

WOLF CREEK

NUCLEAR OPERATING CORPORATION

Matthew W. Sunseri
President and Chief Executive Officer

June 1, 2010

WM 10-0016

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

- Reference:
- 1) Letter ET 10-0013, dated April 13, 2010, from T. J. Garrett, WCNOC, to USNRC
 - 2) Letter dated May 20, 2010, from B. K. Singal, USNRC, to M. W. Sunseri, WCNOC, "Wolf Creek Generating Station – Non-Acceptance with Opportunity to Supplement, License Amendment Request to Remove High/Low Pressure Designation from Pressurizer Power-Operated Relief Valves (TAC No. ME3766)"

Subject: Docket No. 50-482: Response to Supplemental Information Request for License Amendment Request to Remove the High/Low Pressure Interface Designation from the Pressurizer Power Operated Relief Valves (PORVs) and their Associated Block Valves

Gentlemen:

Reference 1 provided Wolf Creek Nuclear Operating Corporation's (WCNOC) License Amendment Request (LAR) to make changes to the approved fire protection program as described in the Wolf Creek Generating Station (WCGS) Updated Safety Analysis Report (USAR). Specifically, a revision to the response to Nuclear Regulatory Commission (NRC) Question 280.5, documented on page 280-5 of the NRC Questions Section at the end of the USAR was requested regarding the removal of the high/low pressure interface designation from the pressurizer Power Operated Relief Valves (PORVs) and their associated block valves.

The NRC Fire Protection Branch has reviewed the subject LAR and determined that the application was unacceptable with an opportunity to supplement. They concluded that the scope of the analysis is incomplete since impacts on the plant are not discussed in the amendment. Therefore, supplemental information is needed to enable an independent assessment regarding the acceptability of the proposed LAR.

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NRC

A phone call between WCNOG and the NRC staff was held on May 13, 2010 to discuss the information required to supplement the LAR. During that phone call it was decided that WCNOG would submit the supplemental information needed by June 1, 2010. Reference 2 provided the formal NRC notification of non-acceptance with opportunity to supplement.

The Attachment provides a copy of the supplemental information needed with WCNOG's response following each requested item.

In accordance with 10 CFR 50.91, a copy of this submittal is being provided to the designated Kansas State official.

This letter contains no additional commitments. If you have any questions concerning this matter, please contact me at (620) 364-4008, or Mr. Richard D. Flannigan, Manager Regulatory Affairs at (620) 364-4117.

Sincerely,



Matthew W. Sunseri

MWS/rt

Attachment

cc: E. E. Collins (NRC), w/a
T. A. Conley (KDHE), w/a
G. B. Miller (NRC), w/a
B. K. Singal (NRC), w/a
Senior Resident Inspector (NRC), w/a

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Matthew W. Sunseri, 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 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 Matthew W. Sunseri
Matthew W. Sunseri
President and Chief Executive Officer

SUBSCRIBED and sworn to before me this 1st day of June, 2010.

Gayle Shephard
Notary Public



Expiration Date 7/24/2011

SUPPLEMENTAL INFORMATION NEEDED
LICENSE AMENDMENT REQUEST REGARDING
PRESSURE BOUNDARY DESIGNATION FOR THE PRESSURIZER
POWER-OPERATED RELIEF VALVES AND THEIR ASSOCIATED BLOCK VALVES
WOLF CREEK GENERATING STATION

The Nuclear Regulatory Commission (NRC) staff has reviewed the license amendment request (LAR) and concluded that the scope of the analysis is incomplete since impacts of the proposed LAR on the plant are not discussed in the LAR. Therefore, additional information is needed to enable an independent assessment regarding the acceptability of the LAR. To enable this independent assessment the following information is required:

Supplemental Information Request 1

- **Please provide a description of the safety impact that the proposed license amendment would have on the plant.**

Wolf Creek Nuclear Operating Corporation (WCNOC) response to Request 1:

The pressurizer is equipped with two types of devices for pressure relief: pressurizer safety valves and power operated relief valves (PORVs). The PORVs are safety-related DC solenoid operated valves that are controlled to open at a specific set pressure when the pressurizer pressure increases and close when the pressurizer pressure decreases. The PORVs may also be manually operated from the control room.

