND ~~6~~ days from discovery of failure to meet LCO ~~Once per 12 hours~~ ~~7 days~~ ~~AND~~ ~~10 days from discovery of failure to meet LCO~~
C. ~~Required Action B.4.2.1 and associated Completion Time not met.~~	~~C.1 Restore DG to OPERABLE status.~~	~~72 hours~~

(continued)

14 days
17
5
INSERT 3.8-4

INSERT 3.8-4

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action B.2 and associated Completion Time not met.	C.1 Restore DG to OPERABLE status.	72 hours from Condition B entry OR 24 hours from Condition B entry ≥ 48 hours concurrent with unavailability of required SBO DGs
	OR	
	C.2 Restore required SBO DGs to available status.	72 hours from Condition B entry OR 24 hours from Condition B entry ≥ 48 hours concurrent with unavailability of required SBO DGs

NO CHANGES THIS PAGE. INFORMATION ONLY.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Two offsite circuits inoperable.	D.1	----------NOTE---------- In MODES 1, 2, and 3, the turbine driven auxiliary feedwater pump is considered a required redundant feature. ----------	
		Declare required feature(s) inoperable when its redundant required feature(s) is inoperable.	12 hours from discovery of Condition D concurrent with inoperability of redundant required features
	AND		
	D.2	Restore one offsite circuit to OPERABLE status.	24 hours
E. One offsite circuit inoperable. AND One DG inoperable.	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems - Operating," when Condition E is entered with no AC power source to any train. ----------		
	E.1	Restore offsite circuit to OPERABLE status.	12 hours
	OR		
	E.2	Restore DG to OPERABLE status.	12 hours
F. Two DGs inoperable.	F.1	Restore one DG to OPERABLE status.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
G. One load shedder and emergency load sequencer inoperable.	G.1	Declare affected DG and offsite circuit inoperable.	Immediately
	AND		
	G.2	Restore load shedder and emergency load sequencer to OPERABLE status.	12 hours
H. Required Action and associated Completion Time of Condition A, C, D, E, F, or G not met. OR Required Actions B.1, ~~B.2, B.3.1, B.3.2, B.4.1, and B.4.2.2~~ and associated Completion Time not met.	H.1	Be in MODE 3.	6 hours
	AND		
	H.2	Be in MODE 5.	36 hours
		B.3, B.4.1, B.4.2, and B.5	
I. Three or more required AC sources inoperable.	I.1	Enter LCO 3.0.3.	Immediately

Revised WCGS Technical Specification 3.8.1 Bases Pages
(Markup) (for information only)

BASES

BACKGROUND (continued)

Power (LOP) Diesel Generator (DG) Start Instrumentation." 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. Following the trip of offsite power, a LSELS strips non-essential loads from the ESF bus. When the DG is tied to the ESF bus, essential loads are then sequentially connected to its respective ESF bus by the load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the DG by automatic load application.

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.

Ratings for Train A and Train B DGs satisfy the requirements of Regulatory Guide 1.9 (Ref. 3). The continuous service rating of each DG is 6201 kW with 10% overload permissible for up to 2 hours in any 24 hour period. The ESF loads that are powered from the 4.16 kV ESF buses are listed in Reference 2.

INSERT P3 CA2

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the USAR, Chapter 6 (Ref. 4) and Chapter 15 (Ref. 5), assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC electrical power sources is consistent with the initial assumptions of the Accident analyses and is based upon meeting the design basis of the unit. This results in maintaining at least one train of the onsite or offsite AC sources OPERABLE during Accident conditions in the event of:

a. An assumed loss of all offsite power or all onsite AC power; and

INSERT B 3.8.1-2

The Station Blackout (SBO) DG System consists of three non-safety related DGs that are capable of supplying essential loads on ESF buses NB01 and NB02. The SBO DG System is made available to support extended Completion Times in the event of an inoperable DG. Only two SBO DGs are required to successfully start the minimum required safe shutdown loads. The SBO DGs are made available as a defense-in-depth supplemental source of AC power to mitigate a loss of offsite power event. The SBO DGs would remain disconnected from the Class 1E AC Distribution System unless required during a loss of offsite power or during a functional load test.

