UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUN 05 1984

The Honorable Dan Glickman
United States House of Representatives
Washington, D. C. 20515

Dear Congressman Glickman:

This is in response to your letter of April 6, 1984 which requested information related to a design deficiency at Kansas Gas and Electric Company's (KG&E) Wolf Creek Generating Station located near Burlington, Kansas. The deficiency was discovered during construction of the Callaway Plant being constructed for the Union Electric Company near Fulton, Missouri.

The valves affected by this design deficiency are electrically operated valves installed on small piping systems used for monitoring and sampling purposes. As indicated in Enclosures 1 and 2, the electrical insulation on field cabling used on these valves was degraded by the heat generated by the operation of these valves. The applicant will replace the cable, prior to licensing, with cable designed to function in the higher temperature environment present in this application.

You identified five questions for which you requested a response. Your questions and the staff's answers are as follows:

Question 1.

"What is the design, safety and quality assurance significance of the potentially defective cables?"

Answer 1.

This cable provides the electrical power needed to operate valves that must operate to permit sampling and monitoring within the various systems identified in your letter. These valves are generally designed so that power must be provided to open the valve. The valve will close or remain closed if power is lost to the valve due to degraded insulation on the cable. The design error could cause a failure of these valves to operate with a resulting loss of the monitoring or sampling capability of the associated system.

The NRC staff does not view this specific instance of error in the design of a valve as significant vis-a-vis the design adequacy of Wolf Creek and Callaway plants. Although the design error went undetected in the design phase, the discovery of the problem during construction reflects positively on quality assurance. The potential safety significance of this error is discussed in response to Question 3.

Question 2.

"Had this apparent design deficiency not been detected prior to licensing, what adverse consequences could have resulted?"

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Answer 2.

If this design deficiency had not been detected prior to licensing, the cable insulation would have continued to degrade under the high temperature environment present until the degradation was observed visually during a routine inspection of the valve or when the insulation failed and the valve malfunctioned. The potential consequences of valve failure during plant operation are discussed in response to Question 3.

Question 3.

"The April 4, 1984, memorandum states that valves in the following systems "are affected" by the apparent design deficiency: S/G blowdown, essential service water and containment monitor isolation systems. Please explain the safety significance of these systems and identify what adverse consequences could have resulted from one or more valve failures."

Answer 3(a).

The steam generator blowdown system is designed to control the secondary side water chemistry in the steam generator. This is accomplished by diverting a portion of the steam generator secondary water through a filter and demineralizer to remove impurities and then returning it to the secondary system. By maintaining a low level of impurities in the steam generator secondary coolant, the potential for corrosion of the steam generator tubes is reduced thereby lessening the probability of a steam generator tube rupture. A failure of a valve in the blowdown system will have no safety impact, because corrosion of steam generator tubes is a relatively slow process that would be detected by the steam generator tube inservice inspection program before the corrosion could reduce the tube wall thickness to the extent that a tube rupture could occur.

Answer 3(b).

The essential service water system removes heat from plant components that require cooling for safe shutdown of the reactor following a design basis accident. The essential service water system also provides emergency makeup to the spent fuel pool and component cooling water system, and is the backup water supply to the auxiliary feedwater system. The essential service water system has two redundant cooling water lines which assure that its function will be maintained even if one of the valves associated with its operation were to fail due to deterioration of unqualified cable.

The simultaneous failure of valves in both trains of the essential service water system caused by temperature related cable deterioration is not considered credible by the staff. The cable failure is a result of heating in the individual valves which is a function of both the ambient temperature at the valve and the heat generated by the valve operation. Because the temperatures developed at each valve location could differ due to length of operating time, local ventilation and fluid temperatures in the system there would be little chance that each valve would experience the same temperature history and fail simultaneously.

Answer 3(c).

The containment atmosphere is continuously monitored to assure that the concentrations of airborne radioactive materials, or combustible gases, are within established limits. To carry out this task, small monitoring lines pass through the containment to bring the monitored fluid outside the containment for measurement. These monitoring lines are equipped with containment monitor isolation valves which seal the sample line if it's not in use or if the containment must be sealed.

These monitors are in continuous service and the valves are designed to fail in a closed position if they were to lose power due to cable failure. The closure of these valves would cause the loss of the continuously monitored parameters that the systems are measuring. The loss of these readings would alert the operator, to the failure of one of these valves and would cause an investigation that would identify the possibility of failure of the remaining valves with the common design defect. As discussed in answer 3(b) simultaneous failure of redundant systems would not be expected so that the required monitoring capability would not be totally lost.

