NRC FORM 366 (4/95)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 4/30/98

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

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	Page (3)
CONSUMERS ENERGY COMPANY PALISADES NUCLEAR PLANT	05000255	1 of 6

TITLE (4) LICENSEE EVENT REPORT 98-002 - POTENTIAL CHALLENGE TO CHANNEL SEPARATION

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 NUMBER
01	12	98	98	002	00	02	10	98		05000
									FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	N
POWER LEVEL (10)	0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(iii)
	20.2203(a)(1)		20.2203(a)(3)(i)	X	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)		OTHER
	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	TELEPHONE NUMBER (Include Area Code)
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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
B	BQ	DAL							

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES If yes, COMPLETE EXPECTED COMPLETION DATE	X	NO				

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

While making preparations for the 1998 refueling outage, it was discovered that channel separation between two nuclear instrumentation channels had been compromised during the 1996 refueling outage. Temporary Modification (TM) 96-053 installed a data logger during the 1996 refueling outage to allow core monitoring during fuel movement. The TM tied together signal commons from two redundant Class 1E channels of source/wide range nuclear instrumentation (NI-1/3A and NI-2/4A) to a single data logger system ground. Lack of adequate isolation devices, used between each Class 1E NI channel and the datalogger, resulted in a configuration violating NI channel separation criteria when the channel commons were connected to a common point within the datalogger while the TM was installed. No immediate actions were required as the system had been returned to a configuration meeting design basis separation criteria as part of removal of the TM before the end of the 1996 refueling outage. We have determined that this TM put the plant in a condition outside its design basis and is being reported under 10 CFR 50.73(a)(2)(ii)(B).

EVENT DESCRIPTION

During the 1996 refueling outage, a Temporary Modification (TM) was processed to connect a data logger to nuclear source/wide range neutron monitoring channels NI-1/3A and NI-2/4A, to monitor core performance during refueling operations. Prior to the TM, the data logger was connected to the optically isolated outputs of NI-1/3A and NI-2/4A in parallel with the audio count-rate monitor. This previous configuration was found to be inadequate in that the data logger and audio count rate monitor could over-load the isolation circuit from the NI channels. To remedy this potential problem, it was decided to process the TM to use fused outputs from the NI channels instead of the optically isolated outputs.

To alleviate isolation circuit overloading, TM 96-053 was implemented to connect the data logger to the fused spare pulse output jack J12 in each nuclear instrumentation channel, NI-1/3A and NI-2/4A. Without complete evaluation of the isolation capability of the fuses, this configuration was considered an acceptable Class 1E/Non-Class 1E connection at the time because the outputs of the NIs from the J12 jacks are protected by 1/16 amp fuses in the signal and common leads. Since it was determined that the fuses provided an acceptable Class 1E/Non-Class 1E isolation, channel separation was not considered an issue. The TM was installed on November 12, 1996, and removed December 3, 1996. The plant was in refueling shutdown at all times while the TM was installed.

As described later, it was not identified until 1998 that the fuses may not have provided the level of circuit protection necessary to provide the needed Class 1E/Non-Class 1E isolation and, in turn, resulted in a configuration violating NI channel separation criteria when the channel commons were connected to a common point within the datalogger while the TM was installed. Had adequate isolators been employed, electrical disturbances within the datalogger could not have affected Class 1E NI channels, and the configuration would have been acceptable from a channel separation standpoint.

Preparations for the 1998 refueling outage included development of a plant procedure for installation of the data logger using the J12 fused outputs, which is the same configuration installed during the 1996 refueling outage. This procedure was written to avoid having to perform another temporary modification when the instrumentation was needed. As part of the procedure technical review, the NI vendor was contacted. The vendor, Gamma Metrics, recommended not connecting both NI-1/3A and NI-2/4A together with the data logger via the fused outputs, as this ties the circuit commons of both NI drawers together through grounding within the data logger. Further investigation of the data logger configuration revealed that circuit commons were indeed tied together. At this point, it was determined that during the 1996 refueling outage when NI-1/3A

and NI-2/4A were connected to the data logger from November 12, 1996 until December 3, 1996, these redundant channels were tied together through grounding within the data logger without adequate circuit isolation, resulting in violation of channel separation criteria.

ANALYSIS OF EVENT

The source/wide range nuclear instrumentation channels NI-1/3A and NI-2/4A are redundant Class 1E left and right instrumentation channels. During normal operation, the source and wide range outputs are used as inputs to the reactor protection system. During refueling operations, these channels have been used to meet technical specification requirements to monitor neutron flux by two source range monitors providing continuous visual indication in the control room.

Connecting the signal commons of the two redundant channels without proper redundant channel isolation violates the channel separation required for channel redundancy which is described in the following FSAR sections.

- FSAR section 7.6.2.2 states that "Each redundant source/wide range channel is separated and fed through different penetrations."

