

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Fort St. Vrain, Unit No. 1	DOCKET NUMBER (2) 0 5 0 0 0 1 2 6 1 7	PAGE (3) 1 OF 0 8
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TITLE (4)  
ERROR DISCOVERED IN COMPUTER CODE USED TO DEVELOP E.Q. TEMPERATURE PROFILES

EVENT DATE (5)				LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)	
0 8	1 6	8 8	8 8	0 1 2	0 2	0 5	1 0	8 9	N/A	0 5 0 0 0	
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OPERATING MODE (8) N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)									
POWER LEVEL (10) 0 1 0 1 0	20.406(b)	20.406(c)	50.73(e)(2)(iv)	73.71(b)						
	20.406(e)(1)(i)	50.36(e)(1)	50.73(e)(2)(v)	73.71(c)						
	20.406(e)(1)(ii)	50.36(e)(2)	50.73(e)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 365A)						
	20.406(e)(1)(iii)	50.73(e)(2)(i)	50.73(e)(2)(vii)(A)							
	20.406(e)(1)(iv)	50.73(e)(2)(ii)	50.73(e)(2)(vii)(B)							
20.406(e)(1)(v)	50.73(e)(2)(iii)	50.73(e)(2)(ix)								

LICENSEE CONTACT FOR THIS LER (12)

NAME S. W. Chesnutt, Supervisor, Nuclear Licensing-Compliance	TELEPHONE NUMBER 3 0 3 6 2 0 1 - 1 0 2 1 7
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (if yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

In a letter from General Atomics (GA) to Public Service Company of Colorado (PSC) dated May 10, 1988, GA informed PSC that an error had been discovered in the open building CONTEMPT-G program used in developing the FSV Environmental Qualification temperature profiles for equipment qualification. The error caused the CONTEMPT-G program to calculate lower peak temperatures for certain line break scenarios. GA contended that with the error corrected, certain previously analyzed and acceptable scenarios now had peak temperatures outside of the NRC approved composite profiles. PSC contracted Numerical Applications Inc. (NAI) to analyze the scenarios used by GA to develop FSV building temperature profiles. NAI analysis results confirmed GA's temperature profiles obtained from the CONTEMPT-G program were non-conservative. Upon receipt of NAI's analysis results, PSC notified the NRC on August 16, 1988 in accordance with the requirements of 10CFR 50.72(b)(2)(iii)(D).

New temperature profiles have been developed by NAI. PSC has verified that all E.Q. equipment qualified to the original GA temperature profile is also qualified to the new NAI profile. Additionally, PSC has modified the Steam Line Rupture Detection Isolation System (SLRDIS) to actuate at a fixed setpoint of less than or equal to 171 degrees F.

This supplemental report provides final status of the E.Q. binder review, temperature profile development, and SLRDIS modifications.

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NOTE: If more space is required, use additional NRC Form 366A's (17)

BACKGROUND:

In accordance with the requirements of 10CFR 50.49, Public Service Company of Colorado (PSC) developed and implemented an Environmental Qualification (E.Q.) program in 1986 and 1987. The purpose of environmental qualification is to assure the ability of certain safety related and safe shutdown equipment to withstand the effects of accidents resulting in harsh environments. The FSV E.Q. program is based upon the existence of a Steam Line Rupture Detection Isolation System (SLRDIS) which automatically detects and isolates high energy steam line breaks. A major aspect of the FSV E.Q. program was the development of reactor and turbine building temperature profiles that would result from various postulated high energy line breaks (HELBs). These individual temperature profiles were utilized in the development of composite temperature profiles to which equipment at FSV was qualified.

PSC contracted General Atomics (GA) to develop the building temperature profiles used for equipment qualification. GA developed these profiles using two computer programs, FLASH/GA and CONTEMPT-G. The FLASH/GA program was used to obtain pipe break blowdown rates and the CONTEMPT-G program was used to develop building temperature profiles. GA developed numerous scenarios to consider breaks in all high energy lines from full offset ruptures to partial breaks. Scenarios were analyzed with 100%, 75%, 50%, 25%, 10%, 3%, 2%, 1% and smaller sized breaks. By analyzing this large spectrum of breaks, the final temperature profiles that represent the most limiting environmental conditions were established.

