

LICENSEE EVENT REPORT (LER)

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

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FACILITY NAME (1)

Three Mile Island, Unit 1

DOCKET NUMBER (2)

05000289

PAGE (3)

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TITLE (4)
RADIATION MONITOR, RM-A-8G-HIGH, INOPERABLE MORE THAN 7 DAYS DUE TO LESS THAN ADEQUATE PERFORMANCE OF CALIBRATION SURVEILLANCE

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	
08	18	98	98	-- 008	-- 0	09	14	98		05000	
<p>THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)</p>											
OPERATING MODE (9)			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)			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)		<input checked="" type="checkbox"/> 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

Adam Miller, TMI Licensing Engineer

TELEPHONE NUMBER (Include Area Code)

(717) 948-8128

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	IL	DET	V115	N					

SUPPLEMENTAL REPORT EXPECTED (14)

YES

(If yes, complete EXPECTED SUBMISSION DATE).

NO

EXPECTED SUBMISSION DATE (15)

MONTH DAY YEAR

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

On August 18, 1998, it was discovered that an error was made during the performance of calibration surveillance on radiation monitor RM-A-8G High, a Post Accident Monitoring Instrument for the Auxiliary and Fuel Handling Building Exhaust System. The error, made on August 8, 1998, caused RM-A-8G High to be in an inoperable condition; thus upon discovery, RM-A-8G High was determined to have been inoperable for 10 days. TMI-1 Technical Specifications require that a Special Report be prepared and submitted within 30 days if RM-A-8G High is inoperable greater than seven days. The 30-day report is therefore due by September 17, 1998.

The root cause of this event was weaknesses in Instrumentation and Control (I&C) work practices that resulted in an ineffective verification of the surveillance data. A contributing cause was a very challenging data collection form. The root cause of the delay in detecting this problem was an inadequately defined expectation for completion of the technical review of the surveillance procedure. A series of shop meetings will be conducted to strengthen the effectiveness of I&C work practices. These shop meetings will focus on maintaining attention to detail, and will reinforce the expectation to routinely perform a thorough independent review of completed work. Additional corrective actions include revision of the data collection portion of the surveillance procedure and establishment of expectations regarding timely completion of surveillance technical reviews.

There were no adverse safety consequences from this event, and the event did not affect the health and safety of the public.

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I. Plant Operating Conditions Before Event:

TMI-1 was operating at 100% steady state power prior to and during the event described in the LER.

II. Status of Structures, Components, or Systems that were Inoperable at the Start of the Event and that Contributed to the Event:

None.

III. Event Description:

Summary

On 08/08/98, Instrumentation & Control (I&C) technicians signed off a radiation monitor calibration surveillance as completed without noting an out of tolerance reading and taking appropriate action. The out of tolerance reading went undetected for ten days which exceeded the seven day Technical Specification (TS) allowance per TS 3.5.5.2. The error was discovered during a technical review on 08/18/98 and Corrective Action Program (CAP) item T1998-0681 was initiated. The equipment was returned to service on 08/26/98. The Plant Review Group assigned a root cause team to evaluate this and other recent events involving similar errors made by I&C Technicians.

Event Details

On 08/08/98, I&C Technicians signed off a surveillance for RM-A-8G High [IL/DET]*, a Post Accident Monitoring Instrument for the Auxiliary and Fuel Handling Building Exhaust System, as completed without noting an out of tolerance reading and taking appropriate action. The out of tolerance reading went undetected for ten days, which exceeded the seven-day allowance of TS 3.5.5.2. The error was discovered during a technical review on 08/18/98 and CAP T1998-0681 was initiated. Surveillance 1302-17.1 (Rev 12, effective 12/27/95) which calibrates the High Range Radiation Monitors, is scheduled every 18 months. On 08/19/98, the Plant Review Group assigned a root cause team and requested that the review include the recent increasing trend in errors in the I&C group. For a timeline of the events related to the performance of this surveillance up to the return of the monitor to service, please refer to the following timeline.

