ENCLOSURE

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

MAR 6 1986

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FROM: Eugene A. Trager
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SUBJECT: TRIP REPORT FOR MCGUIRE AND OCONEE SITE VISITS
REGARDING WRONG UNIT/WRONG TRAIN EVENTS

This memorandum documents the activities and findings of an NRC staff visit to the McGuire and Oconee sites on October 21-24, 1985. Members of the NRC team for this visit included A. Ramey-Smith (DHFT), D. Persinko (DHFT), and E. Trager (AEOD). The site visit was conducted as part of the short-term effort to determine whether simple, low cost improvements can be identified and implemented to reduce the frequency of wrong unit/wrong train events occurring at nuclear power reactor facilities. Upon completion of all site visits, the factors contributing to the events will be evaluated and a report issued which discusses causes and recommendations.

General Information

McGuire Units 1 and 2 are 1180 MWe (net) W four-loop PWRs. The station is located in Mecklenburg County, North Carolina, 17 miles NNW of Charlotte. Major structures are the two ice condenser reactor containments, auxiliary building, turbine and service buildings and the dams and canals associated with cooling and service water activities. Major shared facilities and equipment include components of the CVCS and boron recycle, ice condenser refrigeration, liquid waste, compressed air, containment ventilation cooling and recirculated cooling water systems. The licensee, Duke, was the architect engineer and

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constructor for both McGuire units. Unit 1 achieved initial criticality on August 8, 1981, and began commercial operations on December 1, 1981. Unit 2 achieved initial criticality on May 8, 1983 and began commercial operations on March 1, 1984.

The Oconee Units 1, 2, and 3 are two-loop B&W PWRs rated at 886 MWe (net). Bechtel and the utility, Duke, were the architect engineer and Duke was the constructor. The three units are identical except for certain shared auxiliary systems. The site is located in Oconee County, South Carolina, on the shore of Duke Power's Lake Keowee. Unit 1 achieved initial criticality on April 19, 1973, and began commercial operations in July 1973. Unit 1 achieved initial criticality on November 11, 1973, and began commercial operations in December 1973. Unit 3 achieved initial criticality on September 5, 1974, and began commercial operations December 26, 1974.

Site Visit Agenda

The discussions and in-plant observations centered around four wrong unit/wrong train events that occurred at McGuire, and one that occurred at Oconee. The LER numbers for the events at McGuire are 369-81-180, 370-84-021, 370-84-034, and 370-85-010; and Oconee was 269-82-012. During both site visits, the NRC team inspected the locations of the reported wrong unit/wrong train events to the extent possible, and discussed the events with plant management as well as many of the individuals directly involved with the events. Enclosures 1 and 2 provide the sequence of events resulting in the LERs at McGuire and Oconee, respectively, the licensee's conclusions regarding the event, and NRC staff observations. During the visits licensee staff were asked to provide any available information on events that were not reportable but that involved the wrong unit or the wrong train. This information is also contained in the enclosures.

Observations at McGuire

Labeling and Identification

The NRC team felt the program for labeling was seriously deficient, particularly for valves. There is no procedure for the labeling of most equipment. There is no system of color-coding to distinguish between units, trains, and systems. There is no formal label maintenance program, however, technicians are encouraged to report bad labeling on work requests.

Duke has a corporate instruction on labeling, however, each of the Duke sites implements the instruction differently. McGuire plans to start using a color-code system for labels. That system would use white for unit 1, yellow for unit 2, and orange for common systems and equipment. Valve labels would have a light background (white, yellow or orange) and black lettering.

Component numbers start with the unit (1, 2, or 0), then with letters of the system and finally with a component serial number.

During the site visit it appeared that McGuire personnel have begun to consider improvements in labeling. Personnel interviewed said the labeling was getting better. As noted earlier technicians are encouraged to report defective labeling on a work request. However, with all indications of

improvement there were still signs of problems. There is no site-specific procedure on labeling and color-coding and many indications of "false starts," in earlier attempts. (Exhibit 1 is an example of one earlier attempt to apply identification information to component and piping surfaces.) Current valve labeling consists of embossed aluminum tags and bailing wire, but there are no standards for the tags. Exhibit 2 is a photograph of identification information written on a wall in "Magic Marker," and is further evidence that personnel at the site need better information on identification.

In the control room the NI channels had no unit designation. In addition, the keys for similar equipment/panels are the same for both units (e.g., solid state protection system trains A and B, channels I, II, III, and IV).

Procedures

Written procedures are generally required to be on hand to perform work except for jobs in contaminated spaces, cramped spaces, etc. There are separate procedures for separate units.

At McGuire, the procedures fall into "groups" of procedures, and personnel responsible for the groups are responsible for reviewing related procedures when an event occurs to identify and correct generic problems.

People at Headquarters review the human factors aspects of procedures used at McGuire. Personnel interviewed at the site felt this was an improvement and appreciated the effort. Technicians are encouraged to stop work when procedures are defective (unclear, ambiguous, etc.) and get them corrected rather than wait for someone to have a problem.

Communications

The licensee has no formal program in this area.

Planning and Control of Work

Duke makes only little use of contractors. In fact, Duke provides consulting to other utilities (Management and Technical Services (MATS)). When work must be performed by outside contractors, the group requesting the work is responsible for ensuring contractor personnel are adequately trained.

