WOLF CREEK
NUCLEAR OPERATING CORPORATION

John P. Broschak
Vice President Engineering

March 3, 2013
ET 13-0009

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

Reference: 1) Letter WO 11-0086, dated November 30, 2012, from S. E. Hedges, WCNOC, to USNRC

2) Letter MO 12-0002, August 16, 2012, from R. P. Clemens, WCNOC, to USNRC

3) Electronic Mail dated January 31, 2013, from C. F. Lyon, USNRC, to S. G. Wideman, WCNOC

Subject: Docket No. 50-482: Clarification of Request for Additional Information Regarding License Amendment Request to Revise Technical Specification (TS) 3.8.1, "AC Sources - Operating"

Gentlemen:

Reference 1 provided Wolf Creek Nuclear Operating Corporation's (WCNOC) application to revise Technical Specifications (TS) 3.8.1, "AC Sources - Operating," Surveillance Requirements (SR) related to Diesel Generator (DG) test loads, voltage, and frequency in SR 3.8.1.2, SR 3.8.1.3, SR 3.8.1.7, SR 3.8.1.10, SR 3.8.1.11, SR 3.8.1.12, SR 3.8.1.14, SR 3.8.1.15, SR 3.8.1.19, and SR 3.8.1.20. Reference 2 provided a response to a request for additional information related to the application. Reference 3 requested a clarification of the response to question 1.b. in Reference 2. Attachment I provides WCNOC's response to the requested clarification.

The additional information does not expand the scope of the application as originally noticed, and does not impact the conclusions of the Nuclear Regulatory Commission (NRC) staffs originally proposed no significant hazards consideration determination as published in the Federal Register (77 FR 35708).

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," a copy of this submittal is being provided to the designated Kansas State official.

A001
NRR

This letter contains no commitments. If you have any questions concerning this matter, please contact me at (620) 364-4085, or Mr. Michael J. Westman at (620) 364-8831 ext. 4009.

Sincerely,

John P. Broschak

JPB/rlt

Attachment

cc: E. E. Collins (NRC), w/a
T. A. Conley (NRC), w/a
C. F. Lyon (NRC), w/a
N. F. O'Keefe (NRC), w/a
Senior Resident Inspector (NRC), w/a

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

John P. Broschak, 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 John P. Broschak
John P. Broschak
Vice President Engineering

SUBSCRIBED and sworn to before me this 3rd day of March, 2013.

Gayle Shepheard
Notary Public

GAYLE SHEPHEARD
Notary Public - State of Kansas
My Appt. Expires 7/24/2015

Expiration Date 7/24/2015

Response to Request for Clarification of Additional Information

Reference 1 provided Wolf Creek Nuclear Operating Corporation's (WCNOC) application to revise Technical Specifications (TS) 3.8.1, "AC Sources - Operating," Surveillance Requirements (SR) related to Diesel Generator (DG) test loads, voltage, and frequency in SR 3.8.1.2, SR 3.8.1.3, SR 3.8.1.7, SR 3.8.1.10, SR 3.8.1.11, SR 3.8.1.12, SR 3.8.1.14, SR 3.8.1.15, SR 3.8.1.19, and SR 3.8.1.20. Reference 2 provided a response to a request for additional information related to the application. Reference 3 requested a clarification of the response to question 1.b. in Reference 2. The specific Nuclear Regulatory Commission (NRC) requested clarification is provided in italics.

1. *The LAR is proposing a minimum voltage of 3950V. With the DG output at 3950 Volts, provide the following details when the ESW pump STARTS:*

   I. The instantaneous voltage at the safety busses monitored by protective devices such as degraded voltage and loss of voltage relays and clarify if any relays may actuate.

