NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Dresden Nuclear Power Station, Unit 2	05000237	1 OF 10

TITLE (4) Control Room Ventilation System Found Outside Design Limits Due to Unsealed Control Room Penetrations and Breaches Caused By Management and Modification Process Deficiencies

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
10	07	96	96	-- 017 --	01	04	11	97	Dresden Unit 3	05000249
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N
POWER LEVEL (10)	100

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

	20.2201(b)		20.2203(a)(3)(i)		50.73(a)(2)(iii)		73.71(b)
	20.2203(a)(1)		20.2203(a)(3)(ii)		50.73(a)(2)(iv)		73.71(c)
	20.2203(a)(2)(i)		20.2203(a)(4)		50.73(a)(2)(v)		OTHER
	20.2203(a)(2)(ii)		50.36(c)(1)		50.73(a)(2)(vii)		(Specify in Abstract below and in Text, NRC Form 366A)
	20.2203(a)(2)(iii)		50.36(c)(2)		50.73(a)(2)(viii)(A)		
	20.2203(a)(2)(iv)		50.73(a)(2)(i)		50.73(a)(2)(viii)(B)		
	20.2203(a)(2)(v)	x	50.73(a)(2)(ii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Mr. P. Garrett, Plant Engineering Ext. 2713	(815) 942-2920

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)			EXPECTED SUBMISSION DATE (15)	MONTH	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 September 26, 1996, Engineering personnel were performing review activities associated with Control Room (CR) Heating, Ventilation and Air Conditioning (HVAC) modifications that had been implemented between 1988 and 1993. While reviewing the CR emergency zone boundary, with the CR HVAC system in normal mode, air flow into the CR was detected through the main entrance, indicating a negative pressure with respect to this adjacent area. Subsequent review and investigation determined that the CR differential pressure was not in accordance with the UFSAR and the associated Dresden Administrative Technical Requirements.

The cause of this event is management and modification process deficiencies. Corrective actions include: repair of identified air inleakage/outleakage, modification testing to restore operability, procedure revisions to require timely performance of modification testing and action to take when a potential design basis discrepancy is identified, an Engineering Assurance Group was formed to provide oversight of key engineering activities, and personnel training on engineering expectations. The system was fully operable on January 21, 1997.

PLANT AND SYSTEM IDENTIFICATION

General Electric - boiling water reactor - 2527 MWt rated core thermal power.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX] and are obtained from IEEE Standard 805-1984, IEEE Recommendation Practice for System Identification in Nuclear Power Plants and Related Facilities.

Control Room HVAC System [VI]

EVENT IDENTIFICATION:

Control Room Ventilation System Found Outside Design Limits Due to Unsealed Control Room Penetrations and Breaches Caused By Management and Modification Process Deficiencies

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 2(3) Event Date: 10/7/96 Event Time: 0030

Reactor Mode: N(N) Mode Name: Run(Run) Power Level: 100(82)

Reactor Coolant System Pressure: 993(1003) psig

B. DESCRIPTION OF EVENT:

This issue is reportable pursuant to 10CFR50.73 (a)(2)(ii)(B) any event or condition...that resulted in the nuclear power plant being: in a condition that was outside of design basis of the plant. This condition was identified on October 7, 1996.

On September 26, 1996, Engineering personnel were performing review activities associated with Control Room (CR) Heating, Ventilation, and Air Conditioning (HVAC) [VI] open modifications that had been implemented between 1988 and 1993. While reviewing the CR emergency zone boundary, with the CR HVAC system in normal mode, air flow into the CR was detected through the main entrance, indicating a negative pressure with respect to this adjacent area. The HVAC system serving the adjacent area was secured and a positive CR pressure was observed to be restored. A Performance Improvement Form (PIF) was written. The PIF was reviewed by the Shift Manager (Licensed-Senior Reactor Operator). The Shift Manager noted on the PIF to further review the design basis and entered it into the PIF process. On October 2, 1996, following a briefing by Engineering on the results of the Design Basis research, an operability determination evaluation was initiated.

The initial engineering operability judgment was reviewed by the Plant Operations Review Committee (PORC) on October 7, 1996. Based on concerns raised by PORC, the CR HVAC system was declared inoperable by Operations in accordance with the Dresden Administrative Technical Requirements (DATRs). The operability determination concluded that the existing configuration was not in accordance with the design basis of the plant. Following declaring the CR HVAC system inoperable, differential pressures were measured between the CR and surrounding spaces under a variety of CR HVAC configurations. Results indicated that the CR

emergency zone could not be maintained at >/= 1/8 inches of water gauge (iwg) positive pressure with respect to the surrounding spaces, with CR HVAC operating in the emergency pressurization mode as required by the design basis. The CR emergency zone also could not be maintained at the positive pressure in the normal operating mode with respect to the adjacent spaces.