BASES

ACTIONS

A.2 (continued)

b. A required feature on the other train is inoperable and not in the safeguards position.

If at any time during the existence of Condition A (one offsite circuit inoperable) a redundant required feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering no offsite power to one train of the onsite Class 1E Electrical Power Distribution System coincident with one or more inoperable required support or supported features, or both, that are associated with the other train that has offsite power, results in starting the Completion Times for the Required Action. Twenty-four hours is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

The remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to Train A and Train B of the onsite Class 1E Distribution System. The 24 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 24 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

A.3

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition A for a period that should not exceed 72 hours. With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the unit safety systems. In this Condition, however, the remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System.

The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action A.3 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DG is inoperable and that DG is subsequently returned OPERABLE, the LCO may already have been not met for up to ~~72 hours~~ 14 days. This could lead to a

BASES

ACTIONS

A.3 (continued)

17 days

14 days

17

total of ~~144 hours~~, since initial failure to meet the LCO, to restore the offsite circuit. At this time, a DG could again become inoperable and an additional ~~72 hours~~ allowed prior to complete restoration of the LCO. The ~~6~~ day Completion Time provides a limit on the time allowed in a specified condition after discovery of failure to meet the LCO. Although highly unlikely, this could continue indefinitely if not limited. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. This limits the time the plant can alternate between Conditions A, B, and E (see Completion Time Example 1.3-3). The "AND" connector between the 72 hour and ~~6~~ day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

17

14

~~Tracking the 6 day~~ Completion Time is a requirement for beginning the Completion Time "clock" that is in addition to the normal Completion Time requirements. With respect to ~~the 6~~ day Completion Time, the "time zero" is specified as beginning at the time LCO 3.8.1 was initially not met, instead of at the time Condition A was entered. This results in the requirement, when in this Condition, to track the time elapsed from both the Condition A "time zero," and the "time zero" when LCO 3.8.1 was initially not met. Refer to Section 1.3, "Completion Times," for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO portion of the Completion Time.

~~The Completion Time is modified by a Note. The Note modifies the Completion Time and allows 10 days from discovery of failure to meet the LCO during the use of the 7 day Completion Time in Required Action B.4.2.2.~~

~~The 10 day Completion Time specified in the Note establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DG is inoperable using the 7 day Completion Time of Required Action B.4.2.2 and that DG is subsequently restored OPERABLE, the LCO may already have been not met for up to 7 days. This could lead to a total of 10 days since initial failure to meet the LCO, to restore the offsite circuit. At this time, a DG could again become inoperable and an additional 72 hours allowed prior to complete restoration of the LCO. Although highly unlikely, this could continue indefinitely if not limited. The 10 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. This limits the time the plant can alternate between Conditions A, B, and D (see Completion Time Example 1.3-3).~~

BASES

ACTIONS

~~A.3 (continued)~~

~~Tracking the 10 day Completion Time is a requirement for beginning the Completion Time "clock" that is in addition to the normal Completion Time requirements. With respect to the 10 day Completion Time, the "time zero" is specified as beginning at the time LCO 3.8.1 was initially not met, instead of at the time Condition A was entered. This results in the requirement, when in this Condition, to track the time elapsed from both the Condition A "time zero," and the "time zero" when LCO 3.8.1 was initially not met. Refer to Section 1.3, "Completion Times," for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO portion of the Completion Time."~~

B.1

To ensure a highly reliable power source remains with an inoperable DG, it is necessary to verify the availability of the offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions and Required Actions must then be entered.

INSERT B 3.8.1-8

3

B.2

Required Action B.2 is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical redundant required features. These redundant required features are those that are assumed to function to mitigate an accident, coincident with a loss of offsite power, in the safety analyses, such as the Emergency Core Cooling System and Auxiliary Feedwater System. These redundant features do not include monitoring requirements, such as Post Accident Monitoring and Remote Shutdown. These features are powered from the redundant AC electrical power train. This includes motor driven auxiliary feedwater pumps. Single train systems, other than the turbine driven auxiliary feedwater pump, are not included in this Condition. A Note is added to this Required Action stating that in MODES 1, 2, and 3, the turbine driven auxiliary feedwater pump is considered a required redundant feature. The reason for the Note is to confirm the OPERABILITY of the turbine driven auxiliary feedwater pump in this Condition, since the remaining OPERABLE motor driven auxiliary feedwater pump is not by itself capable of providing 100% of the auxiliary feedwater flow assumed in the safety analysis. Redundant required feature failures consist of inoperable features associated with a train, redundant to the train that has an inoperable DG.

