

# WOLF CREEK NUCLEAR OPERATING CORPORATION

John P. Broschak  
Vice President Engineering

March 29, 2013  
ET 13-0012

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

Reference: Letter dated December 27, 2011, from J. Mateychick, USNRC, to M. W. Sunseri, WCNOG, "Wolf Creek Generating Station – NRC Triennial Fire Inspection Report (05000482/2011007)"

Subject: Docket No. 50-482: Request for Review of Information to Support Resolution of Example 2 of Non-cited Violation 05000482/2011007-03, "Failure to Ensure Post-Fire Safe Shutdown Components Remain Free of Fire Damage"

Gentlemen:

The purpose of the letter is to request Nuclear Regulatory Commission (NRC) Region IV review of the information provided in the Attachment for the resolution of Example 2 of Non-cited Violation (NCV) 0500482/2011007-03, "Failure to Ensure Post-Fire Safe Shutdown Components Remain Free of Fire Damage." The NCV was identified during the October 17, 2011, through December 12, 2011, triennial fire protection inspection as documented in the Reference.

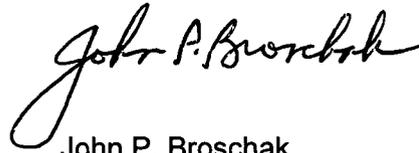
The NRC identified that Wolf Creek Nuclear Operating Corporation (WCNOG) had failed to properly analyze for fire damage in the form of shorts-to-ground related to the pressurizer power-operated relief valves (PORV). Certain postulated shorts-to-ground could spuriously actuate these valves such that safe shutdown would be impacted. This deficiency was documented in Condition Report 00045452. Subsequent to this inspection, the NRC issued additional information based on fire testing results. Utilizing this information in conjunction with the guidance in Nuclear Energy Institute (NEI) 00-01, Revision 2, "Guidance for Post Fire Safe Shutdown Circuit Analysis," WCNOG has determined that the PORV circuits had been properly analyzed and that further modification to these circuits is not required.

WCNOG requests that NRC Region IV review the attached information for resolution of Example 2 of NCV 0500482/2011007-03 and provide the results of the review by September 1, 2013. The information in the Attachment was discussed with NRC Region IV personnel on January 8 and 28, 2013, and with the NRC Project Manager for the Wolf Creek Generating Station on February 13, 2013.

IEOL  
A006  
MLD

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,

A handwritten signature in black ink that reads "John P. Broschak". The signature is written in a cursive style with a large, looping initial "J".

John P. Broschak

JPB/rit

- Attachment I - Request for Review of Information to Support Resolution of Example 2 of  
Non-cited Violation 05000482/2011007-03
- Enclosure - Drawing E-13BB40: Schematic Diagram Pressurizer Power Relief Valves

cc: E. E. Collins (NRC), w/a, w/e  
C. F. Lyon (NRC), w/a, w/e  
G. B. Miller (NRC), w/a, w/e  
N. F. O'Keefe (NRC), w/a, w/e  
Senior Resident Inspector (NRC), w/a, w/e

**Request for Review of Information to Support Resolution of Example 2 of Non-cited Violation 05000482/2011007-03**

The Nuclear Regulatory Commission (NRC) identified in NRC Triennial Fire Inspection Report 05000482/2011007 (Reference 1) that Wolf Creek Nuclear Operating Corporation (WCNOC) had failed to properly analyze for fire damage in the form of shorts-to-ground related to the pressurizer power-operated relief valves (PORV). Certain postulated shorts-to-ground could spuriously actuate these valves such that safe shutdown would be impacted. This deficiency was documented in Condition Report 00045452. Subsequent to this inspection, NUREG/CR-7150, Vol. 1/EPRI 1026424 (Reference 10), "Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE)," was issued and provided additional information based on fire testing results. Utilizing this information in conjunction with the guidance in Nuclear Energy Institute (NEI) 00-01, Revision 2 (Reference 2), "Guidance for Post Fire Safe Shutdown Circuit Analysis," WCNOC has determined that the PORV circuits had been properly analyzed and that further modification to these circuits is not required. Provided below is WCNOC's basis for this determination.

Wolf Creek Generating Station (WCGS) Renewed Facility Operating License

The Wolf Creek Generating Station (WCGS) Renewed Facility Operating License NPF-42, Section 2.C.(5) conditions the operating license as follows regarding fire protection:

- (5) Fire Protection (Section 9.5.1, SER, Section 9.5.1.8, SSER #5)
- (a) 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, Amendment No. 191, and Amendment No. 193 subject to provisions b and c below.
  - (b) The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.
  - (c) Deleted.

Removal of High/Low Pressure Interface Designation for Pressurizer Power Operated Relief Valves (PORVs)

Wolf Creek Nuclear Operating Corporation (WCNOC) letter ET 10-0013 (Reference 3) submitted a license amendment request that proposed the removal of the high/low pressure interface designation from the pressurizer power operated relief valves (PORVs) and their associated block valves.

