

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION

P. O. BOX 2300

SANATOGA, PA 19464-2300

(215) 327-1200 EXT. 2000

J. DOERING, JR.
PLANT MANAGER
LIMERICK GENERATING STATION

March 30, 1993
Docket Nos. 50-352
50-353
License Nos. NPF-39
NPF-85

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

SUBJECT: Licensee Event Report
Limerick Generating Station - Units 1 and 2

This LER reports a condition prohibited by Technical Specifications (TS) in that the Toxic Gas Detection system was inoperable for the detection of ammonia since initial installation due to a system response time in excess of the design requirements, and the TS Actions were not taken in the specified period of time.

Reference:	Docket Nos. 50-352 50-353
Report Number:	1-93-003
Revision Number:	00
Event Date:	October 26, 1984
Discovery Date:	February 17, 1993
Reportability Date:	March 3, 1993
Report Date:	March 30, 1993
Facility:	Limerick Generating Station P.O. Box 2300, Sanatoga, PA 19464-2300

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B).

Very truly yours,

KDS:cah

cc: T. T. Martin, Administrator, Region I, USNRC
T. J. Kenny, USNRC Senior Resident Inspector, LGS

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LICENSÉE EVENT REPORT (LER)

FACILITY NAME (1) Limerick Generating Station, Unit 1										DOCKET NUMBER (2) 0 5 0 0 0 3 5 2										PAGE (3) 1 OF 0 5																													
TITLE (4) A condition prohibited by Technical Specifications in that the Toxic Gas Detection System was inoperable for the detection of ammonia since initial installation.																																																	
EVENT DATE (5)										LER NUMBER (6)										REPORT DATE (7)										OTHER FACILITIES INVOLVED (8)																			
MONTH			DAY			YEAR			YEAR			SEQUENTIAL NUMBER			REVISION NUMBER			MONTH			DAY			YE / R			FACILITY NAMES										DOCKET NUMBER(S)												
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OPERATING MODE (9) 1										THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11)																																							
POWER LEVEL (10) 1 0 0										20.402(b)										20.405(c)										50.73(a)(2)(iv)										73.71(b)									
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										20.405(a)(1)(iii)										50.36(c)(2)										50.11(a)(2)(vii)										OTHER (Specify in Abstract below and in Text, NRC Form 386A)									
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LICENSEE CONTACT FOR THIS LER (12)																																																	
NAME G. J. Madsen, Regulatory Engineer, Limerick Generating Station																				TELEPHONE NUMBER 2 1 5 3 2 7 - 1 2 0 0																													
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																																																	
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SUPPLEMENTAL REPORT EXPECTED (14)																				EXPECTED SUBMISSION DATE (15)										MONTH DAY YEAR																			
YES (If yes, complete EXPECTED SUBMISSION DATE)																				X NO																													

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

On March 3, 1993, the 'A' and 'B' Toxic Gas Analyzers were declared inoperable since the analyzers would not respond to the presence of ammonia in adequate time to allow operators 120 seconds to don Self Contained Breathing Apparatus (SCBA) as specified in the Limerick Generating Station Updated Final Safety Analysis Report. The condition has existed since original construction. The Main Control Room (MCR) ventilation was placed in an isolated mode such that analyzer response time was within acceptable limits until the analyzers were declared operable in the normal mode of operation. The consequences of this event were minimal since the operators would have had sufficient time to detect the odor of ammonia, don SCBA and initiate a manual isolation of the MCR ventilation system in accordance with approved procedures. The cause of this event was an original hardware deficiency in that the analyzers were not capable of alarming the presence of ammonia within the required response time. A contributing cause of this event was less than adequate testing of the analyzers prior to initial startup. On March 6, 1993, the analyzer flush times were reduced to lower the overall analyzer response time while maintaining analyzer operability. This new response time limit was determined using known values of wind speed and building wake effects rather than the estimated values used in the original design calculations. The reduced flush time has been incorporated into the site procedures.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

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

Unit Conditions Prior to the Event:

Unit 1 was in Operational Condition (OPCON) 1 (Power Operation) at 100% power level and Unit 2 was in OPCON 5 (Refuel) at 0% power level at the time of discovery of the event. Both units have operated at various power levels and all OPCONs since receipt of their Low Power Operating Licenses which were issued on October 26, 1984 and June 22, 1989, respectively. There were no structures, systems or components out of service which contributed to this event.