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Timeline of Events

- **02/14/97** – Surveillance 1302-17.1 “RM-A-5, 8 and 9 High Range Calibration” is successfully performed.
- **08/07/98** – Night orders direct backshift I&C Technicians to perform the High Range Calibration surveillance 1302-17.1.
- **08/08/98** – Towards the end of this surveillance, the Technician recording the data records an out of tolerance reading for RM-A-8G High. The reading (As Found: 35163 CPM) is later confirmed to be correct. The technician fails to recognize that this reading exceeds the maximum limit (Expected + 25%: 33954 CPM) calculated and recorded in a later step. The two I&C Technicians are working in separate locations during this portion of the surveillance.
- **08/08/98** - Although both Technicians stated they reviewed the surveillance data, the out of tolerance reading was overlooked. The surveillance was later signed off as complete and turned in to the Shift Supervisor for signature without taking action to calibrate the out of spec condition.
- **08/08/98** – The signed surveillance is returned to I&C for technical review and included in the stack of surveillances awaiting review. The Technical Review Supervisor is on vacation.
- **08/18/98** – The I&C Technical Reviewer returns from vacation and begins to review the surveillances completed during his absence.
- **08/18/98** – The technical reviewer finds the out of tolerance reading in the High Range Calibration surveillance and initiates CAP T1998-0681 to document this problem.
- **08/19/98** – The surveillance is re-performed to ensure the readings recorded are correct.
- **08/19/98** – With the assistance of the System Engineer, I&C begins troubleshooting the equipment. The source counts are checked for all five calibration sources. The data taken on 08/08/98 was confirmed to have been accurate. Power supply voltages and other parameters were checked.
- **08/20/98** – Troubleshooting continued by checking the Log Ratemeter and Alarm boards without success in identifying the problem. Historical data revealed a trend of steady data drift upward which required the high voltage to be lowered with each calibration of this detector. No further voltage adjustments were possible, so the decision was made to replace the detector.
- **08/21/98** – Of the three replacement detectors available in the warehouse, two did not respond when voltage was applied, and the third detector “avalanched” while establishing the high voltage plateau per the vendor manual. Work was suspended while the vendor (Victoreen) was contacted to check for spare detectors.

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- **08/24/98** – The vendor is contacted and it is learned the detector is not in stock. The vendor began attempting to find replacements. It is also learned that the avalanche observed, on the detector from the warehouse, was noted when 900 volts was applied during the initial vendor testing in 1983.
- **08/25/98** – The detector from the warehouse is re-tested and found to be operating satisfactorily. RM-A-8G High was re-calibrated and allowed to operate over night for observation.
- **08/26/98** – RM-A-8G High operated successfully over night and the detector was officially re-calibrated. All five data points were left in tolerance and the monitor was returned to service.

IV. Identification of Root Cause:

The I&C Technicians performing the High Range Calibration had not run this particular surveillance since initial qualification since it is only performed every 18 months. However, the least experienced technician in the I&C group has been on the job for thirteen years and while this surveillance uses five sources instead of one to calibrate the channel, the overall approach is very similar to other RMS channel calibrations these Technicians had performed many times before. The technicians stated during interviews that because they were not familiar with this surveillance that they were trying to be "extra careful" and that the missed out of tolerance reading was simply an oversight.

Through interviews and a review of the CAP database, the root cause team identified six events, which were the result of errors in the performance of I&C TS surveillances. Only this event was determined to be reportable, however the other events were addressed via a CAP or Surveillance Deficiency Report. Although these six events constitute a very low error rate, considering the large volume of surveillances performed by I&C, the three most recent errors each involved a missed out of tolerance reading. The other three events were one instance of recording the wrong values, a case of going to the wrong equipment, and one calculation error. Since these six events involve nine different technicians, five surveillance's, and both day and night shifts; no single causal factor was apparent. No significant changes to the work process, tools, schedules, procedures, or volume of work being performed were found to account for the recent events. The volume of work performed in a given month by the I&C technicians has not increased but remained fairly constant at approximately 46 surveillances each month since May 1997. Nor have there been any recent changes to the tools, procedures, or locations of the work to account for the recent I&C technician errors.

An analysis of these human error problems indicates that they are not confined to any one or two surveillance procedures. Additionally, most of these surveillances, including the High Range

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Calibration (1302-17.1), have not been revised in several years and have a history of being successfully performed in the past.

Scheduling was examined and dismissed as a possible causal factor in the I&C surveillance errors. The surveillances to be performed each night are arranged so that the more difficult or plant significant surveillances are performed early in the shift at the time of peak alertness. With regard to this event, the event did not occur on the first night of the Technicians midnight shift and they stated that they did not feel overly tired or in a hurry when they were completing the surveillance. When more than one surveillance is planned for the night, they perform the surveillances in the sequence they are given in the night orders. Additionally, other I&C paperwork errors have been initiated in the daytime as well as backshifts.

The technical reviews of I&C Surveillances are typically performed within 24 to 48 hours after surveillance completion. The current practice is that when the I&C Supervisor that performs the surveillance technical reviews is not available, another supervisor will review those surveillances that are about to become overdue from a scheduling standpoint. The remaining surveillances are left until the usual Technical Reviewer returns. This was the case with the High Range Calibration surveillance. The due date of that surveillance was not until December 1998, so although it was completed on 08/08/98, no technical review was performed until 08/18/98. The corrective actions will include an action item to establish expectations to reassign all TS surveillance reviews to other personnel to assure these reviews are performed within 72 hours.

In conjunction with interviews, Barrier Analysis and Change Analysis techniques were applied to this event investigation.