WCNOC submitted letter WM 10-0016 (Reference 4) in response to a request for supplemental information concerning Reference 1. The response stated, in part:

"... For non-high/low pressure interface components, the WCGS PFSSDA [post-fire safe shutdown analysis] 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 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."

"... De-energizing both polarities ensures a single proper polarity hot short will not prevent operators from de-energizing the AR [auxiliary relay] using the hand switch in the control room."

"... 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 or will prevent spurious operation of the PORVs."

The Nuclear Regulatory Commission (NRC) issued License Amendment No. 193 (Reference 5) that approved the removal of the high/low pressure interface designation for the PORVs. The Safety Evaluation for Amendment No. 193, states, in part (page 9):

"The only fire-induced failure that could circumvent the proposed plant modification is two simultaneous independent proper polarity (positive-to-positive and negative-to-negative) inter-cable hot shorts."

The Safety Evaluation for Amendment No. 193, concludes, in part (page 10):

"The proposed modifications would allow operating a control room switch to prevent or mitigate a fire-induced spurious opening of the PORVs. The only scenario that would remain that could cause the PORVs to open would involve two simultaneous inter-cable proper polarity cable failures. ... Changing the high-low pressure commitments will allow the licensee to analyze PORV cables for a single proper polarity hot short between two cables (inter-cable) in combination with any number of internal cable (intra-cable) hot shorts. ... The proposed modifications and control room operator actions provide an adequate level of protection as described in Section III.G.2 of Appendix R to 10 CFR Part 50."

Based on the information in the NRC Safety Evaluation for License Amendment No. 193, the analysis of the PORV circuitry required consideration of a single proper polarity hot short between two cables in combination with any number of internal cable hot shorts. Multiple shorts to ground that impress a voltage on one side of the circuit in conjunction with a proper polarity external hot short is not a circuit failure combination that is required to be analyzed.

### Analysis and Modification of PORV Circuits

During Refueling Outage 18 in Spring, 2011, WCNOG implemented design change package (DCP) 12944, "PORV BBPCV0455A and BBPCV0456A Circuit PFSSD Modifications." This modification re-wired the control circuit associated with both pressurizer PORVs to ensure a single proper-polarity hot short and/or multiple intra-cable hot shorts could either be mitigated from the control room or would not cause the PORVs to spuriously open. Prior to the modification, the PORV circuits were of the "single break" design. In a single break circuit, one side of the circuit is always "hot" while the other side requires contact closure to complete the circuit. The PORV modification implemented per DCP 12944 created a "double break" circuit, where both sides of the circuit are de-energized. A double break circuit requires a minimum of two contact closures, one on the positive side and one on the negative side, to energize the circuit. Therefore, a double break circuit requires two proper polarity hot shorts to open the PORV and maintain it in the open position. The Enclosure provides drawing E-13BB40, "Schematic Diagram Pressurizer Power Relief Valves," that depicts the modified circuit.

### NRC Triennial Fire Inspection Report (05000482/2011007)

From October 17, 2011 through December 12, 2011 the NRC conducted a triennial fire protection inspection with the results being documented in inspection report 05000482/2011007. Provided below are excerpts associated with Non-cited Violation (NCV) 0500482/2011007-03, "Failure to Ensure Post-Fire Safe Shutdown Components Remain Free of Fire Damage."

Introduction. The team identified a Green non-cited violation of License Condition 2.C(5) because the licensee failed to implement and maintain in effect all provisions of the approved fire protection program. Specifically, the licensee failed to properly analyze for fire damage in the form of shorts-to-ground related to the residual heat removal Train B refueling water storage tank suction valve and the pressurizer power-operated relief valves. Certain postulated shorts-to-ground could spuriously actuate these valves such that safe shutdown would be impacted. The licensee documented these deficiencies in Condition Reports 044912 and 045452, respectively.

Description. The licensee conducted a circuit analysis to identify circuit vulnerabilities created by fire damage affecting post-fire safe shutdown components. The team independently assessed the licensee's circuit analysis of several components. The team identified two examples where the licensee failed to properly evaluate fire damage in the form of shorts-to-ground. The affected components included Valve BNHV8812B, refueling water storage tank to residual heat removal Pump B suction valve, and Valves BBPCV0455A and BBPCV0456A, pressurizer power-operated relief valves.

#### *Example 2: Failure to Analyze the Effects of Grounds on the Pressurizer Power-Operated Relief Valve*

By letter dated March 9, 2011, the NRC approved License Amendment No. 193 that changed the categorization of the pressurizer power-operated relief valves and block valves to non-high/low pressure interface valves. Changing the categorization allowed the licensee to consider a single hot short rather than two hot shorts when evaluating the possible circuit failures. Since a portion of the defense-in-depth basis for this declassification included a circuit modification to the power-operated relief valve circuits,

the team selected these valve circuits for additional review. Change Package 012944, "Power-Operated Relief Valve BBPCV0455A and BBPCV0456A Circuit Modifications," modified the control circuit by adding contacts that isolated the positive and negative sides of the actuation relays and solenoids. The modification prevented a single hot short from causing Valves BBPCV0455A and BBPCV0456A from spuriously opening and provided the operators the capability to close the power-operated relief valves from the control room.