Notification of the event was performed pursuant to 10CFR72(b)(2)(iii)(D) at 0209 (CT) on October 8, 1996 through Emergency Notification System (ENS) number 31109.

A special test procedure was written and performed to determine if the air inleakage and pressurization requirements could be met with portions of the CR emergency zone isolated, which included a temporary alteration which isolated the Auxiliary Computer room. The special test showed that the requirements of >/= 1/8 iwg could not be met. Identification and sealing of breaches in the emergency zone boundary was initiated.

During the repair effort, the gross leakage was measured using tracer gas which determined that the unfiltered inleakage was 4056 +/- 293 scfm (Train B, emergency mode). The sealing efforts performed prior to the tracer gas test is believed to have not reduced the overall inleakage because the flow through the remaining breaches increased in velocity, thus, resulting in a comparable value of total inleakage. The original design allows a maximum of 263 scfm for unfiltered air inleakage. Following a significant sealing effort, which included the complete teardown and re-assembly of wall and penetration seals, unfiltered air inleakage was reduced to about twice the allowed maximum. Calculations were performed using Standard Review Plan (SRP) methodology 6.5.5 that indicated the actual inleakage was acceptable per General Design Criteria (GDC) 19. The CR system was declared operable but degraded on October 21, 1996 at 1836. Identification and sealing of leakage on the negative pressure ductwork and the CR emergency zone boundary was continued until the CR HVAC system was declared operable with no concerns on January 21, 1997, at 0000.

Control Room Leakage

Sections 6.4.2 and 9.4.1 of the UFSAR describe the design basis for the CR HVAC system. Section 6.4.2.4 states that potential adverse interactions between the CR emergency zone and adjacent zones that may allow the transfer of toxic or radioactive gases into the CR are minimized by maintaining the CR at a positive pressure of 1/8 iwg during emergency pressurization modes, with respect to adjacent areas.

In 1982, modification M12-2/3-82-01 added a second ventilation train to the CR HVAC system in response to NUREG - 0737. Post modification testing performed on this modification was inadequate. A single point differential pressure (DP) measurement was used to verify CR pressure requirements. The ability to pressurize the CR emergency zone to >/= 1/8 iwg with respect to the adjacent area was not verified. The test did not detect that the CR boundary was improperly sealed.

Between 1988 and 1993 four other modifications were made to the CR HVAC system that negatively impacted the ability to maintain the correct DP. These modifications are;

1) M12-0-87-005-D provided for the installation of security equipment such as bullet resistant plating for walls and ceilings, new east-west kitchen and locker room area, fire and non-fire rated doors, and the sealing of new and unused wall and floor penetrations. Field work was initiated in August 1991 and completed in January 1992. Post-modification testing was not completed.

2) M12-0-86-006-D provided for the removal of existing HVAC duct work supports inside the Unit 2 and 3 CR, installed acoustical tile, installed new duct work including hangers and safety chains, reworked existing ductwork inside the CR, and removed existing butterfly dampers inside the CR. The field work was initiated in June 1988 and the work was determined to be completed in May 1993. Post-modification testing was not completed.

3) M12-0-87-005-E provided supply and exhaust ventilation systems for the new locker room and kitchen areas, new fire dampers in duct work penetrating fire walls, control logic for operation of the isolation dampers, and an interlock for the exhaust fans from the isolation dampers. Field work was started in September 1991 and completed by June 1993. Post-modification testing was not completed.

4) M12-0-86-006-C provided supply and return side duct silencers, thermally insulated duct work, and manual volume dampers in the shared return duct works. The field work was started in March 1989 and the documentation closure was completed in September 1993. Post-modification testing was not completed.

As a result, the design of each of these modifications added inadequately sealed penetrations which resulted in the CR not being able to maintain the DP and air inleakage requirements. Also, the CR design drawings did not identify the CR emergency zone boundary as a ventilation boundary. This allowed other modifications and system work to penetrate the CR emergency zone boundary without air tight sealing of those penetrations.