Background:

On February 17, 1993 a concern was identified by the Toxic Gas Analyzer System Manager at the site regarding the response time of the Toxic Gas Analyzers (EIIIS:VI) associated with the Main Control Room (MCR) Heating, Ventilation and Air Conditioning (HVAC) system (EIIIS:VI) while aligned in the normal fresh air supply mode of operation. The concern was identified as a result of investigating methods to improve the reliability of the Toxic Gas Analyzer system. As a result of this concern, the System Manager timed the Toxic Gas Analyzer system cycle time at 90 seconds on February 17, 1993. Further analysis has determined that a worst case scenario based on this cycle time resulted in a calculated 315 second response time. These results were confirmed on February 23, 1993 via telecon with Foxboro, the manufacturer of the Toxic Gas Analyzer system. However, an analyzer response time of 40 seconds was used by the Architect Engineer (A/E) in the original design basis calculations. A Nonconformance Report (NCR) was initiated to evaluate the Toxic Gas Analyzer response time that was used in the design basis calculations to determine Toxic Gas Analyzer operability and MCR habitability following postulated release of toxic gases at or near the site.

Limerick Generating Station (LGS) Updated Final Safety Analysis Report (UFSAR) Section 6.4.1 identifies a commitment to comply with Regulatory Guide (RG) 1.78, "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," June, 1974. RG 1.78 specifies advance notification to MCR personnel of the detection of a toxic gas to allow two (2) minutes to don Self Contained Breathing Apparatus (SCBA) prior to MCR concentrations reaching the incapacitation limits. A "Toxic Chemical Incapacitation Level Study" was performed by the A/E for LGS during the design process to determine the chemicals that need to be monitored, the required monitor setpoints and incapacitation times of chemicals to be monitored based on the MCR design inlet leakage rate. Acceptable concentration levels were based on conformance with the RG 1.78 guidance and engineering judgement to factor in uncertainties in the models and chemical data. The Toxic Gas Analyzer system at LGS monitors for ammonia, ethylene oxide, phosgene, vinyl chloride and formaldehyde. The Toxic Gas Analyzers provide an alarm in the MCR when the monitored concentration of these gases exceeds the alarm setpoint and MCR operators implement Special Event (SE) procedure SE-2, "Toxic Gas," which requires donning of SCBA and manually initiating a MCR HVAC isolation.

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In order to ensure Toxic Gas Analyzer system operability while the investigation into the design basis continued, the MCR HVAC system was placed in the radiation isolation mode of operation on February 19, 1993. This mode of operation uses less outside air inflow to the MCR (i.e., 525 scfm rather than the 2100 scfm nominal outside air flowrate in the normal MCR HVAC mode of operation) while still maintaining a positive MCR differential pressure relative to the turbine enclosure. The reduced outside air flow rate causes an increase in the transport time of the toxic gas into the MCR environment that in turn permits a longer Toxic Gas Analyzer system response time, while still maintaining the design basis assumptions regarding MCR habitability. Prior to placing the MCR HVAC system in the radiation isolation mode of operation, Engineering determined that the Toxic Gas Analyzers would be operable and able to meet their design function with the MCR HVAC in the radiation isolation mode of operation.

Description of the Event:

On March 3, 1993, during the disposition of NCR 93-00119 it was concluded that the 'A' and 'B' Toxic Gas Analyzers had been inoperable for the detection of ammonia since issuance of the Low Power Operating Licenses for LGS, Units 1 and 2. It was determined that the analyzers would not have responded to the presence of ammonia in adequate time to annunciate the MCR alarm and allow the operators two minutes to don SCBA as specified in LGS UFSAR Section 6.4.1. The Toxic Gas Analyzers were determined to be operable for the remaining monitored gases.

Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.3.7.8.2 ACTION b requires the initiation of a MCR chlorine isolation within one hour of both Toxic Gas Analyzers being declared inoperable. A condition prohibited by TS existed since it was determined that the Toxic Gas Analyzers were not operable since issuance of the Low Power Operating Licenses for LGS, Units 1 and 2, for the detection of ammonia, and the TS ACTION was not implemented within the required time. This event is being reported in accordance with the requirements of 10CFR50.73(a)(2)(i)(B).

Analysis of the Event:

The consequences of this event were minimal since operators would have had sufficient time to detect the odor of ammonia, don SCBA, and initiate a Toxic Gas isolation of the MCR HVAC system in accordance with procedure SE-2 prior to becoming incapacitated. According to the calculations performed in the disposition of NCR 93-00119, the operators would have had 163 seconds to detect the odor of ammonia, while still allowing an additional two minutes to don SCBA prior to reaching the incapacitation concentration of 980.5 ppm for ammonia in the MCR. The MCR licensed operators are trained in the detection of various odors (e.g., ammonia, wintergreen, alcohol, and smoke) in their annual medical examinations, and procedure SE-2 contains specific descriptions of the various odors. Additionally, the Toxic Gas Analyzers were capable of identifying the presence of ammonia throughout this period and would normally respond significantly sooner than the worst case 315 seconds. This worst case response

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time includes a once-per-hour 180 second nitrogen zero cycle. At other times throughout the hour, the analyzers would respond to the presence of ammonia within 135 seconds. Therefore, there is reasonable assurance that the MCR operators would have been alerted to the presence of ammonia and would have implemented the necessary actions prior to becoming incapacitated. There have been no known instances of actual high ammonia readings on the Toxic Gas Analyzers nor detection of the odor of ammonia in the MCR since the startup of Unit 1.