EVENT DESCRIPTION:

In support of the research and development of the FSV E.Q. program, GA was contracted to determine building temperature responses in the event of various HELB scenarios. GA utilized the CONTEMPT-G computer program for determining these building temperature responses. This computer program was initially developed by the Phillips Petroleum company in 1967 for water reactors and was oriented towards small compartmentalized building volumes. Therefore, in order to utilize the CONTEMPT-G program in determining building temperature responses at FSV, it was necessary that GA modify the CONTEMPT-G program for an open building application. Following program modification, GA pursued the development of the building temperature profiles that would be used as the basis for equipment qualification. These temperature profiles were submitted to the NRC as part of the overall E.Q. program review.

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The NRC review included an independent verification of two scenarios (i.e., large and medium breaks) from each building. This independent review was performed by Pacific Northwest Laboratories (PNL) using the COBRA computer program. As a result of the initial review, discrepancies were identified between the peak temperatures determined by COBRA vs. CONTEMPT-G. Discussions with the NRC in November, 1986 led to the conclusion that use of different heat transfer coefficients by GA and PNL caused these discrepancies. It was decided that PSC would reanalyze six selected scenarios using the heat transfer value used by PNL in addition to reducing conservatisms of the prior analysis. Following completion of this reanalysis, the NRC again had PNL perform an independent check of the new temperature profiles. The results of PNL's analysis were in acceptable agreement with GA's and the FSV temperature profiles were approved by the NRC (Ref. 1).

Subsequent to the reanalysis process identified above, GA identified an error in the open building CONTEMPT-G program. This error caused instability in program output when size changes were made to the computational time steps. The temperature profiles approved by the NRC (Ref. 1) were generated while this error in the open building CONTEMPT-G program was in place. GA corrected the error and under its own direction, performed additional analysis to study the impact of this program error on the building temperature profiles. GA notified PSC via GP-3118 dated May 10, 1988, that after correcting the program error and analyzing the various steam line rupture scenarios, several resultant temperature profiles exceeded the composite envelope profiles utilized for equipment qualification. PSC was unfamiliar with GA's basis and rationale for the CONTEMPT-G program change (Ref. 2) and contracted Numerical Applications Inc. (NAI) to independently verify the new temperature profiles generated by the modified CONTEMPT-G program. NAI's analysis results concluded that the old GA profiles were non-conservative and informed PSC of this finding. PSC reviewed NAI's results and agreed with NAI's conclusion. On August 16, 1988 following PSC's review, NRC notification was made per the requirements of 10CFR 50.72(b)(2)(iii)(D).

CAUSE DESCRIPTION:

Due to the long period of time (over 10 years) that the program error had existed in the open building CONTEMPT-G program, it is difficult to specifically identify and correct all the various factors that contributed to this issue. The "root cause" for this event was that inappropriate assumptions were made in the open building CONTEMPT-G program that were not identified in the verification process.

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TEXT (If more space is required, use additional NRC Form 386A's) (17)

It should be noted that in the early stages of the E.Q. issue, emphasis was placed on large steam line breaks with considerable mass and energy discharges. Although small partial breaks were certainly recognized as plausible events, the open building CONTEMPT-G program was primarily validated against large line break scenarios. The results of these validation efforts, even with the program error in place, agreed closely with other industry computer codes. Even during the NRC independent verification of the GA profiles, PNL analyzed only the large and medium line break scenario data provided them by PSC. No comparative analysis was performed by PNL on the small line break scenarios. Additionally, it was discovered as a part of this current evaluation that an apparent error was made in the modelling assumptions utilized for the analyses. This apparent error produced results which closely paralleled GA's errant CONTEMPT-G code results.

SAFETY ANALYSIS:

Since the computer code utilized to develop the FSV E.Q. temperature profiles contained an error, certain FSV equipment could have been qualified to less limiting criteria than what would have actually existed during an HELB. In such an event, equipment items exposed to harsh environments in excess of their qualification rating could conceivably have failed to perform their safety functions. Therefore, this event alone could have prevented the safety function of equipment needed to mitigate the consequences of an HELB accident and was reported pursuant to 10CFR 50.73(a)(2)(v)(D).