While the installation of the above four modifications was completed and in use by 1993, the required final testing was not completed and the modifications were not closed. Since 1993, there was an intermittent effort to close out the above four CR HVAC modifications. The work involved determination of design basis, and significant repairs to seal identified breaches in the CR boundary prior to and after initial baseline testing. However, the required post modification tests were deferred because Engineering personnel believed that the CR pressurization requirements were verified by existing periodic single point surveillance. The periodic surveillance did not identify that penetrations were inadequately sealed. It was later recognized that this surveillance did not demonstrate that the CR HVAC system was in conformance with design basis requirements. Incorrect reliance on the periodic surveillance and failure to confirm that the surveillance would verify system design requirements represents a missed opportunity for CR HVAC degradation discovery.

Special Procedure (SP) 94-5-069, Control Room HVAC Baseline Ventilation Flow Measurement, was completed in July of 1994. The purpose of this SP was to collect data, and no acceptance criteria was specified. However, the testing performed was inadequate in that it did not establish conformance to design basis requirements and unfavorable test results (Computer room pressure not slightly positive) were not questioned during the review of the test data.

Another Special Procedure, SP 94-12-139, Control Room Ventilation Performance Requirements, was initiated, but not completed in January of 1995. The key steps that required verification that the CR could be maintained at a DP of greater than 1/8 iwg with respect to adjacent areas were not performed. Unfavorable test results (Computer room pressure not slightly positive) of the Computer room were not questioned.

Both tests had an additional deficiency in that proper data collection techniques were not specified. Also, the CR DP instrument, used in the tests, was mislabeled, a condition that was known by the test engineer. The engineers worked around this problem during the tests. These inadequate tests represent another missed opportunity to discover the problem.

The Engineering personnel working on the CR HVAC modifications had other "higher priority" issues to work on which resulted in the slow progress of the modification completion. Since the Engineering personnel thought that the single point periodic surveillance satisfied the requirements of having the CR positive and because the CR HVAC system was not in the Technical Specifications, previous management gave closure of the modification a low priority and subsequently did not provide the resources needed to complete the modification. In addition, Management did not provide sustained oversight of these efforts. An "owner" and team members were identified and action plans were developed to close the open modifications in 1994, but there was little management involvement or follow through. This was also justified, at the time, based on the acceptable results of periodic (18 month) surveillance tests.

In early 1995, Station Management recognized that the backlog of open modifications represented a potential risk to the Station. An initiative to close out open modifications was once again started. The open CR HVAC modifications were listed as a backlog item. In June of 1996, an initiative began that required all open modifications be evaluated against the criteria on 10CFR50.59. This activity would assure that the open modifications did not introduce an unreviewed safety question. During CR HVAC system preparatory walkdowns for the development of the 10CFR50.59, a lack of positive CR pressurization was identified.

Surveillance Testing

The 18 month CR surveillance test involved reading the CR to atmosphere DP gauge located in the CR. If the reading was found within the acceptable level (greater than 1/8 iwg) then the CR was considered to have met its operability criteria for DP. This surveillance would have been acceptable to detect nonconforming pressure conditions if the modification testing would have properly been completed, bounding value identified and if initial adjacent spaces' HVAC systems lineups were specified.

Additionally, the DP gauge used in the surveillance did not indicate as labeled, CR to atmosphere. It actually indicated between the CR and the East Turbine Building (ETB). The ETB fan lineup was not specified in the surveillance procedure. The System Engineer knew that the gauge was mislabeled and compensated the reading with the pressure indication of the ETB to atmosphere, but did not properly revise the procedure. In addition, the ETB to atmosphere gauge materiel condition problems and inconsistent fan lineups would have produced incorrect indications, resulting in faulty data for the pressure measurements in the CR proper.

No other system or component inoperabilities have been identified which contributed to the event. In addition, no manual or automatic engineered safety feature (ESF) actuation occurred as a result of this event.

C. CAUSE OF THE EVENT:

The root cause of this event is Management Deficiency (NRC Cause Code E). Inadequate Management oversight and design control led to:

Complacent attitude towards configuration management, which resulted in:

a. A lack of questioning attitude by the engineers involved when confronted by unfavorable results identified during performance of the SPs.

b. Acceptance of CR HVAC backlogged modifications;

Low expectations, which resulted in:

a. Poor problem identification and resolution of design basis issues;

b. Proper SP data collection techniques and acceptance criteria were not specified. Also, the CR DP instrument was mislabeled, a condition that was known by the test engineer, not corrected, but worked around.

