



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

Related to Issue 102

Reference (643)

AUG 6 1984

PDR per R. Ennit :

MEMORANDUM FOR: Harold R. Denton, Director  
Office of Nuclear Reactor Regulation

FROM: C. J. Heltemes Jr., Director  
Office for Analysis and Evaluation  
Of operational Data

SUBJECT: HUMAN ERROR IN EVENTS INVOLVING  
WRONG UNIT OR WRONG TRAIN

On January 13, 1984, I forwarded a report on the results of a special study of events involving loss of safety system function that resulted because an action was performed on the wrong unit or wrong train and the error was not detected. The purpose of this memorandum is to briefly update the results of our ongoing study of that type of event.

The special study report described a number of events resulting from human error in identification of the correct unit or train. The study found that although most of the events had limited safety significance because of the short duration of the condition and/or because redundant systems were operable and available, they were considered to be examples of events that could have high safety significance under other circumstances. In the study, we suggested that:

- the Maintenance Action Plan being developed by the Division of Human Factors Safety consider the high proportion of events that were due to human error in maintenance and testing operations at power.
- specific consideration be given to developing additional guidance on the characteristics of an adequate labeling system for the correct identification of units, trains, and components.

Several actions have been taken since that time that are intended to eliminate errors involving the wrong unit or wrong train, including the issuance by IE of Information Notices 84-51, "Independent Verification", and 84-85, "Inadvertent Defeat of Safety Function Caused By Human Error Involving Wrong Unit, Wrong Train, or Wrong System." In addition your memorandum of May 2, 1984 stated that the Maintenance and Surveillance Program Plan has been developed giving full consideration to the need to eliminate this type of error.

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Since the publication of our study, wrong unit/wrong train errors have continued to occur. For example, from August 1983 to date, we are aware of an additional 13 events involving either wrong unit or wrong train identification. Further, because the Maintenance Task Action Plan has been undergoing substantial modification, we have not been able to determine the method of and schedule for implementation of corrective actions. In addition, a recently received French operating experience report expresses concern about errors involving confusion between units and confusion between trains of the same unit. The report indicates that a number of actions have already been taken (e.g., better identification of rooms and cells). My conversations with the French indicate they consider this to be a serious potential problem that warrants specific additional corrective action. They are evaluating various methods such as physical separation of equipment, improvement of marking and routing, fully automatic RPS testing, etc. to help minimize misidentification of equipment.

For all of these reasons, we are changing our suggestion regarding labeling to the recommendation that NRR review the wrong unit/wrong train events and develop appropriate guidance to minimize such events. In addition, although we are aware that this problem will be addressed in many phases and tasks in the maintenance and surveillance program plan, we believe that potential problems with identification of units, trains, and components should be treated as a separate and distinct safety issue and in a timely manner.

We are enclosing brief descriptions of the wrong unit/wrong train events that we have accumulated since the special study was published (Enclosure), and a copy of the French report (NEA/IRS No. 405, "Human Errors Involving Wrong Units") for your use in evaluating this recommendation. If you or your staff have any questions or comments on this memorandum, please contact me or Gene Trager of my staff. Mr. Trager can be reached on X24492.

  
C. J. Heltemes, Jr., Director  
Office for Analysis and Evaluation  
of Operational Data

Enclosure:  
As stated

cc w/enclosure:

E. Case, NRR  
D. Eisenhut, NRR  
H. Thompson, NRR  
R. Vollmer, NRR  
[REDACTED]  
F. Miraglia, NRR  
D. Ziemann, NRR  
G. Holahan, NRR  
J. Beard, NRR  
D. Pickett, NRR

J. Taylor, IE  
E. Jordan, IE  
Regional Administrators  
Resident Inspectors at  
Sites Listed in Enclosure  
W. Fisher, DEDROGR  
R. Lewis, RII  
L. Norrholm, RI  
C. Norelius, RIII

c w/o enclosure:  
J. Sniezek

SUPPLEMENT 1  
SUMMARY OF  
WRONG UNIT/TRAIN EVENTS  
(MID-1983 TO MID-1984)