The team identified that the licensee limited the failure modes review to a single hot short without considering the hot short coincident with other types of fire damage (i.e., open circuits or shorts to ground) to cables in the cable tray. The team postulated a fire that would cause a single inter-cable hot short combined with fire damage creating multiple grounds of remaining cables in the cable tray. With this fire damage present, the pressurizer power-operated relief valve solenoid would energize and the operators would be unable to close the pressurizer power-operated relief valve from the control room. The pressurizer block valves can normally be used to isolate a pressurizer power operated-relief valves; however, the pressurizer block valve cables were routed above the pressurizer power-operated relief valve cables in the fire areas and would be subject to the same fire damage caused by the same fire.

The licensee did not implement any modifications to protect the circuits for the pressurizer power-operated relief valve block valves nor did they instruct operators to close the block valves. Consequently, if a pressurizer power-operated relief valve spuriously opened because of fire damage, operators would not have the ability to isolate the power-operated relief valves. This unisolable path would result in a loss of reactor coolant inventory and loss of pressure control that exceeded the plant response to a loss of normal ac power. The team identified areas in the plant with cables routed for both the pressurizer power-operated relief and block valves that could be damaged during a fire.

For both of the circuit issues, the team determined that the licensee did not follow the guidelines contained in NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 2 and Regulatory Guide 1.189, "Fire Protection for Nuclear Power Plants," Revision 2, Section 5.3. Section 5.3 identifies that licensees should consider circuit faults in at least two adjacent, external cables and all interactions within the target cable. Specifically, the licensee did not correctly account for the interactions among cables for all types of fire damage. This failure requires a hot short combined with a short to ground of the target cable and a short to ground on one additional cable. The licensee implemented a fire watch as a compensatory measure for the deficiencies.

#### Generic Letter 86-10

Generic Letter 86-10 (Reference 6), "Implementation of Fire Protection Requirements (Generic Letter 86-10)," provides NRC Staff interpretations of 10 CFR 50, Appendix R. Enclosure 2 to GL 86-10 provides NRC Staff answers to industry questions related to implementation of 10 CFR 50, Appendix R. Question 5.3.1, "Circuit Failure Modes," states the following:

"What circuit failure modes must be considered in identifying circuits associated by spurious actuation."

The NRC Staff response to this question is as follows:

"Sections III.G.2 and III.L.7 of Appendix R define the circuit failure modes as hot shorts, open circuits, and shorts to ground. For consideration of spurious actuations, all possible functional failure states must be evaluated, that is, the component could be energized or de-energized by one or more of the above failure modes. Therefore, valves could fail open or closed; pumps could fail running or not running; electrical distribution breakers could fail open or closed. For three-phase AC circuits, the probability of getting a hot short on all three phases in the proper sequence to cause spurious operation of a motor is considered sufficiently low as to not require evaluation except for any cases involving Hi/Lo pressure interfaces. For ungrounded DC circuits, if it can be shown that only two hot shorts of the proper polarity without grounding could cause spurious operation, no further evaluation is necessary except for any cases involving Hi/Lo pressure interfaces."

The pressurizer PORV circuit is an ungrounded DC circuit. Based on License Amendment No. 193, the PORVs are not designated as high/low pressure interfaces. Therefore, WCNOG is not required to consider two or more proper polarity hot shorts causing spurious actuation of the PORVs.

#### NEI 00-01, Revision 2

NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis," Revision 2, Section 3.5.1.1, "Circuit Failure Criteria," specifies criteria that addresses the effects of multiple-fire induced circuit failures impacting circuits for components classified as either "required for hot shutdown" or "important to safe shutdown." Section 3.5.1.1 states, part:

"A hot short may result from a fire-induced insulation breakdown between conductors of the same cable, a different cable or from some other external source resulting in a compatible but undesired impressed voltage or signal on a specific conductor. A hot short may cause a spurious operation of safe shutdown equipment."

"A short-to-ground may result from a fire-induced breakdown of a cable insulation system, resulting in the potential on the conductor being applied to ground potential. A short-to-ground may have all of the same effects as an open circuit and, in addition, a short-to-ground may also cause an impact to the control circuit or power train of which it is a part. A short-to-ground may also result in a change of state for normally energized equipment."

From the guidance in NEI 00-01, for "important to safe shutdown" components (i.e., the pressurizer PORVs), multiple shorts to ground are to be evaluated for their impact on ungrounded circuits as explained in Figure 3.5.2-3. Figure 3.5.2-3 (see page 7 below) shows examples of the effects of shorts to ground on ungrounded DC circuits and illustrates that a single short to ground anywhere in the circuit will not cause a loss of control power to the circuit. In order for control power to be lost, another short to ground would have to exist somewhere in the circuit.