Insufficient resources being applied, which resulted in:

a. Little involvement of Station Personnel to ensure the adequacy of the design (adequate sealing of penetrations, revision of CR boundary drawings);

b. Poor materiel condition of the ETB HVAC DP gauge

An additional root cause is inadequate design control (NRC Cause Code B). The modification process did not require post modification testing be performed in a timely manner or that proper evaluation (10CFR50.59) be performed for those modifications left open or provide sufficient guidance for testing. This resulted in the CR HVAC modifications to be in place with significant degradation.

Contributing Cause is personnel error (NRC Cause Code A). The test engineers (non-licensed) involved with the SP tests did not properly identify acceptance criteria (procedural) and did not recognize (cognitive) the reportability requirements of the degraded CR boundary during the SP tests.

Cause analysis techniques used during this investigation included event and causal factor charting.

D. SAFETY SIGNIFICANCE:

This event resulted in no adverse impact on the health and safety of the public. Gaseous release to the environment are limited by the primary containment, secondary containment, off gas system, standby gas system, and the elevated stack. The CR HVAC system does not mitigate or contribute to gaseous releases to the environment. In addition, previous analysis performed indicates that the CR habitability concern caused by hazardous chemicals is below the criteria specified by SRP 2.2.3.

For the CR personnel, had a loss of coolant accident (LOCA) occurred that resulted in a release of radiation to the environment, the quantity of unfiltered air inleakage to the CR would have been higher than that assumed in the currently licensed (SRP 6.4) CR dose analysis and resulted in exceeding the requirements of GDC 19. In addition, a qualitative assessment of the radiological impact of a Main Steam Line Break Accident on the Habitability of the CR for excessive unfiltered inleakage was performed. This qualitative assessment indicated that the LOCA is the limiting accident because the specific activity of the reactor coolant is limited to 0.2 micro curies per gram. The Technical Specifications require that specific activity of the reactor coolant (I-131 dose equivalent) be below 0.2 micro curies per gram during power operations (the Technical Specifications include action and surveillance requirements to assure this).

The calculation performed to support operability demonstrated that a significantly higher inleakage of approximately 2500 scfm is acceptable, when using SRP Section 6.5.5 and Stand By Gas Treatment system charcoal efficiency of 90 percent. The operability calculation methodology was compared to the analysis performed by the NRC in response to Region III TIA 88-12. The NRC analysis performed a number of parametric studies including the adoption of SRP 6.5.5 scrubbing and the ICPR 30 dose conversion factors. When these newer methodologies are applied, the NRC shows a dose on the order of 4 rem (thyroid) with a Stand By Gas Treatment system charcoal efficiency of 90 percent, CR emergency filtration system efficiency of 99 percent and inleakage of 263 scfm. These results are consistent with the results of the operability calculation for an inleakage of 263 scfm. In addition, the use of SRP Section 6.5.5 methodology, in conjunction with the Stand By Gas Treatment system charcoal efficiency of 95 percent and inleakage in excess of 20000 scfm, results in the calculated dose to the Operators being bounded by the requirements of GDC 19.

However, the proceeding discussion assumes that all barriers to radiological release are intact. As documented in LER 95-007, docket 50237, a bypass release path around the Main Steam Isolation Valves (MSIVs) existed for approximately 6 months in 1995. The isolation capability of some of the main steam drain line isolation valves was not assured. An assessment of the dose consequences to the Operators was performed which used SRP 6.5.5 methodology. The conclusion was that the Operator dose to the thyroid would be approximately 51 REM, which exceeds the GDC 19 acceptance criteria of 30 REM.

This event did not create an appreciable risk to the health and safety of the public. Although CR personnel were at risk during the time period the bypass around the MSIVs existed, the overall conclusion is that all required Operator accident mitigation actions could have been performed. However, based on the elevated dose to the Operators, the safety significance of this event has been determined to be significant.