Block valves, which are normally open, are located between the pressurizer and the PORVs. The block valves are used to isolate the PORVs in case of excessive leakage or a stuck open PORV. Block valve closure is accomplished automatically below 2185 psig or manually using controls in the control room. A stuck open PORV is, in effect, a small break loss of coolant accident (LOCA). As such, block valve closure terminates the reactor coolant system (RCS) depressurization and coolant inventory loss. The PORVs and their associated block valves may be used by plant operators to depressurize the RCS to recover from certain transients if normal pressurizer spray is not available. The PORVs may also be used for feed and bleed core cooling in the case of multiple equipment failure events that are not within the design basis, such as a total loss of feedwater.

The plant has two PORVs, each having a relief capacity of 210,000 lb/hr at 2335 psig. The functional design of the PORVs is based on maintaining pressure below the Pressurizer Pressure - High reactor trip setpoint following a step reduction of 50% of full load with steam dump. In addition, the PORVs minimize challenges to the pressurizer safety valves and also may be used for low temperature protection (LTOP).

10 CFR 50.2, 10 CFR 50.55a(c), and GDC 55 of 10 CFR 50, Appendix A, define RCS pressure isolation valves (PIVs) as any two normally closed valves in series within the reactor coolant pressure boundary (RCPB), which separate the high

pressure RCS from an attached low pressure system. During their lives, these valves can produce varying amounts of reactor coolant leakage through either normal operational wear or mechanical deterioration. PIV leakage could lead to overpressure of the low pressure piping or components. Failure consequences could be a LOCA outside of containment, an unanalyzed accident, that could degrade the ability for low pressure injection. Technical Specification (TS) 3.4.14, "RCS Pressure Isolation Valve (PIV) Leakage," identifies the pressure isolation valves which separate the high pressure RCS from an attached low pressure system. The PORVs and associated block valves are not included as pressure isolation valves in TS 3.4.14.

The definition of high/low pressure interface can be found in NRC Information Notice 87-50 which states, in part, the following:

Thus, for those low-pressure systems that connect to the reactor coolant system (a high-pressure system), at least one isolation valve must remain closed despite any damage that may be caused by fire. A fire could occur in the panel or cables that control the isolation valves causing hot shorts that may result in opening the valves at the high/low-pressure interface. Since the low-pressure system could be designed for pressures as low as 200 to 400 psi, the high pressure from the reactor coolant system (approximately 1000 to 1200 psi for BWRs and 2000 to 2200 psi for PWRs) could result in failure of the low-pressure piping. In many instances, the valves at the high-pressure to low-pressure interface are not designed to close against full reactor coolant system pressure and flow conditions. Thus, spurious valve opening could result in a LOCA that cannot be isolated, even if control of the valve can be reestablished.

The definition of a RCS PIV given in 10 CFR 50.2, 10 CFR 50.55a(c), and GDC 55 of 10 CFR 50, Appendix A is similar to that for high/low pressure interface given in IN 87-50 in that both definitions describe these interfaces as the boundary between the high pressure RCS and low pressure piping in which spurious opening of the interface valve(s) will likely result in an un-isolable LOCA.

The two pressurizer PORVs and associated block valves are presently classified in the Fire Protection Program as high/low pressure interface components. This classification was made per the response to question 280.5 documented on pages 280-4 and 280-5 of the Wolf Creek Generating Station (WCGS) Updated Safety Analysis Report (USAR). The piping downstream of the pressurizer PORVs and block valves is designed for the expected pressure and thus will not rupture upon opening of the PORVs. The pressure will be contained within the PRT until the rupture disks rupture as designed at approximately 91 psig then the pressure will relieve into containment. A spurious open PORV will not result in a LOCA outside containment. Therefore, the pressurizer PORVs do not meet the definition of high/low pressure interface or RCS PIV.

Because of the immediate adverse consequences of a failed open high/low pressure interface, the valves that form a high/low pressure interface boundary are evaluated in the post-fire safe shutdown analysis (PFSSDA) using more

stringent circuit failure criteria than for non-high/low pressure interface valves. The pressurizer PORVs are solenoid operated, power is fed from the ungrounded 125 VDC Class 1E electrical system. The block valves are motor operated, fed from the 480 VAC Class 1E electrical system. NRC Generic Letter 86-10 response to question 5.3.1 clarified the circuit failure criteria to be applied for non-high/low pressure interface components fed from ungrounded DC power supplies and three-phase AC power supplies. Based on the response to Question 5.3.1, the PFSSDA does not have to consider simultaneous proper phase hot shorts on three-phase AC power supplies on non-high/low pressure interface components. In addition, based on the response to Question 5.3.1, the PFSSDA does not have to consider two or more proper polarity hot shorts on ungrounded DC circuits on non-high/low pressure interface components. For non-high/low pressure interface components, the WCGS PFSSDA considers one proper polarity inter-cable hot short and any number of proper polarity intra-cable hot shorts within multi-conductor cables associated with the component.