Event Date	Plant	Type	LER#	Unit/Train	Power Level	Cause, Contributing Factor(s)/Corrective Action(s)
08/02/83	Surry 1	P	280-83-033	Unit	100%	misidentification/ counseling
09/08/83	Trojan	P	344-83-013	Train	100%	defective procedure/ counseling
10/29/83	Farley 2	P	364-83-055	Train	48%	misidentification/ counseling
11/03/83	Quad Cities 1	B	50-254*	Unit	(Power)	misidentification/ counseling
11/10/83	Surry 1	P	280-83-051	Train	100%	misidentification/ counseling
12/13/83	Calvert Cliffs 1	P	317-83-074	Train	59%	procedure, failure to verify/procedure
12/16/83	La Salle 1	B	373-83-140	Unit	(Power)	failure to verify/ procedure
12/22/83	TMI-2	P	320-83-063	Train	0%	misidentification/ counseling
01/06/84	Zion 2	P	304-84-001	Train	100%	misidentification/ counseling
01/09/84	Turkey Point 3	P	250-84-003	Train	63%	misidentification/ training, procedure
03/13/84	Kewaunee	P	305-84-001	Train	83%	labeling, failure to verify/counseling, labeling, procedure
07/16/84	D.C. Cook 1	P	Daily Report 50-315	Train	100%	misidentification/ procedure
07/22/84	Dresden 2	B	Daily Report 50-237	Unit	(Power)	misidentification/ procedure

\*Daily Highlight, Docket 50-254

## Summaries of Wrong Unit/Train Events

(Supplement 1)

<u>Date</u>	<u>Description</u>
08/02/83	With Surry Unit No. 1 at 100% power, the torque switch for MOV-1289B (an operable MOV) was removed thereby rendering the MOV inoperable. The work was to have been performed on Unit 2 MOV-2289B (Unit 2 was in the CSD condition), but the electrician went to the wrong valve. The redundant valve, MOV-1289A, remained operable throughout the event. (LER #280-83-033)
09/08/83	While at 100% power a maintenance tag-out was prepared at 0545 for the Trojan 'A' train boric acid transfer pump by the assistant control operator. The tag-out correctly deenergized the 'A' train pump but incorrectly called for valving out the 'B' train transfer pump. The tags were then hung as called for in the tag-out. At 0840 when the maintenance person went to work on the 'A' train pump, his verification check of the tag-out discovered that the 'B' train pump was improperly valved out. He informed the control room and the tags on the 'B' train valves were removed restoring the boric acid flow path. The boric acid flow path was inoperable for three hours in violation of technical specifications. (LER #344-83-013)
10/29/83	With Farley 2 at 48% power and with the 'B' train post accident hydrogen analyzer removed from service for calibration and testing, I&C personnel at 2125 operated the 'A' train analyzer mode selector switch instead of the 'B' train switch, causing the 'A' train analyzer to become inoperable. The 'A' train analyzer was returned to service at 2135. The personnel involved were counseled. (LER #364-84-055).
11/30/83	After maintenance work on a service air compressor for Quad Cities Unit 1, the system was being tested. A workman intended to valve out cooling water to the newly-repaired compressor, which is cooled through a heat exchanger (Hx) by the turbine building closed cooling water (TBCCW) system. The workman inadvertently cut off cooling water to the wrong Hx, causing it to overheat and rupture thus, forcing air into the TBCCW system. Unit 1 was manually scrammed. Several hours later, after Quad Cities Unit 1 had been restarted, maintenance work was being done on Unit 2 (shutdown for refueling). A workman intended to close an instrument air valve on Unit 2, but inadvertently closed the instrument air valve on Unit 1, causing Unit 1 to scram. (Daily Highlight for Docket #50-254 dated November 3, 1983).