Question 4.

"Why was this apparent design deficiency not previously detected by either the licensee or the NRC?"

Answer 4.

The purpose of the NRC's construction inspection program is to verify, by means of inspections done on a sampling basis, that a nuclear facility, in this case the Wolf Creek facility, is constructed in accordance with NRC requirements and the applicant's commitments. The keystone of the NRC's inspection program is verification that the applicant has an adequate QA Program and that the QA Program is being effectively implemented. The NRC Program consists of (1) review of the applicant's QA Program, from the corporate QA manual to the basic work and inspection procedures, including the QA programs of the various site contractors; (2) observation, on a sampling basis, of the actual work and inspection activities in the field; and (3) review, again on a sampling basis, of the records which document both the work accomplished and the results of the QA/QC inspections and audits.

During the design and construction of a nuclear power plant it is neither unusual nor unexpected that design errors or equipment malfunctions are detected and corrected by the contractor. The NRC regulations require that the applicant maintain an effective quality assurance program that follows up each aspect of the plant's construction to assure that the facility and its constituent systems are constructed as designed and are properly inspected and tested to detect design or construction errors.

The intent of the NRC inspections is not to identify every deficiency in materials or workmanship, which is not practicable considering the resource limitations of the NRC, but to ensure that the QA program in effect at the site is identifying and requiring correction of significant construction deficiencies. This approach, coupled with the multiple levels of safety which are designed into the plant through redundancy of safety systems and containments and the margins of safety in structural design, is meant to ensure that any unidentified deficiencies in construction will not be of a significance, type, or quantity which will compromise the overall safety of the plant during future operation.

In the case of the Valcor solenoid valves a design error was made and was undetected at the design phase. However as shown in this event, there are additional layers of construction inspection and testing that can detect deviations that pass through the applicant's design verification process.

Question 5.

"What action will the NRC take to remedy this apparent problem?"

Answer 5.

The NRC Resident Inspector will inspect a representative sample of the reworked valves to evaluate the adequacy of the applicant's corrective action. He will review procurement records relating to the replacement cable and review the quality assurance documentation and work records related to the rework. Upon satisfactory resolution of any questions related to the field rework, the inspector will document the results of the review in a routine Inspection Report that will be provided to you for your information. The inspection effort will include review of the applicant's generic evaluation of other valves at Wolf Creek that may be affected by this deficiency.

The NRC Office of Inspection and Enforcement will evaluate this SNUPPS design deficiency that occurred at Callaway and Wolf Creek to determine whether there are any generic design implications that should be considered at other reactors.

As you have requested, we have enclosed copies of all documents related to this deficiency. These are Bechtel Power Corporation's March 19, 1984 letter (Enclosure 1) SNUPPS April 18, 1984 final report (Enclosure 2) on this deficiency, SNUPPS May 10, 1984 Supplemental Deficiency Report (Enclosure 3). We will also provide you with any additional documentation that we receive relative to this matter.

With regard to the investigation of allegations concerning quality control and documentation problems at Wolf Creek, we will provide you with a copy of the investigative report as soon as it is available.

Sincerely,

(Signed) William J. Dircks

William J. Dircks
Executive Director
for Operations

Enclosures:
1. Ltr. to Richard DeYoung dtd. March 19, 1984
2. Ltr. to J. Keppler and J. Collins dtd. April 13, 1984
3. Ltr. to J. Keppler and J. Collins dtd. May 10, 1984

DD:NRR	*D:NRR	EDO	OCA
ECase	HDenton	WDircks	
5/ /84	5/22/84	6/ / /84	6/5/84

*SEE PREVIOUS CONCURRENCES
(RETYPED 5/22/81 EILEEN

DL:LB#1	DL:LB#1	DL:LB#1	DL	OELD	AD:DL	D:DL
*PO'Connor:es	*MRushbrook	*BJYoungblood	*GEdison	*Christenbury	*TMNovak	*DEisenhut
5/16/84 31	5/09/84	5/09/84 5-31-84	5/18/84	5/10/84	5/11/84	5/17/84

In the case of the Valcor solenoid valves a design error was made and was undetected at the design phase. However as shown in this event, there are additional layers of construction inspection and testing that can detect deviations that pass through the applicant's design verification process.