An important distinction between hot shorts and shorts to ground is that hot shorts can cause spurious operation of equipment whereas shorts to ground can only result in loss of power or change of state for normally energized equipment. Multiple shorts to ground that cause spurious equipment operation are treated in traditional circuit analysis as hot shorts.

NEI 00-01, Section 3.5.2.2, "Circuit Failures Due to a Short-to-Ground," provides guidance for addressing the effects of a short to ground on circuits for "required for hot shutdown" or "important to safe shutdown." Section 3.5.2.2 states, in part:

"A short-to-ground is a fire-induced breakdown of a cable insulation system resulting in the potential on the conductor being applied to ground potential. A short-to-ground can cause a loss of power to or control of required safe shutdown equipment. In addition, a short-to-ground may affect other equipment in the electrical power distribution system in the cases where proper coordination does not exist.

There is no limit to the number of shorts-to-ground that could be caused by the fire.

Consider the following consequences in the post-fire safe shutdown analysis when determining the effects of circuit failures related to shorts-to-ground:

- A short to ground in a power or a control circuit may result in tripping one or more isolation devices (i.e. breaker/fuse) and causing a loss of power to or control of required safe shutdown equipment.
- In the case of certain energized equipment such as HVAC dampers, a loss of control power may result in loss of power to an interlocked relay or other device that may cause one or more spurious operations."

None of the potential consequences discussed in the above bullets involve energizing the circuit. The short to ground concern is focused on loss of power to the circuit or loss of power to upstream power supplies in the event of improper circuit coordination.

Figure 3.5.2-3 in NEI 00-01 illustrates how a short to ground fault may impact an ungrounded circuit.

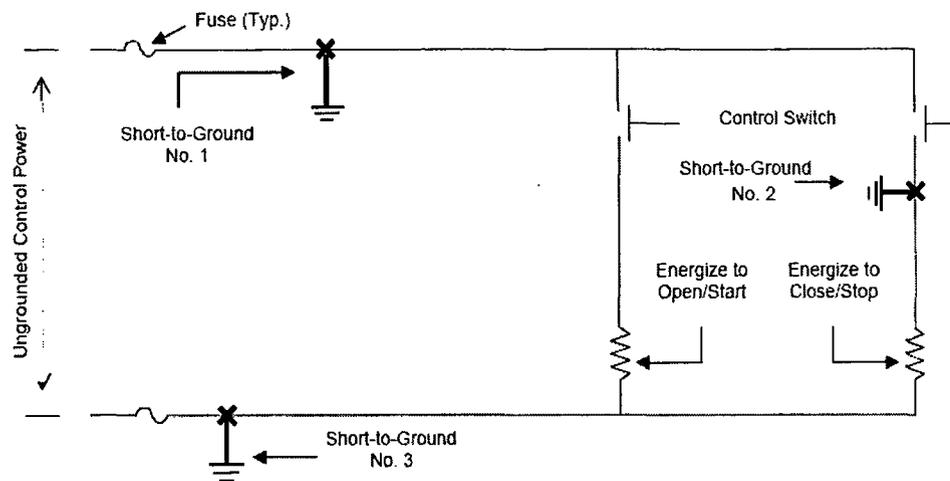


Figure 3.5.2-3: Short to Ground  
(Ungrounded Control Circuit)

#### "Short-to-ground No. 1

A short-to-ground at location No. 1 will result in the control power fuse blowing and a loss of power to the control circuit if short-to-ground No. 3 also exists either within the same circuit or on any other circuit fed from the same power source. This will result in an inability to operate the equipment using the control switch. Depending on the coordination characteristics between the protective device on this circuit and upstream circuits, the power supply to other circuits could be affected. If multiple grounds can occur in a single fire area, they should be assumed to occur simultaneously unless justification to the contrary is provided."

#### "Short-to-ground No. 2

A short-to-ground at location No. 2 will have no effect on the circuit until the close/stop control switch is closed. Should this occur, the effect would be identical to that for the short-to-ground at location No. 1 described above. Should the open/start control switch be closed prior to closing the close/stop control switch, the equipment will still be able to be opened/started. If multiple grounds can occur in a single fire area, they should be assumed to occur simultaneously unless justification to the contrary is provided. Note that a simultaneous short-to-ground at locations No. 1 and No. 2 could result in a spurious close/stop. This condition is identical to that portrayed in Figure 3.5.2-5 should a hot short occur on the ungrounded circuit shown in Figure 3.5.2-5 at location No. 1."