The WCGS Renewed Operating License NPF-42, Section 2.C.5(a) states the following:

The Operating Corporation shall maintain in effect all provisions of the approved fire protection program as described in the SNUPPS Final Safety Analysis Report for the facility through Revision 17, the Wolf Creek site addendum through Revision 15, and as approved in the SER through Supplement 5, subject to provision b & c below.

The Final Safety Analysis Report (FSAR), Appendix 9.5B, contained the original fire hazards analysis for the station. Each fire area analysis contained a summary of the safe shutdown capability for a fire in that area. The safe shutdown summary was based on the original PFSSDA prepared during plant design. The following is stated in each of the fire areas where one or both PORVs can spuriously open:

... However, should the PORV fail open and should the block valve fail as-is in the open position, the RCS would blow down to the PRT. In this case, the control room operator would place the PORV in manual and close the PORV from the control room.

The FSAR, Appendix 9.5B, Section 9.5B.3.c states the following assumption regarding cable failures:

If a fire is postulated to cause a short in a circuit and that circuit is protected by an individual overcurrent protection device, that device is assumed to function to clear the fault without further degradation of the power source.

The Wolf Creek SER, Supplement 3, Section 9.5.1.5 states, in part, the following:

We have reviewed the applicant's method of determining that the separation criteria of Appendix R are met and have reviewed the associated circuits identified by the applicant and the actions necessary or modifications made to prevent spurious operation that would affect safe plant shutdown. Based on

our review we conclude that the applicant has adequately addressed the effects of associated circuit interaction and that the necessary isolation devices and procedures are adequate to ensure that such circuit interactions will not prevent safe shutdown. We further conclude that the applicant's methodology for verifying that separation is in accordance with Appendix R, Item III.G.2 is acceptable.

Based on the FSAR, Appendix 9.5B statements listed above, it is apparent that the original PFSSDA did not consider inter-cable hot shorts when analyzing the pressurizer PORV circuits. The two statements would only be true if intra-cable shorting is the only cable failure mechanism considered. An intra-cable short within some cables could lead to opening of the protective fuses and fail the PORV closed. An intra-cable short within other cables could cause the PORV to open but the hand switch in the control room would close the PORV when placed in the closed position.

The proposed action to re-classify the pressurizer PORV and implement a modification (described in the response to item 2) will effectively make the safe shutdown summary statement in each fire area in the original FSAR true.

WCNOC document E-1F9910 provides an area-by-area analysis of the post-fire safe shutdown capability if a design basis fire occurs in any one area. Fifteen (15) fire areas have cables associated with one or both pressurizer PORVs and one or both block valves. In 14 fire areas, one of the two pressurizer PORVs could spuriously open due to control cable damage. Also in these 14 fire areas the associated block valve may not close due to damage to the power and/or control cables. There is one fire area where both pressurizer PORVs can open due to control cable damage but the block valve associated with one of the two PORVs can be closed from the control room. The E-1F9910 analysis for the PORVs and block valves was performed using the high/low pressure interface circuit failure criteria.

The existing configuration at WCGS requires operator manual action outside the control room to de-energize the PORV if a fire causes the PORV to open. The PORV cables are run in raceway with other 125 VDC cables. Therefore, DC power would have to be removed from a number of other components to prevent an inter-cable hot short from re-opening the PORV when applying the high/low pressure interface circuit criteria. In most cases, loss of power to these other components will have no adverse impact on PFSSD. However, DC control power would have to be removed from the affected train 480 VAC load centers and 4,160 volt switchgear. If the fire subsequently causes damage to an energized 480 or 4,160 volt cable supplied from these buses, the protective breaker will not open and the fault could propagate to another fire area, causing a secondary fire in the other area. Therefore, without significant cable rerouting, there are presently no inconsequential actions that would guarantee closure of the PORVs in the event of a fire when considering high/low pressure interface circuit criteria. Re-classifying the PORVs as non-high/low pressure interfaces, without the modification described in the response to item 2, would allow operator action outside the control room to de-energize the individual PORV

circuit and successfully close the PORV when considering non-high/low pressure interface circuit criteria.