INSERT B 3.8.1-8

B.2

In order to extend the Completion Time for an inoperable DG from 72 hours to 14 days, the required SBO DGs must be verified available within 1 hour upon entry into TS 3.8.1, Condition B, and every 8 hours thereafter. SBO DG availability requires that:

a. A start/loaded test has been performed within 30 days of entry into the extended Completion Time. This portion of the Required Action evaluation is performed one time and is met with an administrative verification of this prior to a planned removal of a DG from service or after an emergent DG outage; and

b. Fuel oil tank level for each required SBO DG is verified locally to be ≥ 24 hour supply (SBO Mission Time Minimum Fuel Satisfied Light); and

c. Supporting system parameters for starting and operating each required SBO DG are verified to be within required limits for functional availability (e.g., battery state of charge).

Only two SBO DGs are required to successfully start the minimum required safe shutdown loads. The SBO DG System is not used to extend the Completion Time for more than one inoperable DG at any one time.

BASES

ACTIONS

B.2 (continued)

The Completion Time for Required Action B.2 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. A required feature on the other train (Train A or Train B) is inoperable and not in the safeguards position.

If at any time during the existence of this Condition (one DG inoperable) a required feature subsequently becomes inoperable, this Completion Time would begin to be tracked.

Discovering one required DG inoperable coincident with one or more inoperable required support or supported features, or both, that are associated with the OPERABLE DG, results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

In this Condition, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE DG. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on the other DG, it would be declared inoperable upon discovery and Condition F of LCO 3.8.1 would be entered. Once the failure is repaired, the common cause failure no longer exists, and Required Action B.3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on

BASES

ACTIONS B.3.1 and B.3.2 (continued)

the remaining DG, performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that DG. Required Action B.3.2 is modified by a Note stating that it is satisfied by the automatic start and sequence loading of the DG. The Note indicates that an additional start of the DG for test purposes only, is not required if the DG has automatically started and loaded following a loss of the offsite power source to its respective bus (Ref. 18).

In the event the inoperable DG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the plant corrective action program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B.

According to Generic Letter 84-15 (Ref. 7), 24 hours is reasonable to confirm that the OPERABLE DG is not affected by the same problem as the inoperable DG.

B.4.1, B.4.2.1, and B.4.2.2

In Condition B, the remaining OPERABLE DG and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. With a DG inoperable, the inoperable DG must be restored to OPERABLE status within the applicable, specified Completion Time.

The Completion Time of 72 hours for Required Action B.4.1 applies when a DG is discovered or determined to be inoperable, such as due to a component or test failure, and requires time to effect repairs, or it may apply when a DG is rendered inoperable for the performance of maintenance during applicable MODES. The 72-hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and the low probability of a DBA during this period.

The second Completion Time for Required Action B.4.1 also establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an offsite circuit is inoperable, the LCO may already have been not met for up to 72 hours. If the offsite circuit is restored to OPERABLE status within the required 72 hours, this could lead to a total of 144 hours, since initial failure to meet the LCO, to restore the compliance with the LCO (i.e., restore the DG). At this time, an offsite circuit could again become inoperable and an additional 72 hours allowed prior to complete

INSERT B 3.8.1-10

In Condition B, the remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. The 14 day Completion Time takes into account the capacity and capability of the remaining AC sources (including the required SBO DGs), a reasonable time for repairs, and the low probability of a DBA occurring during this period.

When one DG is inoperable due to either preplanned maintenance (preventive or corrective) or unplanned corrective maintenance work, the Completion Time can be extended from 72 hours to 14 days if the required SBO DGs are verified available for backup operation in accordance with Required Action B.2. The 14 day Completion Time for an inoperable DG will be used no more than once in an 18-month period on a per DG basis to perform DG planned maintenance.