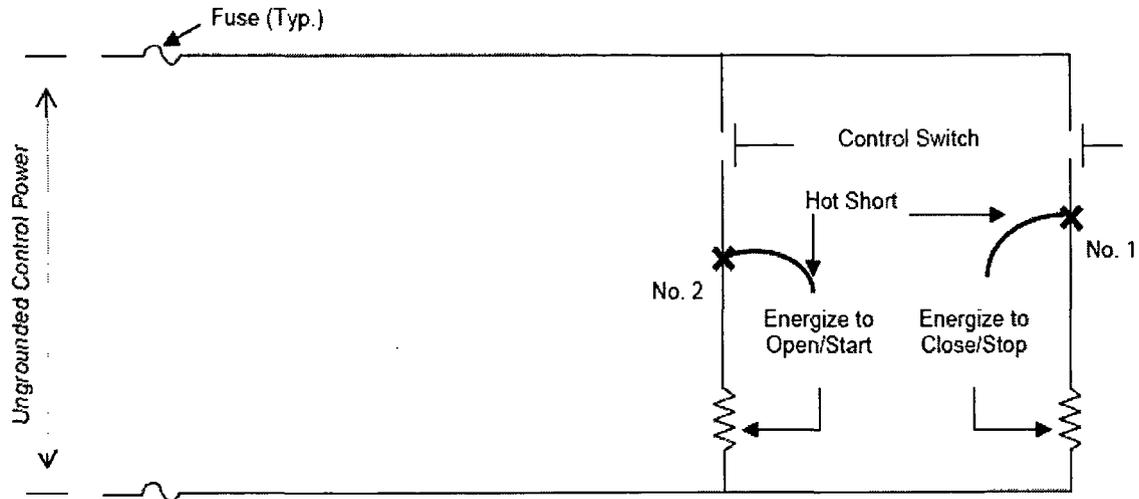


Figure 3.5.2-5: Hot Short  
(Ungrounded Control Circuit)

Regulatory Guide 1.189, Revision 2

Regulatory Guide (RG) 1.189, Revision 2 (Reference 7), "Fire Protection for Nuclear Power Plants," Section 5.3, "Fire Protection of Safe-Shutdown Capabilities," indicates, with some exceptions, that Chapter 3 of NEI 00-01 provides an acceptable deterministic methodology for the analysis of post fire safe-shutdown circuits, when applied in conjunction with the RG. This section of the RG further indicates that the seventh bullet in Section 3.5.1.1 of NEI 00-01 titled "Circuits for important to safe shutdown components" is not endorsed by the NRC. The seventh bullet in Section 3.5.1.1 of NEI 00-01 states:

"Conversely, multiple fire-induced circuit failures affecting separate conductors in separate cables with the potential to cause a spurious operation of an "important to safe shutdown" component need not be assumed to exist concurrently when the effect of the fire-induced circuit failure is not sealed-in or latched. This criterion applies to consideration of concurrent hot shorts in secondary circuits and to their effect on a components primary control circuit. It is not to be applied to concurrent single hot shorts in primary control circuit for separate components in an MSO combination."

In lieu of the seventh bullet in Section 3.5.1.1 of NEI 00-01, RG 1.189, Section 5.3 addresses circuits not sealed in or latched as follows:

"For circuits not sealed-in or latched for equipment important to safe shutdown, licensees should consider multiple fire-induced circuit failures in at least two separate cables. For circuits not sealed-in or latched for equipment important to safe shutdown that involves high-low pressure interfaces, licensees should consider circuit failures in at least three cables."

As indicated on page 4 above, NRC Triennial Fire Inspection Report (05000482/2011007) states, in part:

"Section 5.3 [RG 1.189] identifies that licensees should consider circuit faults in at least two adjacent, external cables and all interactions within the target cable. Specifically, the licensee did not correctly account for the interactions among cables for all types of fire damage. This failure requires a hot short combined with a short to ground of the target cable and a short to ground on one additional cable. The licensee implemented a fire watch as a compensatory measure for the deficiencies."

The NRC Triennial Fire Inspection Report specified that RG 1.189 identified that licensees should consider circuit faults in at least two adjacent, external cables and all interactions within the target cable. This implies that three cables would need to be affected. The RG specifies that licensees should consider multiple fire-induced circuit failures in at least two separate cables for non high-low pressure interfaces.

The pressurizer PORV circuits are not sealed in or latched. In the modified PORV circuit design shown in the Enclosure, consideration was given for multiple fire-induced circuit failures in at least two separate cables, consistent with the guidance in RG 1.189. The WCNO design considers any number of intra-cable hot shorts combined with a single proper polarity inter-cable hot short on cables located in the fire area of concern. Therefore, WCNO meets the guidance specified in RG 1.189, Section 5.3.

Regulatory Guide 1.189 defines hot short and short to ground as follows:

Hot short – Individual conductors of the same or different cables that come in contact with each other and that may result in an impressed voltage or current on the circuit being analyzed.

Short-to-ground – A short circuit between a conductor and a grounded reference point (e.g., grounded conductor, conduit or other raceway, metal enclosure, shield wrap, or drain wire within a cable).