Cause of the Event:

The cause of this event was an original hardware deficiency in that the 'A' and 'B' Toxic Gas Analyzers were not capable of providing response to the presence of ammonia within the design basis required response time. The original MCR habitability calculations assumed that the Toxic Gas Analyzers were capable of monitoring five (5) gases simultaneously with a combined response time of 40 seconds for any gas. This was based on a misinterpretation of the analyzers' capabilities which provide a 40 second response time when monitoring for any single gas. The original MCR habitability calculation concluded that the UFSAR requirements were met. A contributing cause of this event was less than adequate testing of the Toxic Gas Analyzers following receipt from the vendor prior to initial plant startup. The actual analyzer cycle time was never confirmed or analyzed to determine if it met the design specification response time of 40 seconds.

Corrective Actions:

The disposition of NCR 93-00119 concluded the Toxic Gas Analyzers would be made operable by revising the analyzers' flush time to 10 seconds which would reduce the worst case analyzer response time from 315 seconds to 255 seconds. As explained below, this flush time maintains detector operability. This response time is within the bounds of the recalculation that determined the required monitor response time limit is 262 seconds using known values of duct transport time, wind speed, and building wake effects. The original calculation did not have actual input data available relating to wind speed and building wake effects. Therefore, the original calculation was performed using conservative input values for these parameters. The original calculation had incorrectly concluded, based on conservatism and other assumptions, that the required 120 seconds to don SCBA per RG 1.78 was supported.

Review of the Toxic Gas Analyzer vendor manual shows that the flush time of 40 seconds, previously in use, replaces over 100% of the sample chamber air volume. Atmospheres susceptible to consistent exposure of low levels of toxic chemicals require flush times great enough to ensure 100% replacement of the sample chamber volume. However, the air environment at LGS infrequently exposes the sample chamber to toxic gases, and the use of a flush time yielding over 100% sample chamber flushing is over-designed. A flush of 10 seconds yields a 95% sample chamber flush which is adequate for the LGS environment as determined in the

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disposition of NCR 93-00119. This adjustment to the flush time was accomplished on both Toxic Gas Analyzers on March 6, 1993. Both Toxic Gas Analyzers were declared operable and the MCR HVAC was returned to the normal mode of operation at 1705 hours.

Foxboro is contracted to provide Preventive Maintenance and calibration services on the analyzers. Foxboro was requested to incorporate the 10 second flush time into the parameter requirements for the LGS analyzers. Procedures are used on site, upon receipt of the Toxic Gas Analyzers from Foxboro, to ensure that all parameters have been properly entered into the analyzer memory. The following calibration and functional Surveillance Test (ST) procedures will be revised by April 2, 1993, to incorporate the new 10 second flush time:

- o ST-2-078-404-0, "Toxic Gas Detection System - Control Enclosure Air Intake, Channel A, Calibration/Functional Test,"
- o ST-2-078-405-0, "Toxic Gas Detection System - Control Enclosure Air Intake, Channel B, Calibration/Functional Test,"
- o ST-2-078-604-0, "Toxic Gas Detection System - Control Enclosure Air Intake, Channel A, Functional Test," and
- o ST-2-078-605-0, "Toxic Gas Detection System - Control Enclosure Air Intake, Channel B, Functional Test,"
- o and Instrumentation and Controls (IC) procedure IC-11-00491, "Procedure for the Checkout of Foxboro Miran 981 Toxic Gas Analyzer."

The Toxic Gas Analyzer System Manager has confirmed that all other requirements of the design specification 8031-M-261, "Specification for the Toxic Chemical Detection system," and the other design basis requirements in the UFSAR for the Toxic Chemical Detection System have been satisfied.

Additionally, UFSAR Table 2.2-6 will be revised to indicate a required monitor response time of less than 262 seconds, in accordance with the disposition of NCR 93-0019.

Previous Similar Occurrences:

LERs 85-065 and 86-043 reported calibration problems with the Toxic Gas Analyzers which were unrelated to the monitor response time. Therefore, the corrective actions from these previous events could not have prevented this event.