Response: The diesel generators (DG) provide a source of emergency power when offsite power is either unavailable or is insufficiently stable to allow safe unit operation. There are two sets of undervoltage/degraded voltage protection circuits, one for each 4160 kV NB system bus (NB01 and NB02). Four potential transformers provide input to four degraded voltage bistables with associated time delays for each NB bus for detecting a sustained degraded voltage condition. From calculation XX-E-009, "System NB, NG, PG Undervoltage/Degraded Voltage Relay Setpoints," the degraded voltage bistables have a minimum dropout voltage of 3706.5V with a time delay of 8 seconds under accident conditions. Actuation of the degraded voltage bistables will trip the 4160 kV normal and alternate bus feeder breakers resulting in isolation of NB01 and NB02 and an alarm in the control room. When the DGs are supplying their respective NB bus, the degraded voltage bistables only provide an alarm function.

From calculation XX-E-009, the undervoltage relays have a minimum dropout voltage of 2905V. Four instantaneous undervoltage relays with a 1 second time delay are provided for NB01 and NB02 for detecting a loss of bus voltage. Upon actuation of the undervoltage relays, a logic signal generated by the load shedder and emergency load sequencer (LSELS) initiates tripping the 4160 kV normal and alternate bus feeder breakers, shedding of selected loads, a loss of power DG start signal, and an alarm in the control room. When the DGs are supplying their respective NB bus, the undervoltage relays will still provide the capability for load shedding of selected loads and an alarm function.

The DGs achieve approximately 4250V upon starting. A slightly elevated voltage is established to assure the DG voltage is maintained above 3120V when starting the large 1750 horsepower Essential Service Water (ESW) pump motors. This is consistent with the design considerations of Regulatory Guide 1.9, Revision 3, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants." Table 1 provides data from the performance of Surveillance Requirement (SR) 3.8.1.7, that the DGs consistently achieve a voltage around 4250V. SR 3.8.1.7 requires that the DG starts from standby conditions and achieves required voltage and frequency within 12 seconds, and subsequently achieves steady state required voltage and frequency ranges. Figure 1 provides the results of the start of the 'A' ESW pump motor during the 18 month integrated emergency safety features actuation surveillance testing. This figure is

representative of both ESW pump motors and shows adequate margin to the design considerations of Regulatory Guide 1.9.

Procedure STS KJ-015A			Procedure STS KJ-015B		
Date	**Seconds**	**Voltage**	**Date**	**Seconds**	**Voltage**
11/29/12	8.2	4260	12/14/12	8.9	4250
6/1/12	7.7	4250	8/8/12	9.6	4250
3/6/12	8.0	4250	2/22/12	7.9	4250
12/1/11	7.8	4250	2/20/12	8.8	4250
9/4/11	7.81	4250	1/19/12	8.1	4300
6/9/11	5.7	4290	12/1/11	7.9	4300
12/27/10	7.3	4250	8/10/11	8.2	4250
			6/14/11	8.0	4280
			2/11/11	8.97	4250

When an ESW pump motor is started on an NB bus that is being powered by its associated DG, the voltage at the terminals of the DG drops to 3196.35V and recovers to 90% in less than 0.48 seconds from the minimum dip. This voltage is based on the DG operating at nominal voltage of 4160V. If the DG were operating at a reduced voltage of 5.05% below nominal or 3950V, the voltage that had been calculated with nominal voltage can be conservatively reduced by 5% of nominal to determine the resulting voltage. This result is conservative because the voltage drop within the DG would not have the full 5% reduction due to the dominant load being a constant impedance load (motor start), which will result in a smaller current than the DG would see at nominal voltage rating on a motor start. However, using the conservative methodology, the lowest generator terminal voltage would be approximately 3036.53V [3196.35V*(1-0.05)]. Using the loading taken from Calculation XX-E-006, "AC System Analysis," for the L1 scenario (offsite power calculation with loss-of-coolant accident conditions and starting an ESW pump motor) to determine the voltage drop from the 'A' DG (longest cable length), results in an instantaneous voltage of 3009V at NB01 for the 5% voltage reduction. The instantaneous voltage on the NB buses during a start of an ESW pump motor does not drop below the undervoltage relay setpoint. No protective relays actuate and no motors would stall.