From these definitions, as well as the definitions in NEI 00-01, a circuit failure that causes an impressed voltage is a hot short. Furthermore, a multiple short-to-ground that impresses an unwanted voltage on the circuit is a hot short. Since the pressurizer PORVs are designated as non-high/low pressure interfaces, multiple shorts to ground that impress unwanted voltage along with a single proper polarity hot short does not have to be analyzed since this is the same as two proper polarity hot shorts.

#### Fire Testing

The NRC conducted fire testing of energized DC circuits and reported the results in NUREG/CR-7100 (Reference 8), "Direct Current Electrical Shorting in Response to Exposure Fire (DESIREE-Fire): Test Results" in April, 2012. The test results were analyzed in draft NUREG-2128 (Reference 9), "Electrical Cable Test Results and Analysis During Fire Exposure (ELECTRA-FIRE)." Based on the data analysis reported in draft NUREG-2128, the following observations were made during the tests.

- Shorts through the ground plane or common conductors are possible, provided that the circuits involved are ungrounded and use a common power supply.
- Seventeen tests were conducted to evaluate the likelihood of proper-polarity inter-cable (cable-to-cable) shorting. Of these tests, only one showed weak signs of multiple external shorts to separate conductors. This test, identified as penlight # 47, used thermoplastic PE/PVC insulated cable.
- None of the tests resulted in a proper polarity ground fault equivalent hot short in combination with an inter-cable proper polarity hot short.

A Phenomena Identification and Ranking Table (PIRT) panel was assembled made up of NRC and Nuclear Industry representatives. The objective of the PIRT was to identify phenomena that can affect the fire-induced failure modes of electrical circuits after cables are damaged by fire. The PIRT panel used the results of recent NRC, NEI and EPRI tests to identify circuit configurations that are vulnerable to fire-induced circuit failures that can cause spurious operation of components. The results of the PIRT panel are documented in NUREG/CR-7150, Vol. 1/EPRI 1026424 (Reference 10), "Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE)."

The final disposition of the PIRT panels evaluation on some specific issues was characterized as "incredible" or "implausible." The definition of each is as follows:

Incredible – The event will not occur.

Implausible – The event, while theoretically possible, would require the convergence of a combination of factors that are so unlikely to occur that the likelihood of the phenomenon can be considered statistically insignificant.

Table 3-7 in NUREG/CR-7150 summarizes the PIRT panel results for a double break ungrounded DC circuit. Based on Table 3-7, an inter-cable hot short combined with a ground fault equivalent hot short involving thermoset cables is considered incredible. This circuit failure combination was postulated by the NRC during the 2011 Triennial Fire Protection Inspection and resulted in example 2 of NCV 05000482/2011007-03. An intra-cable hot short combined with a ground fault equivalent hot short involving thermoset cables is considered possible and has been addressed in Change Package 012944 for the pressurizer PORVs. For WCGS, an intra-cable hot short combined with a ground fault equivalent hot short will result in either the PORV remaining closed or the PORV opening with mitigating action available from the control room.

### Conclusions

Based on the above information, WCNOG has determined that the PORV circuits had been properly analyzed and that further modification to these circuits is not required. Consistent with the guidance in RG 1.189, a single proper polarity inter-cable hot short in combination with two shorts to ground that impresses a voltage on the opposite polarity is effectively two hot shorts, does not have to be analyzed for non-high/low pressure interface components. Furthermore, industry testing does not support the claim that a ground fault equivalent hot short in combination with a proper-polarity inter-cable hot short can occur. A PIRT panel composed of NRC and Industry experts concluded in NUREG/CR-7150 that this combination of failures will

