

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 86-17

Docket No. 50-352

License No. NPF-39

Licensee: Philadelphia Electric Company  
2301 Market Street  
Philadelphia, PA 19101

Facility Name: Limerick Generating Station, Unit 1

Inspection Conducted: July 21 - 31, 1986

Inspector: E. M. Kelly, Senior Resident Inspector

Approved by:

Robert M. Jallo FOR  
P. W. Eselgroth, Chief  
Reactor Projects Section 2A, DRP

9/11/86  
Date

Summary: Special inspection to assess the cause and independently evaluate the inoperability of two non-automatic containment isolation valves in the B loop of drywell chilled water for approximately 29 hours on July 17 - 18, 1986. This inspection accounted for 30 hours by the Senior Resident Inspector.

Results: Licensed operator training has been ineffective in addressing containment isolation valves other than those which receive automatic isolation signals. The drywell chilled water (DCW) Loop B outboard isolation valves were disabled and open for a time in excess of that allowed by Technical Specifications. Also, remote manual closure of the outboard isolation valves in both loops of DCW was found to be not possible from the control room following a design basis accident because of installed shunt trips coils.

## DETAILS

### 1.0 Principals Contacted

J. F. Franz, Jr., Manager, Limerick Generating Station  
J. Doering, Jr., Superintendent, Operations  
J. W. Spencer, Superintendent, Services  
G. A. Hunger, Engineer in Charge, Nuclear Safety Section  
K. S. Kemper, Assistant Engineer, Maintenance  
W. Truax, Shift Superintendent  
E. G. Firth, Training Supervisor  
R. H. Moore, Superintendent, QA Division  
J. Cook, Electrical Foreman, Maintenance Division

Shift superintendents, supervisors, licensed and non-licensed plant personnel were also contacted and, in some cases, interviewed during this inspection.

### 2.0 Background and Sequence of Events

#### 2.1 Background

Because of Reactor Enclosure floor repairs and grinding operations near safeguards motor control center D114-R-C during the Unit 1 May 2 - June 17, 1986 outage, a maintenance request was prepared to clean the associated breaker cubicles. Maintenance requests were initiated on June 27, 1986, for breaker cubicles 17 and 18 which supply 480 volt power to the motor operators for the outboard containment isolation valves in the Loop B supply and return lines of the drywell chilled water (DCW) system. The work requests were approved by control room shift supervision and the valves were de-energized at 2:00 p.m. on July 17, 1986. However, the containment isolation function of the valves was not recognized by licensed operators, nor was control room supervision contacted by the plant operator who removed power to the valves at the breaker in spite of an information tag located on the breaker cubicles instructing the operator to ensure Technical Specifications are reviewed prior to de-energizing.

As a result, the supply line outboard isolation valve (HV87-120B) in drywell penetration number X-55 and the return line outboard isolation valve (HV87-121B) in penetration X-56 remained open and incapable of manual isolation from control room for 28 hours and 45 minutes. These isolation valves do not receive automatic containment isolation closure signals, but are the subject of Limerick Unit 1 License Condition 2.C.10 which requires the provision of automatic isolation signals prior to startup following the first refueling outage scheduled to begin in May, 1987.

The disabled valves were identified by a licensed operator during his control panel walkdowns following a shift turnover on July 18, 1986. The breaker cubicle cleaning and re-installation were subsequently completed within three hours and the valves were declared operable at 6:45 p.m. on July 18, 1986. The NRC Senior Resident Inspector was called on July 19, 1986 and informed of this event by the licensee's Superintendent of Services. This special NRC inspection was conducted from July 21 - 31, 1986, to review the licensee's investigation, to independently assess the circumstances, and to evaluate the licensee's immediate corrective actions associated with this event.

## 2.2 Sequence of Events

<u>Date</u>	<u>Time</u>	<u>Event</u>
June 27	11:00 a.m.	Corrective maintenance to clean and inspect breaker cubicles at Safeguards MCC D114-R-C is identified
July 13	5:00 a.m.	Permits prepared for breaker cubicle work
July 17	12:39 p.m.	Blocking sequence approved by shift supervisors
	2:00 p.m.	Breakers opened and valves de-energized
July 18	7:15 a.m.	Permits issued to Maintenance for work
	3:30 p.m.	Outboard isolation valves HV87-120B and 121B discovered inoperable by licensed operator
	5:50 p.m.	Maintenance on breaker cubicles completed
	6:45 p.m.	Valves declared operable

## 3.0 Discussions

### 3.1 Description of Event

On July 17, 1986, with Unit 1 at 100% full power, the motor operators for DCW Loop B valves HV87-120B and 121B were de-energized at 2:00 p.m. to perform corrective maintenance on the power supply breakers. The maintenance was performed under requests MRF-86-4165 and 4166 to remove, clean and inspect the 480 volt magnetic starters because of previously performed grinding and painting in the vicinity

of the D114-R-C motor control center. A plant operator-nuclear removed the electrical feeds to the valves, disabling them in the open position and thereby making the valves incapable of remote manual closure from the control room. The maintenance cleaning and inspection permits were released by the control room for work at 7:15 a.m. on July 18, 1986. However, the performance of maintenance procedure PMQ-093-004 to remove, clean, examine and re-install the magnetic starters had not commenced as of shift turnover at 3:30 p.m. on July 18 when a licensed operator discovered the disabled valves and informed shift supervision (after investigating and reviewing Technical Specifications) at approximately 4:00 p.m.