PSC utilized NAI to generate new temperature profiles to which E.Q. equipment is now qualified. NAI performed this task using a version of the COBRA computer code. The new composite profile generated by this code has a substantially lower peak building temperature than the old GA CONTEMPT-G profiles, but sustains a higher temperature for a longer period of time (see Figure 1). Analyses of numerous postulated smaller HELBs have established that a SLRDIS fixed high temperature trip setpoint of less than or equal to 171 degrees F will limit the magnitude of the delayed building temperature peaks. This trip setpoint ensures that postulated smaller HELBs are detected and automatically isolated to limit the building elevated temperature and allow for operator access into the building within acceptable time limits. This fixed high temperature trip setpoint has been incorporated into the Technical Specifications (Ref. 3).

PSC has performed a complete review of the FSV E.Q. Binders and determined that all E.Q. equipment originally qualified to the GA CONTEMPT-G composite profile is also qualified to the NAI composite profile, with or without the 171 degrees F SLRDIS fixed high temperature trip (see EE-EQ-0068). Therefore, at no time was the plant operated with E.Q. equipment not properly qualified.

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CORRECTIVE ACTIONS:

GA corrected the error in the open building version of the CONTEMPT-G code.

| Numerical Applications Incorporated (NAI) developed PSC's new building temperature profiles using a version of the COBRA computer code. These profiles | are now the basis for FSV equipment qualification.

| PSC has modified SLRDIS to actuate at a fixed setpoint of less than or equal to | 171 degrees F. This fixed high temperature trip setpoint has been incorporated | into the Technical Specifications (Ref. 3).

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		8	012	02	06	OF	08

TEXT (If more space is required, use additional NRC Form 386A's) (17)

REFERENCES:

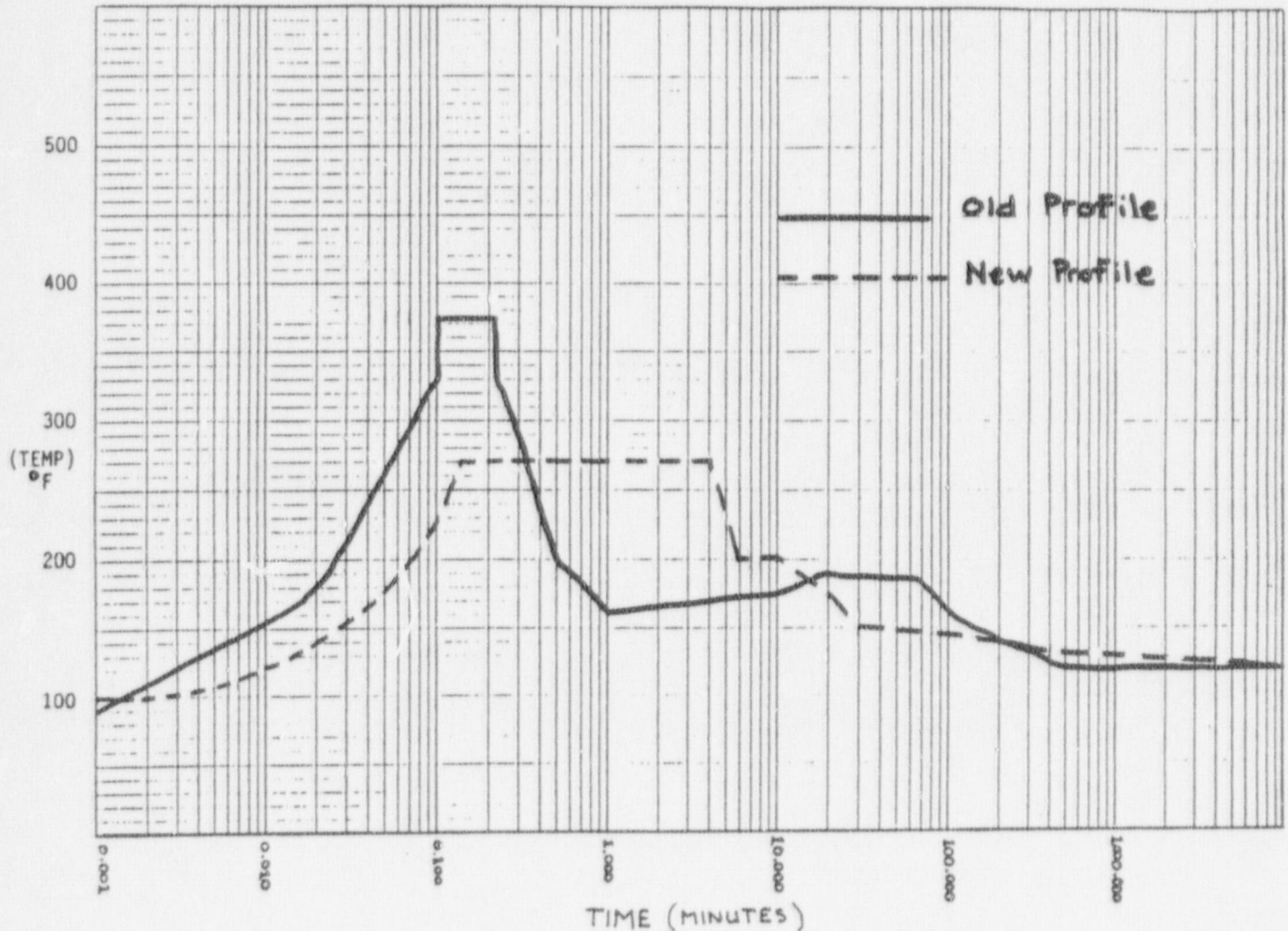
1. K. L. Heitner to R. O. Williams, "Approval of Fort St. Vrain Temperature Pressure Profiles" NRC letter dated March 13, 1987 (G-87071).
2. D. W. Warembourg to D. Alberstein, "Reactor and Turbine Building Temperature Profiles" PSC letter number PG-1738, June 9, 1988.
3. K. L. Heitner to R. O. Williams, "Amendment No. 68 to Facility Operating License No. DPR-34" NRC letter dated February 27, 1989 (G-89079).