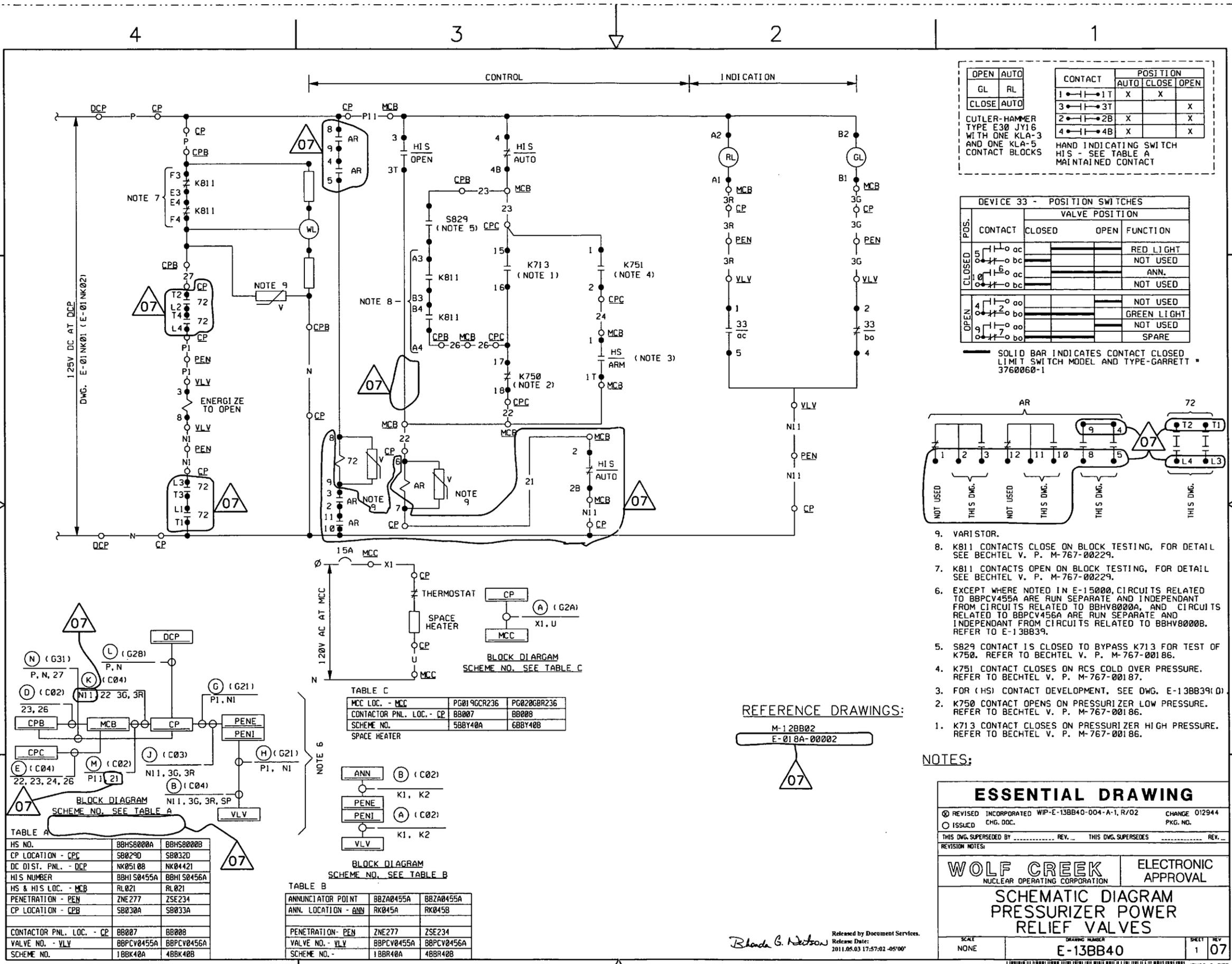
not occur. Therefore, further analyses or modification of the PORV circuits is not required for the resolution of Example 2 of NCV 05000482/2011007-03.

#### References

1. Letter from J. Mateychick, USNRC, to M. W. Sunseri, WCNOC, "Wolf Creek Generating Station - NRC Triennial Fire Inspection Report 05000482/2011007," December 27, 2011. ADAMS Accession No. ML11361A427.
2. Nuclear Energy Institute (NEI) 00-01, Revision 2, "Guidance for Post Fire Safe Shutdown Circuit Analysis," May 2009.
3. WCNOC letter ET 10-0013, "License Amendment Request (LAR) to the Approved Fire Protection Program to Remove the High/Low Pressure Interface Designation from the Pressurizer Power Operated Relief Valves (PORVs) and their Associated Block Valves," April 13, 2010. ADAMS Accession No. ML101100479.
4. WCNOC letter WM 10-0016, "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," June 1, 2010. ADAMS Accession No. ML101590671.
5. Letter from B. K. Singal, USNRC, to M. W. Sunseri, WCNOC, "Wolf Creek Generating Station – Issuance of Amendment re: Removing High/Low Pressure Designation from the Pressurizer Power-Operated Relief Valves (TAC NO. ME3766)," March 9, 2011. ADAMS Accession No. ML110530183.
6. Generic Letter 86-10, "Implementation of Fire Protection Requirements (Generic Letter 86-10)," April 24, 1986.
7. Regulatory Guide 1.189, Revision 2, "Fire Protection for Nuclear Power Plants," October 2009.
8. NUREG/CR-7100, "Direct Current Electrical Shorting in Response to Exposure Fire (DESIREE-Fire): Test Results," April 2012.
9. Draft NUREG-2128, "Electrical Cable Test Results and Analysis During Fire Exposure (ELECTRA-FIRE)," June 2012.
10. NUREG/CR-7150, Vol. 1/EPRI 1026424, "Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE)," October 2012.

