WOLF CREEK
NUCLEAR OPERATING CORPORATION

Neil S. "Buzz" Carns
Chairman, President and
Chief Executive Officer

August 23, 1996

WM 96-0092

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Reference: 1) NRC Letter dated May 21, 1996, "Request for Additional Information, Thermo-Lag-Related Ampacity Derating Issues, Wolf Creek Generating Station"
2) Letter ET 95-0013 dated March 10, 1995, from F. T. Rhodes, WCNOC, to the USNRC

Subject: Docket No. 50-482: Response to the Request for Additicnal Information Regarding Thermo-Lag-Related Ampacity Derating Issues

Gentlemen:

Reference 1 requested additional information be provided within 60 days from receipt of Reference 1, to address several questions and apparent errors with the ampacity derating calculations submitted by Wolf Creek Nuclear Operating Corporation (WCNOC) by Reference 2. The attachment provides the additional information requested by Reference 1.

If you have any questions concerninq the attachment or need additional information concerning this matter, please contact me at (316) 364-8831, extension 4034, or Mr. Terry S. Morrill at extension 8707.

Very truly yours,

Neil S. Carns

NSC/jad

cc: L. J. Callan (NRC)
W. D. Johnson (NRC)
J. F. Ringwald (NRC)
J. C. Stone (NRC)

A029

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Neil S. Carns, of lawful age, being first duly sworn upon oath says that he is President and Chief Executive Officer of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the content thereof; that he has executed that 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 Neil S. Carns
Neil S. Carns
President and
Chief Executive Officer

LINDA M. OHMIE
Notary Public - State of Kansas
My Appt. Expires 8-31-98

SUBSCRIBED and sworn to before me this 23rd day of August, 1996.

Linda M. Ohmie
Notary Public

Expiration Date 8-31-98

RESPONSE TO THE REQUEST FOR ADDITIONAL INFORMATION REGARDING THERMO-LAG-RELATED AMPACITY DERATING ISSUES

A. NRC Request: Calculations F-10A and XX-E-008

"These calculations include many very significant errors and questionable assumptions. The NRC staff agrees with the Sandia National Laboratories (SNL) that these calculations should not be credited. The staff suggests that the licensee not use these calculations and instead rely on the available ampacity test results of Texas Utilities (TU) and the Tennessee Valley Authority (TVA). For details about the errors and questionable assumptions refer to the attached SNL document prepared by Steve Nowlen, SNL, dated April 19, 1996."

WCNOC Response

As stated in the SNL report, a number of errors were made in the formulation of the thermal model in Calculations F-10A and XX-E-008. These calculations have been reevaluated by WCNOC. Based on our reevaluation, WCNOC believes that the basic thermal model used in the original calculations may have provided a misrepresentation of or non-conservative values for fire-wrapped raceways at WCGS. Therefore, both calculations have been voided from the design basis of WCNOC.

B. NRC Request: Calculation XX-E-010

1. "Based on the recommendation of abandoning the Calculations F-10 [*sic*] and XX-E-008, the licensee should reconsider the basis for its overall conclusion of acceptability. The staff suggests that the licensee use TU test results and the more recent TVA test results in formulating its final assessment."

WCNOC Response

Calculation XX-E-010 has been revised in order to use a standard industry de-rating value of 21% for cables in fire-wrapped conduits. This value is based upon TU Electric test data and correspondence between TU Electric and the NRC staff.

WCNOC has chosen Darmatt KM-1 as an acceptable replacement fire wrap material. For raceway that is wrapped with Darmatt KM-1, de-rating values have been provided by Faverdale Technology Centre Ltd. All affected cable ampacities are acceptable using this new approach and industry test data.

2. "The licensee excluded conduits 134U3033 and 114U3C4G from the analysis based on the noncontinuous nature of the load currents for these cables. However, the licensee needs to address the operation of these cables for extended periods when necessary."

WCNOC Response

Based upon engineering judgment, conduits 134U3033 and 114U3C4G were excluded from the original calculation because the end devices do not operate continuously and would not challenge the qualified life of the cable. These affected power cables and their conduits have been analyzed as if they were continuously energized, found acceptable, and are included in revision 1 to WCNOC Calculation XX-E-010.