The root cause team concluded that the recent events are attributable to weaknesses in I&C Technician work practices with regard to independent verification. In addition to the errors which result in events, there are a number of minor errors (missed signatures, initials, etc.) that occur each week that are not captured or trended. These errors are found and corrected during the surveillance technical review process. Given the volume of paperwork processed, it is not unexpected that even an experienced Technician may occasionally overlook something. This is typically the result of inattention to detail. However, what has transformed this and other similar errors into events has been a less than adequate independent verification of the surveillance data. The principal barrier to turning in inaccurate or incomplete surveillances is an effective independent review by another technician. The I&C Technicians have worked together in pairs for several years. This leads to a buildup of trust in each other's work. The work of each team member is not challenged and reviewed by the other team member with the same critical rigor as would be applied in the case of some one new and inexperienced.

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The Shift Supervisor's (SS) review and signature of this completed surveillance is not regarded as a failed barrier. The function of the SS review of a completed I&C surveillance is to document work completed and either log the equipment back into service or take appropriate action primarily based on deficiencies identified by the I&C technicians. The SS provides only a cursory review of completeness and accuracy. A detailed technical review of I&C surveillances is performed by the I&C department after the SS signature. Thus, because the out of tolerance value missed by the I&C technicians was of a technical nature and difficult to discern, the SS review was not expected to have identified the error.

A final barrier to assure the completed surveillances are accurate and complete is the technical review performed by I&C Supervision. The team found that there are no expectations to assure that TS surveillances are reviewed in a timely manner when the Surveillance Review Supervisor is absent.

The data collection form in the High Range Calibration surveillance (1302-17.1) was found to be confusing to use and is considered a contributing factor in the 08/08/98 missed out of tolerance reading event. Although the same surveillance was performed successfully in 1997, the data collection tables are a series of numbers arranged in columns. To check to see if a reading is out of tolerance, it must be compared to the high and low limits which are recorded in a later step and located several rows diagonally down and across to the middle of another column of numbers.

V. Automatic or Manually Initiated Safety System Responses:

No safety system responses occurred or were required to occur.

VI. Assessment of the Safety Consequences and Implications of the Event

Although RM-A-8G High was inoperable greater than the TS allowance of seven days, the safety consequences and implications of this event are considered minor. RM-A-8G High is a Post Accident Monitoring instrument that provides input to a computer program used to calculate offsite doses during emergency conditions. The offsite dose calculation program utilizes contingency estimates if RM-A-8G is out-of service. Use of contingency estimates provides an acceptable method for calculating offsite doses during emergency conditions.

From August 8, 1998 to August 18, 1998, RM-A-8G High was inadvertently allowed to remain in-service with a channel indication slightly exceeding the upper tolerance limit for calibration. This condition would have resulted in a offsite dose estimate in the conservatively high direction and would still have been a reasonable estimate.

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From August 18, 1998, to August 26, 1998 RM-A 8G High was out-of-service while repairs were being made. Thus, a contingency estimate would have been used, had an emergency taken place. As stated earlier, use of contingency estimates provides an acceptable method for calculating offsite doses during emergency conditions.

Vii. Previous Events of Similar Nature

No LER of a similar nature has been previously submitted.

Viii. Corrective Actions:

A. Corrective Actions Taken

1. I&C department verified the out of spec readings by re-performing the high range radiation monitor surveillance 1302-17.1 on RM-A-8G High on 08/18/98.
2. I&C department returned the high range effluent monitor to service on 08/26/98.
3. I&C management has discussed with the supervisor who performs the biennial procedure reviews, the need to ensure future procedure reviews consider human factor improvements in the data collection forms. Although the biennial procedure review procedure contains a review checklist that provides guidance for surveillance procedure reviews, this discussion was intended to reinforce improving the human factor ease of recording and using data.

B. Corrective Actions to be Taken

1. I&C management will conduct a series of shop meetings to accomplish the following:
 - review this event as internal operating experience and review the lessons learned such as reinforce the need to stay focused on the task,
 - Reinforce the necessity of the technicians to back each other up by performing comprehensive independent reviews of completed data sheets and calculations.

(This action will be completed by 11/19/98.)

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2. A review of this LER from a human performance perspective will be included during the next cycle of I&C Continuing Training. The calibration procedure will be used as a training aid to show how human factor issues can affect performance. Also, the importance of performing independent verification of all data collection points as well as switch and lead manipulations will be stressed. Finally, during this review management expectations on independent verifications will be reinforced.
(This action will be completed by 10/23/98.)

3. The data collection portion of surveillance 1302-17.1 will be revised to improve the human factor ease of recording and using the data. One means to accomplish this would be to move the tolerance specification limits to the same line so that they are closer to the as found and as left readings.
(This action will be completed by 12/18/98.)

4. I&C management will communicate its expectation that technical reviews of TS surveillances be performed within 72 hours of their completion and that this will be reassigned to other supervisors in cases where the regular Technical Review Supervisor is unavailable.
(This action will be completed by 10/17/98.)

* The Energy Industry Identification System (EIS), System Identification (SI) and Component Function Identification (CFI) Codes are included in brackets, [SI/CFI] where applicable, as required by 10 CFR 50.73 (b)(2)(ii)(F).