Using the ratio of the NB01 bus worst case voltage (3606V) from calculation XX-E-006, "AC System Analysis," and the NB01 instantaneous voltage of 3009V to adjust the ESW pump motor start terminal voltage from calculation XX-E-006, yields a value of 2814V at the ESW pump motor terminals. This adjustment is conservative because it treats the loads as constant power, even though approximately 65% is constant impedance and would result in a lower voltage drop. A review of the ESW motor and pump torque curves determined that, if the voltage did not recover during the entire motor start, the motor would successfully start. Regarding overlapping with the next motor start, the ESW pump motor will start in 1.5 seconds with 4000V continuously applied and 4 seconds with 3000V continuously applied. Based on the quick voltage recovery shown in the analysis with the DG at nominal voltage (increases the voltage 13.16% in less than 0.48 seconds), if it takes 1 second for the DG voltage to recover to 3950V, then it can be seen that the motor will accelerate in less than 4 seconds. Since an acceleration of 4 seconds will not overlap with the next motor start, it is acceptable. It can be demonstrated that the motor would accelerate in approximately 2.9 seconds with 80% voltage applied continuously, which requires only a 10% increase in voltage in 1.1 seconds. This provides additional confirmation that the motor will accelerate in less than 4 seconds.

1. *The LAR is proposing a minimum voltage of 3950V. With the DG output at 3950 Volts, provide the following details when the ESW pump STARTS:*

   II. *The instantaneous voltage at 'electrically' remote safety busses (480V and below) where voltage sensitive components such as contactors may be energized and can potentially drop out.*

Response: Using the ratio of the NB bus worst case voltages (3606V for NB01 and 3621V for NB02) from calculation XX-E-006, "AC System Analysis," and the NB01 instantaneous voltage of 3009V to adjust the voltages from calculation XX-E-006 yields a worst case motor control center (MCC) voltage of 332V during the ESW pump motor start. To ensure that starters and auxiliary relays do not dropout, the momentary voltages on MCC buses must not drop below 65.7% or 302V. When the DGs are supplying the NB buses, a margin of 30V above the starter dropout is conservatively maintained on the worst case transient voltage dip (i.e., ESW pump motor start). The 120V Class 1E instrument AC power system that supplies power for the vital instrument and control loads is supplied from battery fed inverters and is not subjected to transients from the AC system.

1. *The LAR is proposing a minimum voltage of 3950V. With the DG output at 3950 Volts, provide the following details when the ESW pump STARTS:*

   III. *Identify any operating equipment such as rectifiers/inverters that may lock out as a consequence of momentary inadequate terminal voltage.*

Response: There is no identified equipment that would lock out as a consequence of momentary inadequate terminal voltage. The Class 1E inverters are supplied by their associated Class 1E batteries and are not subjected to transients from the AC system. The invertors do have a manual AC bypass for maintenance purposes, however, entry into the Conditions/Required Actions of Technical Specification 3.8.7, "Inverters-Operating," is required when the inverters are fed from the bypass.

References:

1. WCNOC letter WO 11-0086, "Application to Revise Technical Specification (TS) 3.8.1, "AC Sources – Operating"," November 30, 2011. ADAMS Accession No. ML11340A033.

2. WCNOC letter MO 12-0002, "Response to Request for Additional Information Regarding License Amendment Request to Revise Technical Specification (TS) 3.8.1, "AC Sources – Operating"," August 16, 2012.

3. Electronic Mail from C. F. Lyon, USNRC, to S. G. Wideman, WCNOC, "RE: Clarification Question re: EDG SR LAR (TAC No. ME7674)," January 31, 2013. ADAMS Accession No. ML13032A226.