Enclosure to ET 13-0012

**Drawing E-13BB40**  
**Schematic Diagram Pressurizer Power Relief Valves**  
(1 page)

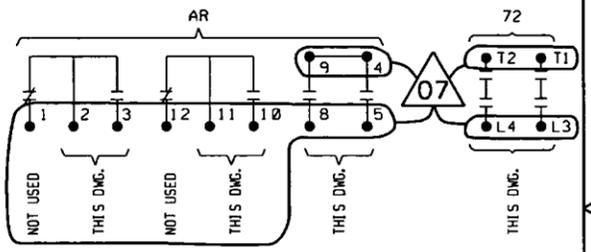


OPEN	AUTO	CONTACT			POSITION		
GL	RL	1	1T	X	X		
CLOSE	AUTO	3	3T			X	X
		2	2B	X			
		4	4B	X			X

CUTLER-HAMMER TYPE E30 JY16 WITH ONE KLA-3 AND ONE KLA-5 CONTACT BLOCKS  
HAND INDICATING SWITCH HIS - SEE TABLE A MAINTAINED CONTACT

DEVICE 33 - POSITION SWITCHES				
VALVE POSITION				
POS.	CONTACT	CLOSED	OPEN	FUNCTION
CLOSED	5	ac		RED LIGHT
	6	bc		NOT USED
	7	ac		ANN.
OPEN	4	oo		NOT USED
	2	bo		GREEN LIGHT
	1	oo		NOT USED
	3	bo		SPARE

SOLID BAR INDICATES CONTACT CLOSED  
LIMIT SWITCH MODEL AND TYPE-GARRETT 3760060-1



9. VARIATOR.
8. K811 CONTACTS CLOSE ON BLOCK TESTING, FOR DETAIL SEE BECHTEL V. P. M-767-00229.
7. K811 CONTACTS OPEN ON BLOCK TESTING, FOR DETAIL SEE BECHTEL V. P. M-767-00229.
6. EXCEPT WHERE NOTED IN E-15000, CIRCUITS RELATED TO BBPCV455A ARE RUN SEPARATE AND INDEPENDANT FROM CIRCUITS RELATED TO BBHV8000A, AND CIRCUITS RELATED TO BBPCV456A ARE RUN SEPARATE AND INDEPENDANT FROM CIRCUITS RELATED TO BBHV8000B. REFER TO E-13BB39.
5. S829 CONTACT IS CLOSED TO BYPASS K713 FOR TEST OF K750. REFER TO BECHTEL V. P. M-767-00186.
4. K751 CONTACT CLOSSES ON RCS COLD OVER PRESSURE. REFER TO BECHTEL V. P. M-767-00187.
3. FOR (HS) CONTACT DEVELOPMENT. SEE DWG. E-13BB39(1).
2. K750 CONTACT OPENS ON PRESSURIZER LOW PRESSURE. REFER TO BECHTEL V. P. M-767-00186.
1. K713 CONTACT CLOSSES ON PRESSURIZER HIGH PRESSURE. REFER TO BECHTEL V. P. M-767-00186.

REFERENCE DRAWINGS:

M-12BB02  
E-018A-00002

NOTES:

TABLE A

HS NO.	BBHS0000A	BBHS0000B
CP LOCATION - CPC	SB029D	SB032D
DC DIST. PNL. - DCP	NK05108	NK04421
HIS NUMBER	BBHI S0455A	BBHI S0456A
HS & HIS LOC. - MCB	RL021	RL021
PENETRATION - PEN	ZNE277	ZSE234
CP LOCATION - CPB	SB030A	SB033A
CONTACTOR PNL. LOC. - CP	BB007	BB008
VALVE NO. - VLV	BBPCV0455A	BBPCV0456A
SCHEME NO.	1BBK40A	4BBK40B

TABLE C

MCC LOC. - MCC	PG019CCR236	PG020GBR236
CONTACTOR PNL. LOC. - CP	BB007	BB008
SCHEME NO.	5BBY40A	6BBY40B

SPACE HEATER

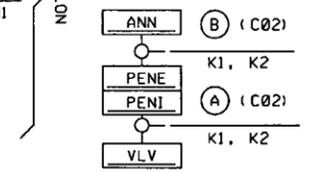


TABLE B

ANNUNCIATOR POINT	BBZ0455A	BBZ0455A
ANN. LOCATION - ANN	RK045A	RK045B
PENETRATION- PEN	ZNE277	ZSE234
VALVE NO. - VLV	BBPCV0455A	BBPCV0456A
SCHEME NO. -	1BBR40A	4BBR40B

**ESSENTIAL DRAWING**

REVISED INCORPORATED WIP-E-13BB40-004-A-1, R/02 CHANGE 012944  
ISSUED CHG. DOC. PKG. NO.

THIS DNG. SUPERSEDED BY \_\_\_\_\_ REV. THIS DNG. SUPERSEDES \_\_\_\_\_ REV. \_\_\_\_\_

REVISION NOTES:

**WOLF CREEK** NUCLEAR OPERATING CORPORATION  
**ELECTRONIC APPROVAL**

**SCHEMATIC DIAGRAM PRESSURIZER POWER RELIEF VALVES**

SCALE NONE DRAWING NUMBER **E-13BB40** SHEET 1 REV 07

17X22 C SIZE E-13BB40-1-07