The second Completion Time for Required Action B.5 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently restored OPERABLE, the LCO may already have been not met for up to 14 days. This could lead to a total of 17 days, since initial failure to meet the LCO, to restore the DGs. At this time, an offsite circuit could again become inoperable, the DGs restored OPERABLE, and an additional 72 hours (for a total of 20 days) allowed prior to complete restoration of the LCO. The 17 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. This limits the time the plant can alternate between Conditions A, B, and D (see Completion Time Example 1.3-3). The "AND" connector between the 14 day and 17 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

Tracking the 17 day Completion Time is a requirement for beginning the Completion Time "clock" that is in addition to the normal Completion Time requirements. With respect to the 17 day Completion Time, the "time zero" is specified as beginning at the time LCO 3.8.1 was initially not met, instead of at the time Condition B was entered. This results in the requirement, when in this Condition, to track the time elapsed from both the Condition B "time zero," and the "time zero" when LCO 3.8.1 was initially not met. Refer to Section 1.3, "Completion Times," for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO portion of the Completion Time."

Administrative controls are required whenever Condition B is entered for a planned or unplanned DG outage that will extend beyond 72 hours. Administrative controls applied ensure or require that:

a. Weather conditions are conducive to an extended DG Completion Time.

b. The offsite power supply and switchyard condition are conducive to an extended DG Completion Time, which includes ensuring that switchyard access is restricted and no elective maintenance within the switchyard is performed that would challenge offsite power availability. Elective maintenance or testing that would challenge offsite power availability is that activity that could result in an electrical power distribution system (offsite circuit or transmission network) transient or make the offsite circuit(s) unavailable

or inoperable (Reference 19). The operational risk assessment procedure provides a list of equipment that could challenge offsite power availability.

c. No equipment or systems assumed to be available for supporting the extended DG Completion Time are removed from service. The equipment or systems assumed to be available (including required support systems, i.e., associated room coolers, etc.) are as follows:

- Auxiliary Feedwater System (three trains)
- Component Cooling Water System (both trains and all four pumps)
- Essential Service Water System (both trains)
- Emergency Core Cooling System (two trains).

BASES

ACTIONS ~~B.4.1, B.4.2.1, and B4.2.2~~ (continued)

time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. This limits the time the plant can alternate between Conditions A, B, and E (see Completion Time Example 1.3-3). The "AND" connector between the 72 hour and 6 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

Tracking the 6 day Completion Time is a requirement for beginning the Completion Time “clock” that is in addition to the normal Completion Time requirements. With respect to the 6 day Completion Time, the “time zero” is specified as beginning at the time LCO 3.8.1 was initially not met, instead of at the time Condition B was entered. This results in the requirement, when in this Condition, to track the time elapsed from both the Condition B “time zero,” and the “time zero” when LCO 3.8.1 was initially not met. Refer to Section 1.3, “Completion Times,” for a more detailed discussion of the purpose of the “from discovery of failure to meet the LCO portion of the Completion Time.”

The Required Actions are modified by a Note that states that Required Actions B.4.2.1 and B.4.2.2 are only applicable for voluntary planned maintenance and may be used once per cycle per DG. Required Actions B.4.2.1 and B.4.2.2 only applies when a DG is declared or rendered inoperable for the performance of voluntary, planned maintenance activities. Required Action B.4.2.1 provides assurance that the required Sharpe Station gensets are available when a DG is out of service for greater than 72 hours. The availability of the required gensets are verified once per12 hours by locally monitoring various genset parameters.

The 7-day Completion Time of Required Action B.4.2.2 is a risk-informed allowed outage time (AOT) based on a plant-specific risk analysis. The Completion Time was established on the assumption that it would be used only for voluntary planned maintenance, inspections and testing. Use of Required Actions B.4.2.1 and B.4.2.2 are limited to once within an operating cycle (18 months) for each DG. Administrative controls applied during use of Required Action B.4.2.2 for voluntary planned maintenance activities ensure or require that (Ref. 16):

a. Weather conditions are conducive to an extended DG Completion Time. The extended DG Completion Time applies during the period of September 7 through April 5.