ESW Pump Starting Transient

	Limit	Actual
Minimum voltage:	3120 V	3545
Minimum voltage within 3 seconds after start:	3774 V	4262
Maximum voltage within 5 seconds after start:	4320 V	4232

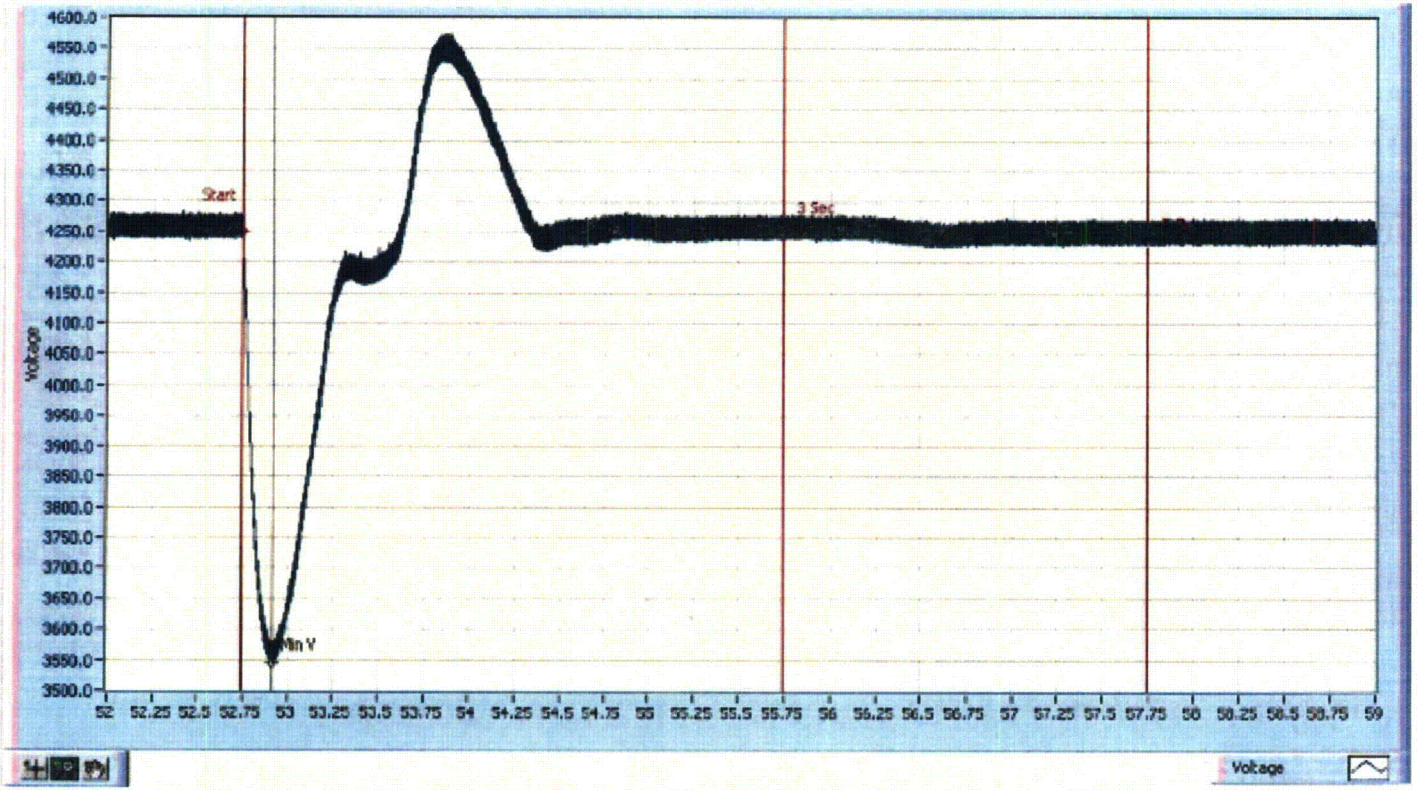

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Figure 1 – ESW Pump Motor 'A'