11/10/83

With Surry Unit 1 at 100% and with 1-CV-P-1A ('A' Containment Vacuum pump) tagged out for maintenance, the suction line for 1-CV-P-1B ('B' Containment Vacuum Pump) was inadvertently blank flanged. As a result, both Containment Vacuum Pumps were inoperable. A blank flange was to have been placed on the suction line for 1-CV-P-1A to support maintenance activities on that pump. However, an operator incorrectly identified the proper suction line for 1-CV-P-1A and the flange was installed on the suction line for 1-CV-P-1B. The flange was removed and the pump was verified operable. The operator involved was disciplined.  
(LER #280-83-051)

12/13/83

Flow was lost in the Calvert Cliffs 1 saltwater subsystem when an operator mistakenly operated the 4kv disconnect on the operating saltwater pump in that subsystem. The operator failed to verify he was operating the correct 4kv manual disconnect. He had been instructed to operate the disconnect for #13 Service Water Pump but in fact operated the disconnect for #13 Saltwater Pump which was in operation at the time supplying #12 Saltwater Subsystem. Flow was restored two minutes later. The redundant saltwater subsystem remained operable throughout the event.  
(LER #317-83-74)

Note: The Operations General Supervisor issued a standing instruction requiring that all operation of 4kv manual disconnects be performed by two operators. Prior to operation of a disconnect the person performing the operation must demonstrate to the second operator that he is operating the correct disconnect.

12/16/83

The LaSalle Unit 1 standby gas treatment system failed to start following a Unit 1 Division 1 isolation signal, because of an incorrectly installed jumper. On 11/15/83, an electrician had placed a jumper in panel 2PA14J rather than in panel 1PA14J. He was in the process of placing numerous jumpers in the Unit 2 panels to prevent spurious starts of shared safety related equipment caused by invalid signals from Unit 2 (Unit 2 was in a pre-fuel load status). Independent verification did not catch the error. (The verification may not have been independent because the operator who verified the installation was with the electrician when the jumper was installed.)  
(LER #373-83-140)

12/22/83

Maintenance was performed on the TMI-2 Auxiliary Building (AB) exhaust filter train "A". However, after completion of the maintenance, the switching order issued by the CRO incorrectly

required the "B" train to be returned to service. Subsequently, the operator performing the order inadvertently closed the inlet damper of the "B" train which tripped the AB exhaust fans.  
(LER #320-83-63)

Note: The cause of this event was two-fold. First, the Control Room Operator (CRO) who issued the switching order incorrectly identified the "B" exhaust filter train instead of the "A" train to be returned to service. Second, the operator who performed the switching order operated AH-D-4020E instead of AH-D-4020B which was specified in the switching order. This action caused the inlet damper of the "B" exhaust filter train to close which, by design, tripped the AB exhaust fans.

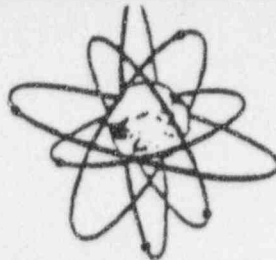
01/06/84

Zion Unit 2 tripped from 100% power due to the inadvertent opening of reactor trip breaker Train "A". At the conclusion of period tests PT-5 & PT-5B, the reactor trip breakers were racked-in and closed and the reactor trip by-pass breakers were racked-in and open. The equipment operator was instructed to rack-out the reactor trip by-pass breakers and after racking-out the Train "A" reactor trip by-pass breaker, he proceeded to rack-out Train "A" reactor trip breaker instead of Train "B" reactor trip by-pass breaker. The licensee reported that (1) the equipment operator was aware of the procedural steps prior to operating the breakers, (2) each of the reactor trip and by-pass breakers were clearly marked by train and breaker function, and (3) the MG-Set room, where the breakers were located, was adequately lit to identify the appropriate breakers, and "since personnel training, procedure adequacy and operating experience could not be found lacking, disciplinary action was taken".  
(LER #304-84-001)

01/09/84

At 2:16 p.m., the Turkey Point Unit 3 reactor tripped from 63 percent power while escalating to full power following a previous unit trip (LER #250-84-002). Instrument and Control Department requested a clearance from Operations to replace a relay in Rack 37 of the Reactor Protection System (Train B). Following instructions for Operating Procedure 1004.2, Reactor Protection Periodic Test, a licensed operator proceeded to Rack 36 (Reactor Protection - Train 'A') and closed Reactor Trip Bypass Breaker 'B'. The procedure then instructed the operator to go to Rack 41 (Train 'B') and trip the Reactor Trip Breaker B, but instead he stayed at Rack 36 and mistakenly tripped Reactor Trip Breaker A. This caused a reactor trip since Reactor Trip Bypass Breaker A was open.  
(LER #250-84-003)