BASES

ACTIONS B.4.1, B.4.2.1, and B4.2.2 (continued)

b. The offsite power supply and switchyard condition are conducive to an extended DG Completion Time, which includes ensuring that switchyard access is restricted and no elective maintenance within the switchyard is performed that would challenge offsite power availability. Elective maintenance or testing that would challenge offsite power availability is that activity that could result in an electrical power distribution system (offsite circuit or transmission network) transient or make the offsite circuit(s) unavailable or inoperable (Reference 19). The operational risk assessment procedure provides a list of equipment that could challenge offsite power availability.

c. Prior to relying on the required Sharpe Station gensets, the gensets are started and proper operation verified (i.e., the gensets reach rated speed and voltage). The Sharpe Station is not required to be operating the duration of the allowed outage time of the DG, however, a minimum of 8 gensets must be capable of providing power to a dead bus (station blackout conditions) to power 1 ESF train. Within 8 months prior to utilization of Required Action B.4.2.2, a load capability test/verification will be performed on the Sharpe Station gensets. The load capability testing/verification will consist of either 1) crediting a running of the gensets for load for commercial reasons for greater than 1 hour, or 2) tested by loading of the gensets for greater than 1 hour to a load equal to or greater than required to supply safety related loads in the event of a station blackout.

d. No equipment or systems assumed to be available for supporting the extended DG Completion Time are removed from service. The equipment or systems assumed to be available (including required support systems, i.e., associated room coolers, etc.) are as follows:

- Auxiliary Feedwater System (three trains)
- Component Cooling Water System (both trains and all four pumps)
- Essential Service Water System (both trains)
- Emergency Core Cooling System (two trains).

If, while Required Action B.4.2.2 is being used, one (or more) of the above systems or components is determined or discovered to be inoperable, or if

BASES

ACTIONS

B.4.1, B.4.2.1, and B4.2.2 (continued)

an emergent condition affecting DG OPERABILITY is identified, re-entry into Required Action B.2 and B.3 would be required, as applicable. In addition, the effect on plant risk would be assessed and any additional or compensatory actions taken, in accordance with the plant's program for implementation of 10 CFR 50.65(a)(4). The 7-day Completion Time would remain in effect for the DG if Required Action B.2 and B.3 are satisfied.

The second Completion Time specified in Required Action B.4.2.2 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an offsite circuit is inoperable, the LCO may already have been not met for up to 72 hours. If the offsite circuit is restored to OPERABLE status within the required 72 hours, this could lead to a total of 10 days since initial failure to meet the LCO, to restore compliance with the LCO (i.e., restore the DG). At this time, an offsite circuit could again become inoperable and an additional 72 hours allowed prior to complete restoration of the LCO. The 10 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. Although highly unlikely, this could occur indefinitely if not limited. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. This limits the time the plant can alternate between Conditions A, B, and E (see Example 1.3-3).

Tracking the 10 day Completion Time is a requirement for beginning the Completion Time "clock" that is in addition to the normal Completion Time requirements. With respect to the 10 day Completion Time, the "time zero" is specified as beginning at the time LCO 3.8.1 was initially not met, instead of at the time Condition B was entered. This results in the requirement, when in this Condition, to track the time elapsed from both the Condition B "time zero," and the "time zero" when LCO 3.8.1 was initially not met. Refer to Section 1.3, "Completion Times," for a more detailed discussion of the purpose of the "from discovery of failure to meet the LCO portion of the Completion Time."

C.1

INSERT B 3.8.1-13

If the availability of the required Sharpe Station gensets cannot be verified, the DG must be restored to OPERABLE status within 72 hours. The 72 hour Completion Time begins upon entry into Condition C. However, the total time to restore an inoperable DG cannot exceed 7 days (per the Completion Time of Required Action B.4.2.2).

INSERT B 3.8.1-13

If the required SBO DGs are or becomes unavailable with an inoperable DG, then action is required to restore the DG to OPERABLE status or restore the required SBO DGs to available status within 72 hours from declaring the DG inoperable and Condition B entry. If the required SBO DGs unavailability occurs sometime after 48 hours from initial entry into Condition B, then the remaining time to restore the DG to OPERABLE status or restore the SBO DGs to available status is limited to 24 hours. However, the total time to restore an inoperable DG cannot exceed 14 days (per the Completion Time of Required Action B.5).

The 24 hour Completion Time only begins on discovery that an inoperable DG exists for ≥ 48 hours and a required SBO DG is unavailable.

