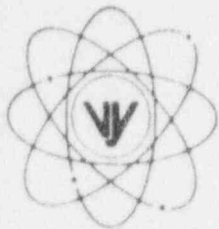


# VERMONT YANKEE NUCLEAR POWER CORPORATION



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October 7, 1996  
BVY 96-115

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

Reference: (a) License No. DPR-28 (Docket No. 50-271)  
(b) BVY 96-59, Vermont Yankee Special Report, Dated 5/2/96

Subject: Licensee Event Report No. LER 96-020

As defined by 10CFR50.73, we are voluntarily reporting the attached information, LER 96-020, to meet Vermont Yankee Technical Specification special reporting requirements.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Robert J. Wanczyk  
Plant Manager

cc: USNRC Region 1 Administrator  
USNRC Resident Inspector - VYNPS  
USNRC Project Manager - VYNPS

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NRC Form 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION  <b>LICENSEE EVENT REPORT (LER)</b>				APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98 ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.							
FACILITY NAME (1) VERMONT YANKEE NUCLEAR POWER STATION						DOCKET NUMBER ( ) 05000271			PAGE (3) 01 OF 04		
TITLE (4) Inadequate vendor design activity and Licensee design verification result in inability to demonstrate Fire Suppression System operability.											
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 NAME	DOCKET NO.(S)	
09	05	96	96	-- 020 --	00	10	07	96	N/A	05000	
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: CHECK ONE OR MORE (11)									
N		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)			
POWER LEVEL (10) 00		20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)			
		20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71			
		20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		X OTHER SPECIAL REPORT			
		20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		(Specify in Abstract below or in NRC Form 366A)			
		20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)					
LICENSEE CONTACT FOR THIS LER (12)											
NAME ROBERT J. WANCZYK, PLANT MANAGER								TELEPHONE NO. (Include Area Code) 802-257-7711			
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	
NA					.....	NA					
NA					.....	NA					
SUPPLEMENTAL REPORT EXPECTED (14)						EXPECTED SUBMISSION DATE (15)		MO	DAY	YEAR	
YES (If yes, complete EXPECTED SUBMISSION DATE)				X	NO						

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On 09/05/96 it was determined that the Vermont Yankee (VY) 4160 Volt Switchgear Room Carbon Dioxide Fire Suppression systems could not be demonstrated to meet National Fire Protection Association Code for extinguishing a "deep seated" cable fire. On 03/29/96 an Appendix R review team revealed that the systems had never been satisfactorily tested to verify that system design requirements were met. VY initiated steps to conduct the necessary testing. Testing and analysis indicated that the as-built CO2 systems would achieve initial CO2 concentrations at or near those cited in the applicable code but the required soak times could not be maintained. The Switchgear Room CO2 systems were therefore declared inoperable, and compensatory measures were verified to be in place. The root causes of this event were inadequate design process controls on the part of a contracted vendor, and inadequate design package review by the VY Cognizant Engineer. VY is replacing the non-conforming High Pressure CO2 systems with a Low Pressure CO2 suppression system and revising procedures as necessary to prevent occurrence of similar events. This voluntary report is being submitted to meet Technical Specification reporting requirements for CO2 suppression systems being inoperable in excess of 14 days.

As the system is capable of automatic detection and initiation, it is deemed capable of extinguishing fires postulated for the affected areas with exception to a deep seated fire. The extent and severity of a deep seated fire would be reduced even for those fire scenarios where the concentration levels and hold times are insufficient to extinguish the fire, allowing more rapid extinguishment by the fire brigade. Therefore, this event is considered to have no safety significance.

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#### DESCRIPTION OF EVENT

On 09/05/96 it was determined that the VY 4160 Volt Switchgear Room Carbon Dioxide Fire Suppression systems (EIS = KQ) could not be demonstrated to meet National Fire Protection Association (NFPA) Code for extinguishing a "deep seated" cable fire. The adequacy of the VY CO2 suppression systems for the East and West Switchgear Rooms came into question on March 29, 1996, when the specifics of the design were evaluated as part of a 10CFR50 Appendix R review. Reviewers noted that the systems had never been successfully tested. The ability to achieve and maintain (soak time) the CO2 concentration established in NFPA 12 for systems designed to extinguish deep seated cable fires had not been demonstrated. VY believed, at that time, that the CO2 suppressions systems could be shown to meet code requirements. VY therefore initiated steps to conduct switchgear room CO2 system functional testing consistent with testing methodologies referenced in NRC Information Notice 92-28. The analysis of test results indicated that the as-built CO2 systems would achieve CO2 concentrations at or near those cited in the code but the required soak times could not be met. The Switchgear Room CO2 systems were therefore declared inoperable. Technical Specification compensatory measures, originally established when the systems' capabilities were called into question, were maintained.

#### CAUSE OF EVENT

The cause analysis revealed two root causes:

1. The contracted vendor's Design Control Program was inadequate to assure the adequacy and quality of the design output documents.
2. The failure of the VY Cognizant Engineer to ensure that an independent design review was performed for the original CO2 system design (cognitive error).

#### ANALYSIS OF EVENT

On 05/02/96, VY notified the NRC of the inoperability of the Switchgear CO2 system in accordance with the VY Technical Specifications in VY Special Report (BVY 96-59). The letter included a commitment that testing and analysis would be implemented to confirm the CO2 system capability to achieve and maintain the post initiation concentration required.