3. "The Licensee has used ampacity from Insulated Cable Engineers Association (ICEA) P-46-426, page 264, for 3/C # 1/0, 3/C- # 2/0, and 3/C- # 500 MCM cables. The ampacities on page 264 are for triplexed cables (3-1/C-T). Ampacities for three conductor cables (3/C) are on page 313. The licensee needs to provide clarification regarding the use of ampacity values on page 264 versus those on page 313."

WCNOC Response

WCNOC Calculation XX-E-010 has been revised to use the ampacity values on page 313 of IPCEA P-46-426 for three conductor cables and page 264 for triplexed cables.

4. "The licensee needs to provide a justification for using 298 amps for two single conductor # 2/0 cables in a conduit (Calculation, page 16). The staff believes that 298 amps is for only one single conductor # 2/0 cable. (Triplexed # 2/0 cable ampacity is 204 amps and three conductor # 2/0 cable ampacity is 190 amps per ICEA P-46-426). Furthermore, National Electrical Code (NEC) Table 310-16 provides ampacity of 195 amps for not more than three conductors of # 2/0 cable in a raceway."

WCNOC Response

WCNOC Calculation XX-E-010 has been revised to use the ampacity values on Table 310-16 of the 1996 NEC for one and two conductor cables.

5. "Some of the conduits exceed percentage fill criteria per NEC (i.e., conduit 135C3074 fill is 53.3 percent). Provide justification for the overfill and impact of the overfill on cable ampacity."

WCNOC Response

The multiconductor cables in conduit 135C3074 have had their outer jacket stripped back as described in E-15000. The outer jacketing material is not the insulating material for these conductors. The outer jacketing material is only used to protect the cable during installation. The 53.34 % was calculated assuming the outer jackets were present. The percent fill, when properly calculated using the area of the individual conductors, is only 18.39%. This percent fill is within acceptable limits, as defined in the NEC 1996, Chapter 9, Table 1. Therefore, an overfill condition does not exist in conduit 135C3074.

The power cable in this conduit is a non-safety related cable and is not required for safe shutdown of the plant.

All conduit percent fills in Calculation XX-E-010 were reviewed to determine if there were any overfilled conditions. The results of this review verified that the percent fill values for all conduits analyzed met the requirements invoked by the NEC and are reflected in Calculation XX-E-010, revision 1. Proper conduit fill criteria is 53% for conduit containing one cable, 31% for conduit containing two cables, and 40% for conduit containing more than two cables (reference NEC 1996, Chapter 9, Table 1).

C. NRC Request: Calculation XX-E-011

1. "The licensee failed to consider the "80 percent of open air" ampacity limit which is specified in ICEA P-54-440 for cables in cable trays 116U5D30 and 116U5E30. Additionally, the licensee has used ampacity values from Thermal Science Incorporated (TSI) test results performed at Underwriter Laboratories (UL). These TSI test results were not supported by UL and were discredited during the NRC/Department of Justice (DOJ) investigation of TSI. Therefore, the use of these TSI test results is unacceptable to the NRC and is not appropriate as the basis for final assessment of margin of acceptability. The staff suggests that the licensee consider more recent results from TVA and TU tests as the basis for its final assessment of margin of acceptability."

WCNOC Response

WCNOC has removed the Thermo-lag material on trays 116U5D30 and 116U5E30 as a result of the WCNOC Thermo-Lag resolution project. The 80% of open air ampacity for trays with a fill depth of less than one inch was applied to these trays to demonstrate past acceptability. The remaining tray (111U1K01) has a fill depth greater than one inch. Therefore, the tables of ICEA P-54-440 have been applied to this tray.

The TSI test results that were originally used in Calculation XX-E-011, revision 0, have been removed and replaced with more recent information from TU and TVA test results. A correction factor of 0.48 (from TVA results) was used in the evaluation of trays 116U5D30, 116U5E30, and 111U1K01 to demonstrate past acceptability. These evaluations showed acceptable ampacity margins for the trays evaluated using an ambient temperature of 40° C (design ambient room temperature) in the evaluations.