The senior licensed operator who approved the blocking open of the HV87-120B and 121B valves was interviewed by the inspector. The operator did not consult Technical Specification 3.6.3 to verify that these valves are containment isolation valves. However, the operator did review P&ID M-87 for the DCW system which does not indicate that the valves are part of the primary containment boundary. Further, since these valves do not currently receive an automatic containment isolation signal, and since the valves are "ganged" along with two other valves (HV87-124B and 125B) on a common handswitch MSS-121B, the operator failed to recognize the containment isolation function of the valves.

The HV87-120B and 121B valves are normally open and provide a supply and return path of DCW to the drywell unit coolers and recirculation pump motor air coolers. Because of concerns for maintaining normal drywell temperature and pressure, both loops of DCW were aligned to the drywell coolers during this event.

The inspector interviewed the operator who had de-energized the feeds to HV87-120B and 121B valves. Because of a previous operator error associated with a standby liquid control system isolation valve which was reported to the NRC in LER 85-091 on December 20, 1985, information tags were affixed to all containment isolation valves and to their motor breaker cubicles identifying them as such. The information tags direct that, prior to de-energizing the breaker, control room supervision be contacted and reminded that the valve is an isolation valve. The information tag on cubicles 17 and 18 for valves HV87-120B and 121B read:

PRIMARY CONTAINMENT ISOLATION VALVE

Prior to de-energizing,  
ensure Tech Spec actions  
are considered by double  
checking with Control  
Supervisor.

However, because of the simplicity of the block to be applied to these valves (involving only 2 tags) and the fact that the permits were approved already by two separate senior licensed operators, the plant operators-nuclear did not contact the control room nor remind the control supervisor of the Technical Specification implications. Interviews with other personnel indicated that not all operators used the information tags in the manner intended, and that training was generally ineffective since the reason for the tags was not understood by most operators.

### 3.2 Licensee Condition 2.C.10

Unit 1 full power license condition 2.C.10 indicates that operation during the first fuel cycle with nonautomatic isolation valves HV87-120 and 121, 124 and 125 on both loops A and B of DCW is acceptable. The inspector reviewed the safety evaluation for modification MDCP-0106 for installing automatic isolation capability on these valves. In the interim, as committed in letters to NRC and the Limerick SER, special interim operating procedures were added to emergency procedure T-250 to manually isolate the subject DCW valves, if necessary after an accident, from the control room. However, inspection of the valve breaker cubicles and electrical schematic drawing E-465 indicates that the valves have shunt trip coils which prevent remote manual closure. Following a design basis accident, the valve motor loads are shed by the shunt trip, but not automatically sequenced back onto their respective safeguards buses.

### 3.3 Corrective Actions

The licensee concluded the principal cause of this event to be a weakness in the process of authorizing the removal of equipment from service. In addition, upgraded operator training was determined to be needed to improve operator knowledge. The immediate actions included:

- Letters were issued to the shift superintendents involved and to all shift personnel discussing this incident and presenting several cautions which should be taken when removing equipment from service.
- Three Training Needs Analysis forms were submitted to the Training Section addressing the need for additional training in three subjects, including containment isolation boundaries, operator aids, and license conditions.
- Administrative Procedure A-26, Maintenance, is being modified to include a check-off list to be used by control supervisors when removing equipment from service. A copy

of this check-off list will be kept at the control supervisor's station. Procedure A-26 will be further modified to clarify the meaning of the section of the Maintenance Request Form titled Tech Spec/LCO.

- A letter is being written to Engineering requesting that all containment isolation valves be specifically annotated on Limerick P&IDs.
- The names of all isolation valves are being reviewed and modified to include the words "Containment Isolation Valves". These names will appear in the CHAMPS and Permit Manager data bases, and will therefore be automatically recorded on MRFs and local permits.
- ISEG is preparing an Event Report on this topic, in addition to convening the first formal session of the Incident Review Committee under the ISEG charter.

#### 4.0 Conclusions

Licensed operator training has been ineffective in addressing containment isolation valves other than those which receive automatic isolation signals. The drywell chilled water (DCW) Loop B outboard isolation valves were disabled open for 29 hours; a violation (50-352/86-17-01) of Technical Specifications. However, the significance of that violation was lessened in that: (a) the condition was identified by licensed operators and promptly corrected by station management; (b) an operable automatic isolation valve was maintained in each affected penetration; (c) the open valves only existed for approximately one day; (d) the lines associated with the RECW and DCW Systems within the drywell do not communicate with either the containment atmosphere or the reactor coolant pressure boundary, and are thus closed non-safety related systems inside primary containment; (e) the licensee established thorough corrective actions including immediate convening of a Plant Incident Review Group as well as proposed longer-range programmatic improvements such as in training, revisions to P&IDs and computer database equipment nomenclature; and, (f) the NRC had previously reviewed the design of these valves and concluded that reasonable assurance existed against undue containment leakage from these penetrations pending modifications at the next outage.

Remote manual closure of the outboard isolation valves in both loops of DCW was found to be not possible from the control room, following a design basis accident, because of installed shunt trips and is a deviation from previous license commitments (50-352/86-17-02).

#### 5.0 Management Meetings

A verbal summary of preliminary findings was provided to the Limerick Station Manager and the Superintendent, Operations, at the conclusion of the inspection during the management meetings on July 25 and August 1, 1986. During the inspection, licensee management was periodically notified verbally of the preliminary findings by the resident inspectors. No draft inspection report material was provided to the licensee during the inspection.