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ENCLOSURE 1

Bechtel Power Corporation
Engineers — Constructors

15740 Shady Grove Road
Gaithersburg, Maryland 20877
301—258-3000

March 19, 1984

Mr. Richard DeYoung, Director
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. DeYoung:

File: 0490.4
SNUPPS Project, Bechtel Job No. 10466
Design Deficiency in Field-Run Cables to Valcor Solenoid Valves

On March 19, 1984, Mr. C. E. Rossi of your office was informed by Bechtel (John Kroehler) of a SNUPPS Project design deficiency reportable under 10 CFR 21. It involves the specification of cable intended for use at conductor temperatures not exceeding 90°C for normal operation for the connection of Valcor solenoid valves, whereas calculated terminal block temperatures would dictate the use of cable rated for 150°C service.

Approximately fifty valves each at the Callaway and Wolf Creek sites, currently installed in the Nuclear Sampling, Steam Generator Blowdown, Post Accident Sampling, Essential Service Water and Containment Monitor Isolation Systems, are affected by the deficiency.

A nonconformance report was written by the constructor, Daniel International, at the Callaway jobsite on March 1, 1984, and referred to Bechtel Project Engineering in Gaithersburg, Maryland, for evaluation on March 13, 1984, following an inspection of field-run cable to a Valcor solenoid valve installed in the Nuclear Sampling System. Inspection of the cable revealed that conductor insulation was excessively degraded.

As part of their investigation, Bechtel Engineering reviewed the internal temperatures of the solenoid housings against the temperature rating (90°C) of the field-run cable. Valves continuously energized or energized for an extended period of time (greater than one hour) will develop temperatures in the valve terminal block area of 250-280°F. At these temperatures, the 90°C (195°F) rated cable will degrade. Failure of the cable insulation may compromise the safety-related function of the valve.

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Bechtel Power Corporation

March 19, 1984

Currently, Bechtel is pursuing procurement of qualified, high-temperature cable from Valcor. The high-temperature cable will be used to make the connection from the valve housing to a junction box several feet remote from the valve. The incoming field cable will be spliced to the high temperature-cable in the junction box.

Mr. C. E. Rossi was informed that SNUPPS had already notified NRC Regions III and IV in accordance with the requirements for 10 CFR 50.55(e). He indicated that a separate 10 CFR 21 report would be necessary if the requirements for 10 CFR 21 reporting were not addressed in the 10 CFR 50.55(e) report.

Mr. Rossi was informed that although this deficiency was detected in the SNUPPS design, it resulted from a breakdown in the exchange of design information between engineering disciplines, and was not necessarily unique to the SNUPPS units. The Bechtel policy is to issue Management Corrective Action Reports (MCARs) to all other Bechtel nuclear projects whenever significant deficiencies are detected so that reviews for applicability can be performed. That practice will be observed for this deficiency.

Sincerely yours,

Bernard L. Meyers
Project Manager

JKJ/jmd

cc: Mr. C. E. Rossi, Office of Inspection & Enforcement, USNRC, Washington, D.C.
Dr. T. E. Murley, Director, Region I, USNRC
Mr. J. A. Keppler, Director, Region III, USNRC
Mr. J. Collins, Director, Region IV, USNRC
Mr. N. A. Petrick, SNUPPS
Mr. S. J. Seiken, SNUPPS
Mr. E. W. Creel, Kansas Gas & Electric Company
Mr. F. D. Field, Union Electric Company

ENCLOSURE 2

SNUPPS
Standardized Nuclear Unit
Power Plant System

5 Choke Cherry Road
Rockville, Maryland 20850
(301) 869-8010

April 13, 1984

SLNRC 84-065 FILE: 0491.10.2
SUBJ: Final Report: Field Run Cables for Solenoid Valves (SDR 84-02)

Mr. James G. Keppler
Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

APR 20 1984

Mr. ~~John T. Collins~~
Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
Suite 1000, Parkway Central Plaza
Arlington, Texas 76012

Docket Nos. STN 50-482 and STN 50-483

Gentlemen:

Pursuant to the requirements of 10CFR50.55(e) Messrs. J. Konklin of NRC Region III and W. Johnson of NRC Region IV were informed via telecon on March 15, 1984, of a design deficiency in the selection of field run cable to Valcor solenoid valves. This deficiency is generic in nature and, as such, is applicable to Callaway and Wolf Creek plants. A written report on the deficiency is enclosed.

The enclosed report should be considered the final report on this matter. NRC will be informed of any significant developments, should they occur. Please do not hesitate to contact the undersigned or R. P. White of my staff should there be any questions concerning this report.