E. CORRECTIVE ACTIONS:

1. The operability of the CR emergency zone boundary and HVAC system were restored on January 21, 1997 at 0000, within the current licensing basis (SRP 6.4). (Complete, Corrective)

2. Implemented Dresden Technical Surveillance 5750-10, "Control Room DP Measurements" which tests the Control Room Emergency Zone to surrounding area differential pressures and includes acceptable initial adjacent spaces' HVAC systems lineups. This surveillance will be performed on a monthly basis until sufficient trend data demonstrates continued system operability. Then it will be performed on a periodic basis to meet technical specification requirements. (Complete, Corrective)

3. The CR design drawings will be updated to show the ventilation boundary and the differential pressure instrumentation configuration. (2371809601701S1, Corrective)

4. Modifications M12-0-87-005-D, M12-0-87-005E, M12-0-86-006-C, and M12-0-86-006-D will be completed and closed out. (2371809601702S1, Corrective)

5. The CR DP instrument was re-labeled to accurately reflect the reference points and repairs were made to the instrumentation sensing lines. (Complete, Corrective)

6. Maintenance will be completed on the ETB HVAC system and differential pressure instrumentation. (2371809601703S1, Corrective)

7. An Engineering Assurance Group (EAG) consisting of senior Commonwealth Edison (ComEd) engineering personnel and experienced outside experts was established. The EAG will function to provide oversight of key engineering activities until normal engineering functions have improved to the point where reviews are no longer necessary. (Complete, Management Deficiency)

8. The Nuclear Engineering Procedures were revised to provide specific direction on action to be taken whenever a potential design basis discrepancy is identified. (Complete, Management Deficiency)

9. Training was provided to the Engineering Department personnel on the Engineering Manager's expectations, through the Engineering Support Personnel Training program. (Complete, Management Deficiency)

10. The need to maintain the formality of the Nuclear Design Information Transmittals was reinforced to Design Engineering personnel. (Complete, Management Deficiency)

11. The review and implementation of 50.59 evaluations for the backlog of open modifications was performed. (Complete, Management Deficiency)

12. ComEd Chief Engineers and Site Quality Verification will perform audits of the Nuclear Steam Supply System (NSSS) supplier and selected architect/engineers to determine quality of design control and calculation quality. (2371219601601, Management Deficiency, Inadequate Design Control)

13. The modifications process (DAP 21-03) will be revised to advise the user that the modification test and Design Change Documentation should be completed in a prompt manner. If this cannot be accomplished a new 10CFR50.59 evaluation shall be performed reviewing the as-installed condition of the modification. In addition, a monthly review by the Design Engineering Superintendent and Operations Manager of modifications which have had work suspended/delayed will be performed. (2371809601704S1, Management Deficiency, Inadequate Design Control)

14. An Electronic Work Control list item was created for the monthly Design Engineering Superintendent and Operations Manager review of modifications that have had work suspended/ delayed. (Complete, Management Deficiency, Inadequate Design Control)

15. DAP 21-19, Guidelines For The Development of Modification Tests For Plant Design Changes, was created in 1996 to provide guidance on how to properly test completed modifications. (Complete, Inadequate Design Control)

16. The cognizant engineer associated with the 1994 and 1995 SP tests, has been disciplined in accordance with station policy, which included revocation of his testing certification until demonstrating an adequate understanding of the proper roles and responsibilities of a test engineer. (Complete, Personnel Error)

17. The System Engineer would have been disciplined in accordance with station policy, but he is no longer employed by ComEd. (Complete, Personnel Error)

18. Evaluate whether a quantitative assessment of the radiological impact of a Main Steam Line Break Accident on the Habitability of the CR for excessive unfiltered inleakage is needed. If it is needed, perform the assessment and if the assessment impacts the safety significance section, provide a supplement to this LER. (2371809601705S1, Safety Analysis)

19. An effectiveness review of the corrective actions provided in this LER will be performed. (237180960170681.ER)

F. PRIOR SIMILAR OCCURRENCES:

LER/Docket Numbers Title

A search conducted of events at the station over the previous two year period identified the following:

95-019/0500237 The Control Rod Drive Scram Discharge Volume's Reactor Protection System Control Logic Fails To Meet The Single Failure Criteria Due To Design Deficiency

96-016/0500237 Reactor Water Clean Up Pressure Control Valve PCV-1217 Configuration Outside Licensing Basis Requirements Due To Inadequate Modification Design

The corrective actions specified in these similar events were not effective at preventing this reported occurrence because:

a. The similar events were identified after the original implementation errors, and,

b. the corrective actions for the similar events focused on event specific activity.

95-001/05000237 Inoperable Control Room HVAC Booster Fans, due to improperly sized thermal overload heater devices.

A corrective action specified in this similar event was to conduct a review of a "Control Room Habitability Assessment" that had been performed in 1993. This review did not identify the degraded control room condition. It is speculated that this review focused on the Outside Air Purge mode, the subject of the LER.

G. COMPONENT FAILURE DATA

Not Applicable