- FSAR Appendix 7C also lists NI-1/3A and NI-2/4A as redundant Regulatory Guide 1.97 rev 3 Category 1 instruments, and states that "Redundant or diverse channels should be electrically independent and physically separated from each other and from equipment not classified important to safety in accordance with RG 1.75, 'Physical Independence of Electric Systems', up to and including any isolation device."

Originally, when the data logger was connected to the optically isolated channel outputs, the channel separation design criteria was not challenged as the circuits downstream of the isolators were considered Non-Class 1E and outside the boundary of the Class 1E system. When the data logger was connected to the fused channel outputs, the level of circuit protection afforded by the fuses was not sufficient to isolate the downstream circuits from the signal source. Therefore, when it was recognized that the fused outputs were connected via a common ground in the data logger, it was also recognized that design basis separation criteria had been violated.

The original plans for the 1996 refueling outage were to use the optically isolated channel outputs for core monitoring as had been the practice in the past. This configuration, however, presented problems in that in certain conditions the audio count rate monitor caused an overload of the optical isolators. To remedy this problem, it was decided to initiate the TM. Thus, the request for

the TM was an emergent issue, occurring just prior to moving fuel during the refueling outage. Utilizing the fused output jack J12 for input to the data logger was considered appropriate since it was thought, albeit erroneously, that the fused outputs provided effective isolation between the Class 1E NIs and the Non-Class 1E data logger. Because of the presumed acceptability of Class1E/Non-Class1E isolation, channel separation was not considered an issue.

Administrative Procedure 9.31, "Temporary Modifications", requires consideration be made to assure that the proposed change is consistent with applicable codes and standards. The technical decisions inappropriately concluded that the Class 1E/Non-Class 1E isolation through the fuses satisfied requirements to maintain channel separation. The conclusion was not based on a detailed analysis of the circuit protection afforded by the fuses and did not consider that the two signal commons from the NI channels would be tied together at the data logger. The manufacturer was not contacted for concurrence of the configuration proposed by the TM because Engineering did not question the separation issue.

The emergent need and classification of the TM contributed to an incomplete evaluation of the proposed electrical configuration. With preparations for fuel moves in progress, and core monitoring capability required before fuel shuffle could begin, a sense of urgency may have over-ridden a consideration to contact the vendor for input. The same TM being prepared and reviewed for the 1998 refueling outage involved a more questioning evaluation which resulted in the vendor being contacted and identification that channel separation integrity would be violated.

The Plant Corrective Action System data base was accessed to determine if other similar events existed. Only one other such event was identified, and involved a 1996 refueling outage TM on the plant polar crane where brake coils were inadequately installed. The improper installation led to an overheating and failure of the coils. This TM was also an emergent issue, with polar crane operation being considered critical path during the refueling outage.

Current practices provide additional barriers serving to prevent similar events. The number of TMs installed in the plant has been significantly reduced minimizing the risk for challenges to the plant design bases. Routine TMs are being incorporated into permanent plant procedures with ample time provided for appropriate and in-depth independent technical reviews. For emergent issues, the plant Safety & Design Review group, as a plant practice, utilizes multi-disciplinary teams to provide a comprehensive review of the safety evaluations for modifications. Implementation of these review practices led to the identification of the deficiency of the TM installed during 1996 refueling outage, and preventing the implementation of that same TM in the 1998 refueling outage.

SAFETY SIGNIFICANCE

No automatic safety feature was required operable when the TM connecting the data logger to NI-1/3A and NI-2/4A was installed. The plant was in cold shutdown for refueling; therefore, the operability of the reactor protective system was not challenged by this temporary condition. The TM was specified and removed prior to leaving cold shutdown.

Technical Specification 3.8.1e, states "Whenever core geometry is being changed, neutron flux shall be continuously monitored by at least two source range monitors, with each monitor providing continuous visual indication in the control room. When core geometry is not being changed, at least one source range neutron monitor shall be in service." Source range indication was available during the TM installation, and was verified by proceduralized periodic surveillance of both nuclear instrumentation channels during refueling operations. In the unlikely event that a failure were to occur that caused a loss of one or both source range channels, fuel movements in progress would have been halted until indication was restored.

CAUSE OF THE EVENT

An inadequate review of the temporary modification caused by a lack of specific knowledge of the configuration of the datalogger, coupled with a less than thorough design review in emergent conditions caused this event.

CORRECTIVE ACTIONS

As a remedial action, TM 96-053 was removed prior to start up from the 1996 refueling outage reestablishing compliance with the design basis. The following actions have been taken to preclude recurrence of this event:

1. Current practices have reduced the risk for challenges to the design basis for the plant:

    a. In many cases, specific controls for future temporary configuration alterations have been incorporated into plant procedures. This practice provides for planned and deliberate design and review for alterations which in the past were implemented by a TM under emergent conditions.

b. When TMs are needed, ample time is provided for design review, allowing time to consult subject matter experts including the vendor. For emergent TMs, multi-disciplinary team reviews of the safety evaluation are performed, as a plant practice, by our Safety and Design Review Group.

2. A briefing of the lessons learned from this event was provided to the Design Engineering Department.