Utilizing circuit failure criteria for non-high/low pressure interfaces when analyzing the PORVs and block valves for PFSSD impact does not adversely affect the health, safety and welfare of the public nor does it result in an adverse safety impact to the plant. The non-high/low pressure interface criteria requires consideration of a single proper polarity hot short on ungrounded DC circuits. Furthermore, the Wolf Creek PFSSDA considers any number of intra-cable hot shorts on any circuit regardless of its classification. Therefore, upon approval of this request, Wolf Creek will analyze the pressurizer PORVs by considering any-and-all intra-cable hot shorts in conjunction with one proper polarity inter-cable hot short. The circuit failures will be considered to be "smart" hot shorts in that the failures will not be assumed to clear the circuit protective devices, even though the most likely result for some of the intra-cable failures would result in blown fuses and closure of the PORVs.

In all of the fire areas outside containment where the PORV cables are routed, the cables are run in raceway that is protected by automatic fire suppression and detection. Within containment, the cable trays of concern have protectowire heat detection installed. All cables in each raceway are IEEE-383 qualified thermoset type cables. Cable testing conducted on thermoset cables in 2001 (EPRI TR1003326) and 2006 (NUREG/CR-6931 - CAROLFIRE) shows that inter-cable interactions during a fire are plausible but are less likely than intra-cable interactions. Intra-cable interactions would likely result in the PORV control power fuse opening or the PORV opening with the ability to close the PORV from the control room. Therefore, intra-cable shorting in the PORV circuit will not cause a condition where the PORV cannot be closed from the control room. Combustible materials in the areas where the PORV and block valve cables are routed are administratively controlled so as not to allow large quantities of unattended combustibles in the plant. No unattended combustible materials are allowed in containment during power operation. These defense in depth measures provide reasonable assurance that a fire that does occur will be limited in severity.

Based on the above discussion, the proposed change has no adverse safety impact on the health, safety and welfare of the public or the safe operation of the plant.

Supplemental Information Request 2

- **Please provide a description of any modifications or changes to the operation of the pressurizer PORVs and their associated block valves, including electrical control circuits and cable rerouting, which would occur, if this license amendment were accepted.**

WCNOC response to Request 2:

As discussed in Letter ET 10-0013, the modification scope is dependent upon the outcome of the license amendment request. The design change that WCNOC will implement during Refueling Outage 18 is based on the assumption that the license amendment request will be approved. This modification will re-wire the control room hand switch so that both the negative and positive sides of the auxiliary relay (AR) are de-energized when the operator places the hand switch in the Closed position. De-energizing both polarities ensures a single proper polarity hot short will not prevent operators from de-energizing the AR using the hand switch in the control room. The operation of the hand switch will remain unchanged and the hand switch itself will not be changed.

In addition, the contactor panel will be re-wired to insert open contacts on the negative side of the '72' relay and the PORV solenoid to maintain both the positive and negative sides de-energized. This will ensure a single proper polarity hot short will not energize the '72' relay or the PORV solenoid and open the PORV.

The modifications will ensure that a single proper polarity inter-cable hot short in combination with any number of intra-cable hot shorts will not prevent closure of the PORVs from the control room and will prevent fire induced spurious operation of the PORVs with the hand switch in the closed position.

The operation of the PORVs will not change. The changes will not affect the safety related function of the PORVs.

The block valve circuits will remain the same. No modifications are planned for the block valves.

Supplemental Information Request 3

- **Please provide a description of any changes to the post-fire safe shutdown analysis, including new or revised procedures, operator manual actions, and other operator post-fire guidance documents, which would occur if this license change were accepted.**

WCNOC response to Request 3:

Upon approval of the LAR, the PFSSDA will be revised for the 15 affected fire areas to incorporate the new circuit analysis criteria. This will result in the elimination of the interim compensatory manual actions outside the control room. The PFSSDA will also be revised to identify the new actions to close a failed open PORV using the control room hand switch. Additionally, the PFSSDA will be revised to remove the high/low pressure interface designation from the PORVs and block valves.

Operations procedures will be revised to include the Control Room action for a spuriously open PORV, and the interim compensatory manual actions will be eliminated.