- 03/13/84 - With Kewaunee operating at 83% power both trains of the shield building vent system were unknowingly taken out of service for one hour. Maintenance personnel had initiated a surveillance procedure on train "A" rather than train "B". (LER #313-84-001, IN #84-58)
- 07/16/84 During ECCS testing while at 100% power the D. C. Cook 1 South SI pump ('B' train) was taken out of service for maintenance. However, the operator shut the suction valves for the north pump ('A' train) making both trains inoperative. This lasted for 5 minutes until the mistake was noticed and the suction valve reopened. (Operations Center Log 7/16/84; Docket #50-135). The licensee is revising the test procedure to separate work on the trains.  
(There will be a procedure for each train).
- 07/22/84 At 1738 CDT 7/22/84, Dresden Unit 2 experienced an automatic scram on turbine stop valve closure. The operator dispatched to open the turbine bypass valve to support unit 3 startup, opened the unit 2 bypass valve instead. This resulted in a loss of EHC pressure and turbine stop valve closure. (Docket #50-23 Daily Report 7/23/84). Although the Unit 2 and 3 EHC systems are mirror images, the equipment floor areas are color coded (yellow for Unit 2 and Blue for Unit 3) to help to distinguish between units. The operator had only a few days experience, most of his training had been on Unit 2, and he was sent alone to open the by-pass valve.



# NEA/IRS

## INCIDENT REPORTING SYSTEM

No. IRS 405 (English translation  
Generic; including 2 events)

RESTRICTED  
DIFFUSION RESTREINTE

Title - Titre

HUMAN ERRORS INVOLVING WRONG UNITS

Country - Pays

FRANCE

Date of Incident - Date de l'incident

Type of Reactor - Type de réacteur

Plant - Centrale

Generic

Licensee - Détenteur du permis d'exploitation

Unit N° - Tranche n°

Manufacturer - Fabricant

r - Puissance

MWe(net)

First Commercial Operation -  
Date de mise en service

Systems or Components Affected - Systèmes ou composants affectés

Initial Plant Condition - Etat initial de la tranche

Way in which Incident was Detected ?  
Comment l'incident a-t-il été détecté ?

Radiation Exposure or Radioactivity Release -  
Exposition aux rayonnements ou libération de radioactivité

Date of Receipt - Date de réception

28.6.1984

Date of Distribution - Date de distribution

2.7.1984 (French version)

5.7.1984 (English translation)

Event description, possible causes, actions taken or planned and lessons learned  
(safety significance of incident) should be included in the following



## HUMAN ERRORS INVOLVING WRONG UNITS

Two incidents that have recently occurred in Bugey (4.22.1984) and Le Blayais (4.29.1984) have focused the attention on human errors involving wrong unit.

In both cases a pair of reactors were involved : one in operation, one in refueling. A confusion has occurred in local intervention (intervention on the reactor in operation instead of the other one).

In both cases the only consequence was a trip of the reactor in operation.

The two events are described in the appendix.

This is not the first time that such a confusion occurs, and another class of error very similar is the confusion between two trains of the same reactor unit. To avoid such events some preventive actions have been taken by Electricité de France (in association with IPSN) : better identifications of rooms and cells, order transmittal etc....

But it is well recognized that these preventive actions will not be sufficient to avoid completely the confusions. So, in the same time, an effort will be made in the safety assessment to evaluate the potential consequences of such errors. This will include a study to identify critical valves and breakers, the position of which is not signaled in the control room or which are not yet covered by administrative controls.

## ANNEX 1

INCIDENT ON 22nd APRIL 1984 - BUGEY 2

SYSTEM CONCERNED: MAIN FEEDWATER SYSTEM

### 1. NATURE OF INCIDENT

Emergency trip of Unit 2 reactor owing to very low level in SG1 after an operator from Automatic Control had operated valve 2 ANG 31 VL.