2. "The licensee excluded the cable "schemes" (16GLY15LA, 16GLY15LB, 16GKG20LA, and 16QJG10BA) involving heaters and heat trace circuits, based on noncontinuous load. However, the licensee needs to address the operation of these cables for extended periods (during extreme cold weather, the heaters might operate at near continuous levels for extended periods). The licensee must provide further justification for excluding these cables or provide analyses for these cables."

WCNOC Response

Cable schemes 16GLY15LA, 16GLY15LB, 16GKG20LA, and 16QJG10BA have been added to revision 1 of WCNOC Calculation XX-E-011. These cables have been analyzed and have been determined to have adequate ampacity margin. A correction factor of 0.48 (from TVA test results) along with an ambient temperature of 40° C was used in the evaluation of these cables to demonstrate past acceptability.

3. "The licensee excluded the cable "schemes" (ALHV09 and ALHV11) involving a unique type of MOV. It is implied that during the operation of the auxiliary feedwater system, these would be continuously energized. If these circuits are required to operate for several hours or longer, then an ampacity analysis is needed to assure that these cables perform as intended."

WCNOC Response

Cables 11ALY09CB and 11ALY09DB (for valves ALHV9 and ALHV11), contained in tray 111U1K01, have been added to revision 1 of WCNOC Calculation XX-E-011. These valves are normally open and operate only when the Auxiliary Feedwater Pumps operate. By applying new ampacity de-rating industry standards and assuming continuous operation for cables 11ALY09CB and 11ALY09DB, these cables did not have sufficient ampacity margin with Thermo-Lag installed. However, as a result of the Thermo-Lag resolution project, WCNOC has removed the Thermo-Lag material from tray 111U1K01 and will install Darmatt KM-1 on this tray before the end of 1996. Until then, compensatory measures (that were initiated in response to NRC Bulletin 92-01 for WCGS Thermo-Lag fire barriers) will be continued. A correction factor of 0.41 (from Faverdale Technology Centre assessment reports) along with an ambient temperature of 40° C was used in the evaluation of these cables to demonstrate acceptability of this new configuration.

4. "The licensee needs to identify the characteristics of the cable being analyzed (i.e., diameter; jacketing of individual conductor; overall jacketing; single conductor, three conductor or triplexing). Also, the licensee should identify the ICEA P-54-440 table used for particular cable ampacity."

WCNOC Response

The characteristics of the cable being analyzed in revision 1 of WCNOC Calculation XX-E-011 are the following:

From plant design documents

- actual full load amps of the cable,
- actual cable O.D. in inches,
- number of conductors and size of cable,
- jacketing material, and insulation material.

Rated current of the cable (per ICEA P-54-440 and IPCEA P-46-426, or NEC 1996) was used, where appropriate.

These characteristics have been verified and are addressed in revision 1 of Calculation XX-E-011. All necessary references are identified in the body of the calculation.

D. NRC Request: General Comment

"The full load current (FLA) used is based on nominal voltage. The constant KVA loads will draw 11 percent more current at 90 percent of rated voltage available. Additionally, some loads may operate at overload or at a service factor of 15 percent. Accordingly, the FLA could be as high as 125 percent of FLA at nominal voltage. The licensee needs to address this."

WCNOC Response

Undervoltage conditions were originally excluded from WCNOC Calculations XX-E-010 and XX-E-011. The purpose of these calculations is to establish the ampacity margins that are available during nominal conditions. The nominal voltage is considered to be an acceptable analysis condition because this encompasses an average expected voltage over the lifetime of the cables. Analyzing the affects of a degraded voltage condition yields a more conservative value for constant KVA devices. The same degraded voltage condition yields a non-conservative value for constant impedance devices.

WCNOC has included the effects of both nominal and degraded voltage conditions to the revised Calculations XX-E-010 and XX-E-011.

As a result of the concerns described in Reference 1, the methodology and input data for WCNOC Calculations XX-E-010 and XX-E-011 have been revised and independently reviewed. The results of these calculations still show adequate ampacity margins exist for WCGS cables in electrical raceways with fire wrapped material.

The revised calculations discussed above are available onsite for review.