Very truly yours,

S J Seiken

S. J. Seiken
QA Manager

RPW/bds/lbl
Enclosure

cc:	D. F. Schnell	UE
	G. L. Koester	KGE
	D. T. McPhee	KCPL
	W. S. Schum	NRC/WC
	J. H. Neisler	NRC/CAL
	B. H. Little	NRC/CAL
	R. C. DeYoung	NRC/IE: HQ
	J. E. Konklin	NRC/IE: III
	Record	

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10 CFR 50.55(e) REPORT

ON

FIELD WIRING DEFICIENCIES TO VALCOR

SOLENOID VALVES INSTALLED AT THE SNUPPS UNITS

BECHTEL POWER CORPORATION

Gaithersburg, Maryland

April 9, 1984

10 CFR 50.55(e) REPORT ON FIELD WIRING TO VALCOR SOLENOID VALVES

TABLE OF CONTENTS

1.0 INTRODUCTION

In accordance with the requirements of 10CFR50.55(e), this final report provides a summary of the deficiency related to improperly rated field wiring to Valcor solenoid valves installed at the Callaway and Wolf Creek jobsites.

This deficiency was initially reported by SNUPPS to Mr. J. Konklin and Mr. W. Johnson, NRC Regions III and IV respectively, by telephone on March 15, 1984. This deficiency has also been reported by Bechtel under 10CFR21 to Mr. C. E. Rossi, USNRC, on March 19, 1984.

This deficiency was first identified in the course of unrelated rework on one of the affected valves at which time degradation of an attached conductor was noted.

2.0 DESCRIPTION OF PROBLEM

Callaway NCR 2SN-9748-ET documented a deficiency involving degraded insulation on field cabling used to connect Valcor solenoid valves. Valcor solenoid valves are supplied with a terminal block internal to the valve body. The incoming field cables are connected directly to this terminal block. Investigation of the valve qualification documents revealed that the ambient temperatures inside the valve body can approach a maximum of 250-280°F when the valves are energized for an extended period of time. The actual ambient temperatures inside the valve body will vary for each valve depending upon the length of time the valve is energized and the fluid or air temperature of the associated piping system. The incoming field cable used to connect the valves into the plant control system has an insulation temperature rating of 90°C (194°F). Use of the 90°C rated field cabling in the high ambient temperature encountered inside the valve body will cause the cable insulation to degrade prematurely resulting in failure of the cable insulation which can ultimately compromise the safety function of the valve. This deficiency exists for both the Wolf Creek and Callaway Generating Stations.

3.0 SAFETY IMPACT

A total of 37 Class 1E valves supplied by Valcor at each jobsite are affected by this deficiency. An additional 6 non-class IE valves are also affected. The valves are used in the following safety related systems:

- Containment Hydrogen Control
- Nuclear Sampling
- Steam Generator Blowdown
- Residual Heat Removal
- Containment Purge
- Fuel Building HVAC

Failure of the cable insulation due to temperatures above its design capabilities could prevent these valves from performing their safety function.

4.0 CAUSE OF DEFICIENCY

This deficiency resulted from a unique solenoid valve configuration wherein the incoming field cables are terminated inside a totally enclosed valve body housing a large energized solenoid. The configuration is such that the terminal boards are located within the valve body and above the solenoid. No means is provided to dissipate the heat generated by the solenoid. Valcor supplied drawings depicting valve and wiring details provided no information concerning the high ambient temperatures inside the valve body. The normal solenoid valve application is to have vendor supplied pigtails routed from the valve body to a remotely located splice box. In such typical applications, the field wiring would not be subjected to the high ambient temperatures. The Architect Engineer did not recognize that high ambient temperatures would be encountered which could compromise the capability of the field run cabling and consequently did not utilize high temperature wire in the wiring design.

5.0 CORRECTIVE ACTION

Design changes have been implemented to replace the field wiring with qualified high temperature wiring with 200°C (392°F) rated insulation. The high temperature wire is used as a jumper from the terminal block inside the valve body to a splice box located approximately 5 to 10 feet remote from the valve. The incoming field cable is spliced into the high temperature wire in the splice box thus preventing the field cable from encountering the high temperatures inside the valve body. The necessary wiring changes will be installed at each jobsite prior to the time that the valves are required for their operational modes. The project is presently evaluating solenoid valves of other manufacturers utilized in the SNUPPS design to insure that other valves are not subject to the same deficiency. If additional solenoid valves are discovered to have the same deficiency, appropriate corrective action will be taken and a supplemental report issued.