### 2. DESCRIPTION OF INCIDENT

#### 2.1 State of units prior to incident

Unit 2 at 100 per cent nominal power,  
Unit 3 starting up.

#### 2.2. Sequence of events

On Easter Sunday, 22nd April 1984, at about 12 am, the switchboard contacted a member of the Automatic Control staff, who was on standby at home, with instructions to go in that afternoon in order to carry out several operations required for starting up Unit 3.

The operator arrived at about 1 pm. He went to the control room in order to read up the instruction sheets. Since periodical test RIS 01 was in progress, his first job was to simulate a safety injection order on valve 3 ANG 31 VL.

This is done from the relay room located underneath the control room.

The operator went to the relay room at about 1.15pm but instead of simulating the safety injection order on valve 3 ANG 31 VL, he did it on valve 2 ANG 31 VL.

### 2.3 Final state of unit

Unit under hot shutdown.

### 3. COMMENTS

The basic reasons for the operator's mistake are difficult to identify. There seem no grounds for blaming the marking of the two valves concerned. And the numbers of the valve and unit concerned were entered on the instruction sheet which the operator had read. In the relay room, the marking was also adequate since each relay frame displays a small label indicating the number of the unit. The A.C. man therefore had a label in front of his eyes telling him he was operating a piece of equipment on Unit 2, but he apparently did not see it. The layout of the electrical rooms may have played a part in the operator's mistake, it being necessary in order to reach the electrical rooms for Unit 3, to go through those for Unit 2. The A.C. man stopped when he got to the Unit 2 rooms.

Nevertheless, this may not be reasonably considered as the direct cause of his mistake.

4. ACTION TAKEN BY THE LICENSEE

Following this incident, the licensee decided to take several steps in order to reduce the probability of mistaking the electrical rooms of the different Units for each other. The measures are as follows:

- marking the number of the Unit concerned on the walls and flooring in each room;
- painting the doors into each room in a different colour, e.g. brown for Unit 2, green for Unit 3;
- in the longer term, replacing all labels displayed on relay frames by different coloured ones, e.g. brown for Unit 2 and green for Unit 3.

We feel these measures will reduce the probability of rooms and hence Units being mistaken for one another, but not remove it entirely. Actually, analysis of this incident shows that the marking of rooms and valves did not play a fundamental role in inducing the human error. A more likely reason is a moment of inattention, the causes of which are difficult to identify.



ANNEX 2

REACTOR TRIP ON 29th APRIL 1984

AT BLAYAIS 2

Instead of locking out the MG sets for the CRDM in Unit 1, which was shut down for refuelling, an operator mistakenly locked out those for Unit 2, causing emergency shutdown.

1. DESCRIPTION OF INCIDENT

On Sunday 29th April 1984 at about 4.00 am while Unit 2 was at 100 per cent nominal power, the shift supervisor and his assistant were both locking out the emergency shutdown breakers for Unit 1, which was shut down for reloading. The shift supervisor was called back to the control room and left his assistant to continue on his own, asking him to lock out the CRDM power supply system which "wasn't serving any purpose anyway", since the trip breaker was switched out. The assistant was tired (end of shift at an unfavourable time of day). He had been in this job for a week only, having previously been acting as chief reactor operator on Unit 2 (the one on which he should not have taken any action). He took the lift from level 19 (control room) and walked through a door which is usually kept locked since it marks a boundary. This door bears a yellow and black notice indicating that it opens into Unit 2 rooms. The operator did not "see" it. He reacted to none of the clues which should have told him that he was in a Unit 2 room. He locked

out the CRDM sets, interpreting the fact that they were in operation as the result of the operating staff forgetting to switch them off. It was only when an auxiliary operator informed him of the emergency shutdown on Unit 2 (at 4.56 am) that he realised his mistake.

2. CAUSES OF THE INCIDENT

The fact that the operator was tired was entirely understandable at this point during the shift. The fact that Unit 1 was shut down, requiring extra work, was an aggravating factor. It is no doubt because the operator was tired that he went towards the rooms of the Unit which was more familiar to him, failing to absorb messages costing too much effort to take in.

The fact that each door showed many different notices made it even more difficult to take in the information which might have made the operator aware of his mistake.