The Completion Time of 72 hours is consistent with Regulatory Guide 1.93 (Ref. 6). The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and low probability of a DBA occurring during this period.

BASES

ACTIONS

C.1 (continued)

~~The Completion Time of 72 hours is consistent with Regulatory Guide 1.93 (Ref. 6). The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and low probability of a DBA occurring during this period.~~

D.1 and D.2

Required Action D.1, which applies when two offsite circuits are inoperable, is intended to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required features. These redundant required features are those that are assumed to function to mitigate an accident, coincident with a loss of offsite power, in the safety analyses, such as the Emergency Core Cooling System and Auxiliary Feedwater System. These redundant features do not include monitoring requirements, such as Post Accident Monitoring and Remote Shutdown. These features are powered from redundant AC safety trains. This includes motor driven auxiliary feedwater pumps and the turbine driven auxiliary feedwater pump which must be available for mitigation of a feedwater line break. Single train features, other than the turbine driven auxiliary feedwater pump, are not included in this Condition. The Completion Time for this failure of redundant required features is reduced to 12 hours from that allowed for one train without offsite power (Required Action A.2). The rationale for the reduction to 12 hours is that Regulatory Guide 1.93 (Ref. 6) allows a Completion Time of 24 hours for two required offsite circuits inoperable, based upon the assumption that two complete safety trains are OPERABLE. When a concurrent redundant required feature failure exists, this assumption is not the case, and a shorter Completion Time of 12 hours is appropriate. A Note is added to this Required Action stating that in MODES 1, 2, and 3, the turbine driven auxiliary feedwater pump is considered a required redundant feature. The reason for the Note is to confirm the OPERABILITY of the turbine driven auxiliary feedwater pump in this Condition, since the remaining OPERABLE motor driven auxiliary feedwater pump is not by itself capable of providing 100% of the auxiliary feedwater flow assumed in the safety analysis.

The Completion Time for Required Action D.1 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action the Completion Time only begins on discovery that both:

a. All required offsite circuits are inoperable; and

b. A required feature is inoperable and not in the safeguards position.

BASES

ACTIONS

F.1 (continued)

According to Reference 6, with both DGs inoperable, operation may continue for a period that should not exceed 2 hours.

G.1 and G.2

Required Action G.1 provides assurance that the appropriate Action is entered for the affected DG and offsite circuit if its associated LSELS becomes inoperable. An LSELS failure results in the inability of the EDG to start upon a loss of ESF bus voltage or degraded voltage condition. Additionally, LSELS trips the ESF bus normal and alternate feeder supplies and trips non-essential loads. A sequencer failure results in the inability to start all or part of the safety loads powered from the associated ESF bus and thus when an LSELS is inoperable it is appropriate to immediately enter the Conditions for an inoperable DG and offsite circuit. Because an inoperable LSELS affects all or part of the safety loads, an immediate Completion Time is appropriate.

The LSELS is an essential support system to both the offsite circuit and the DG associated with a given ESF bus. Furthermore, the sequencer is on the primary success path for most major AC electrically powered safety systems powered from the associated ESF bus. Therefore, loss of an ESF bus sequencer affects every major ESF system in the division. The 12 hour Completion Time of Required Action G.2 provides a period of time to correct the problem commensurate with the importance of maintaining sequencer OPERABILITY. This time period also ensures that the probability of an accident (requiring sequencer OPERABILITY) occurring during periods when the sequencer is inoperable is minimal.

H.1 and H.2

B.3, B.4.1, B.4.2, and B.5

If the inoperable AC electric power sources or the load shedder and emergency load sequencer cannot be restored to OPERABLE status within the required Completion Time, or Required Actions B.1, ~~B.2, B.3.1, B.3.2, B.4.1 or B.4.2 2~~ cannot be met within the required Completion Times, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

REFERENCES (continued)

11. ANSI C84.1-1982
12. IEEE Standard 308-1978.
13. Configuration Change Package (CCP) 08052, Revision 1, April 23, 1999.
14. Amendment No. 161, April 21, 2005.
15. Not used.
16. ~~Amendment No. 163, April 26, 2006.~~
17. Amendment No. 154, August 4, 2004.
18. Amendment No. 8, May 29, 1987.
19. Condition Report 15727.

Not used.