The original system design, implemented in 1978, was outsourced to a commercial fire protection systems vendor. The purchase specifications referenced NFPA 12-1977 code requirements but did not include other applicable requirements. A review of the design calculations revealed that the CO2 suppression system was sized using a combination of conservative room dimensions and qualitative correlations rather than quantifiable inputs.

The design post-installation test procedure failed to identify all relevant performance requirements of NFPA 12-1977. The stated acceptance criteria omitted NFPA code requirements for rate of CO2 flooding (achieving a 30% CO2 concentration within two minutes, and 50% within seven minutes). The test stated that the system was required to achieve a 50% initial concentration and maintain  $\geq 44\%$  concentration for thirty minutes following initial discharge.

Plant procedures required that an independent design review be conducted by the Yankee Nuclear Support Department in accordance with Engineering Instructions. However, due to the cognitive error on the part of the Cognizant Engineer, no design verification was performed.

In September of 1980 the post installation full CO2 discharge test was conducted to verify the operational capability of the newly installed CO2 suppression system. The test showed that the system, as originally configured, would neither achieve nor maintain the design CO2 concentrations in the upper elevations. The vendor evaluated the test data and recommended several

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adjustments to improve system performance. Per vendor recommendations, the CO2 discharge rate was reduced by 50% to address a room pressurization concern. The vendor also recommended altering switchgear room fire damper controls to allow 5 minutes after CO2 Suppression System auto initiation signal, before closing the room exhaust fire damper. This change was made to provide an elevated vent path for displaced air, addressing both the overpressurization and initial CO2 concentration issues. The plant elected to accept the revised system design based on the vendor analysis rather than perform a second discharge test.

In 1982 a second plant design change was implemented which divided the Switchgear Room with a fire wall and modified the existing CO2 system, splitting it into two functionally independent systems.

On 03/29/96, The functional capability of the VY CO2 suppression systems for the east and west switchgear rooms were called into question when the design was evaluated as part of an Appendix R review. VY then initiated steps to conduct switchgear room CO2 system testing consistent with alternate testing methodologies referenced in NRC Information Notice 92-28.

On 09/05/96 the results of these tests were issued. The results indicated that as-built CO2 systems would achieve CO2 concentrations at or near those cited in the applicable code. Calculations indicated that initial CO2 concentrations of 58% in the West Switchgear room and 46% in the East Switchgear Room would be attained. Gas tracer tests indicated that the required soak times could not be demonstrated.

#### Safety Significance

The CO2 suppression systems can be expected to actuate under anticipated fire scenarios and provide some level of suppression. The issues raised in the analysis of the 1996 room pressurization and tracer gas test results are most applicable to extinguishing deep seated fires. These types of fires require that CO2 concentration levels be held for a significant period of time to ensure that the fire is extinguished. The extent and severity of a deep seated fire would be reduced, even for those fire scenarios where the concentration and hold times are insufficient to extinguish the fire, allowing more rapid extinguishment by the fire brigade

VY has Technical Specification controlled fire detection in both Switchgear Rooms which would initiate the applicable suppression system if required. The detection system would also warn plant personnel and the Fire Brigade would be immediately dispatched to combat the fire.

Therefore this condition is considered to be of no nuclear safety significance and presents no threat to public health or safety.

#### CORRECTIVE ACTIONS

##### Immediate Actions:

1. An Event Report was initiated and reviewed by plant management.
2. The CO2 suppression systems for the East and West Switchgear Rooms were declared inoperable and required compensatory measures were verified to be in place in accordance with Technical Specifications.



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Long Term:

1. Replace the current high pressure CO2 suppression systems for the East and West Switchgear Rooms with a low pressure system capable of achieving and maintaining design concentrations in both switchgear rooms. (expected completion date: 11/30/96).
2. Evaluate existing guidance in engineering process procedures and revise as necessary, to ensure that the requirements for design verification, as applied to vendor supplied design output documents are clearly defined.
3. Review applicable procedures to ensure that purchase specifications for outside engineering services clearly state that design output documents supplied to verify that the adequacy of the design meets minimum technical and quality requirements (expected completion date: 12/31/96).
4. Revise applicable procedures to assure appropriate Quality Assurance program requirements and surveillance controls are specified for similar applications involving outside engineering services (expected completion date: 12/31/96).
5. Training for appropriate Engineering staff in the preparation, review, and approval of design changes and design documents will be provided upon revision of the cited engineering and site administrative procedures (expected completion date: 2/15/97).

ADDITIONAL INFORMATION

Several design and analytical solutions have been evaluated which meet current VY licensing commitments and design bases. VY has opted to replace the systems with a modern low pressure automatic CO2 suppression system which meets both NFPA code and current VY standards. VY considers this the best approach in light of the importance of the equipment protected and future system maintainability. VY intends to pursue replacement of the Switchgear Room CO2 systems on an expedited basis, but does not anticipate completion prior to start up from the current refueling outage. Technical Specification required compensatory measures will remain in place until the system is fully restored.

Similar events in the past five years have been reported as LER 96-13, Two fire suppression systems not meeting design requirements; LER 96-10, Inadequate RHR Pump Min-Flow protection due to inadequate design and design review; and LER 96-08, Block wall calculation error, inadequate independent review.