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Figure 1.



Note: These profiles are only approximations and are provided for illustration purposes only.

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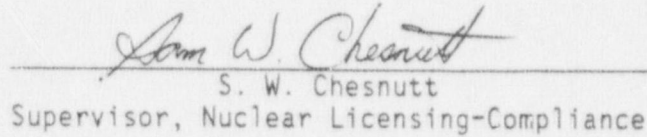
FACILITY NAME (1)  Fort St. Vrain, Unit No. 1	DOCKET NUMBER (2)  05000267	LER NUMBER (6)			PAGE (3)		
		YEAR 88	SEQUENTIAL NUMBER - 012	REVISION NUMBER - 02			

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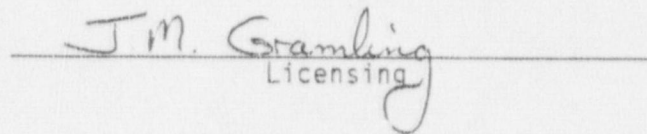
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Jim Hill  
Nuclear Licensing Engineer



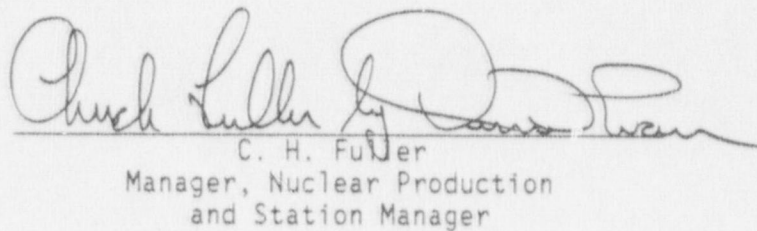
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S. W. Chesnutt  
Supervisor, Nuclear Licensing-Compliance



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J.M. Gramling  
Licensing



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C. H. Fuller  
Manager, Nuclear Production  
and Station Manager





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16805 W<sup>th</sup>R 19 1/2, Platteville, Colorado 80651

May 10, 1989  
Fort St. Vrain  
Unit No. 1  
P-89173

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

Docket No. 50-267

SUBJECT: Licensee Event Report  
88-012-02, Final Report

REFERENCE: Facility Operating  
License No. DPR-34

Gentlemen:

Enclosed, please find a copy of Licensee Event Report No. 50-267/88-012-02, Final, submitted per the requirements of 10 CFR 50.73(a)(2)(v)(D).

If you have any questions, please contact Mr. M. H. Holmes at (303) 480-6960.

Sincerely,

C. H. Fuller  
Manager, Nuclear Production  
and Station Manager

Enclosure

cc: Regional Administrator, Region IV  
ATTN: Mr. T. F. Westerman, Chief  
Projects Section B

Mr. R. E. Farrell  
Senior Resident Inspector, FSV

CHF/lmb

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