Equipment status is monitored in the control room at shift turnover. When equipment is taken out of or returned to service this is logged in RO and SRO logs. Trains are removed from service one at a time and are coordinated with the shift rotation schedule.

Verification of Work

McGuire seems to have a comprehensive program for the verification of work. Operations Management Procedure 1-6 and Station Directive 4.2.2 define verification criteria, methods, and standards and include a list of specific components requiring independent verification.

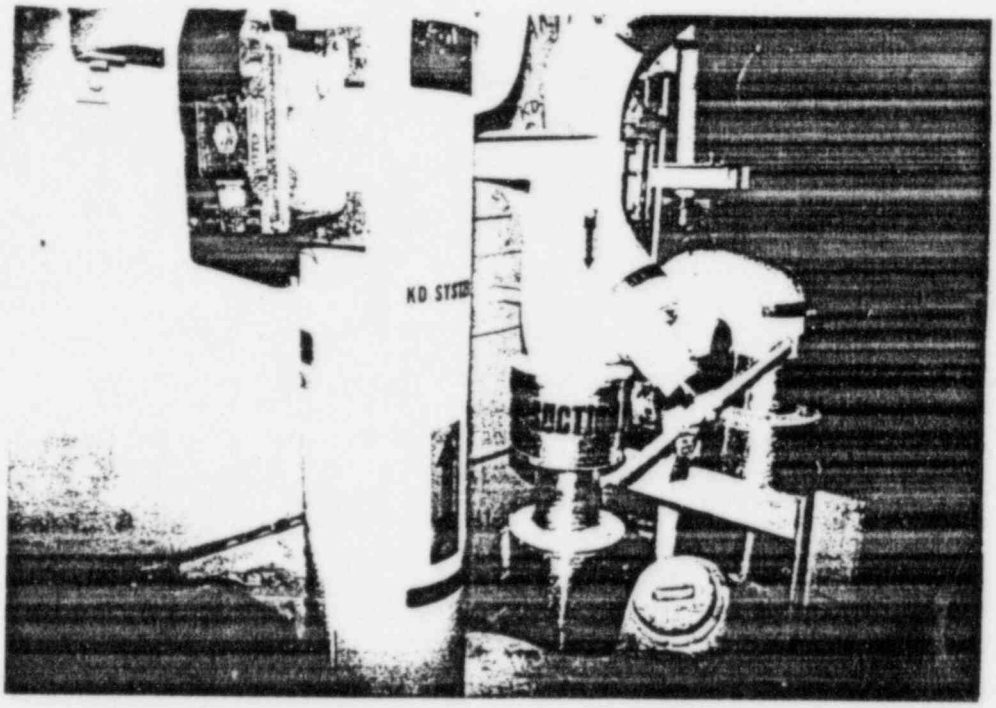

Exhibit 1. McGuire. Early Labeling Attempt that was Discontinued.

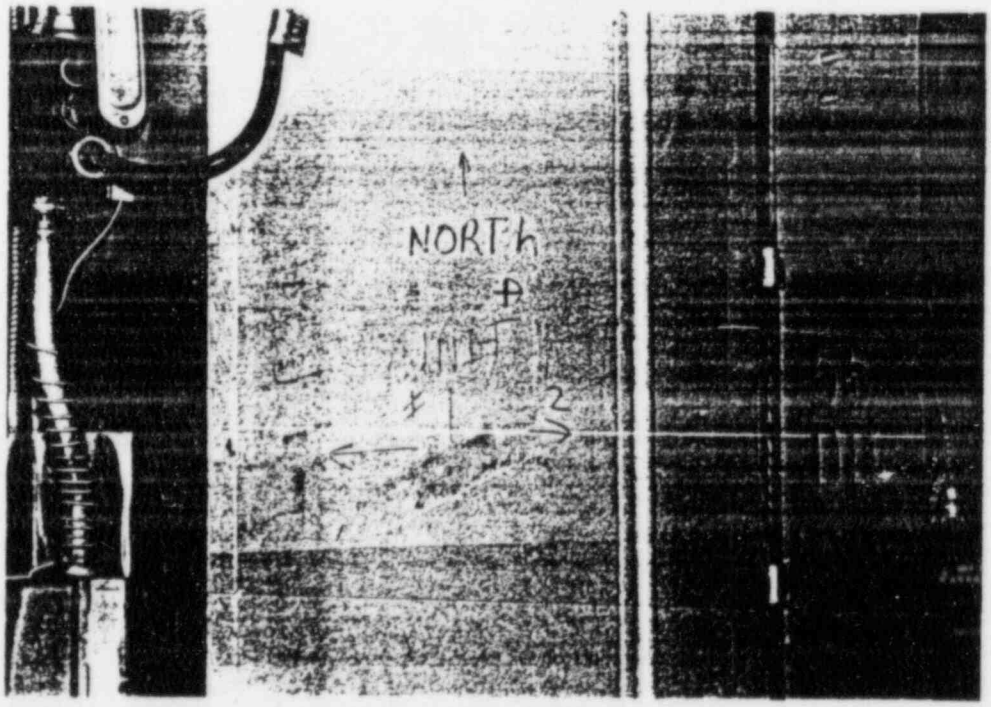


Exhibit 2. McGuire. Information Written on a Wall with "Magic Marker."

Training

The Duke Power Company Nuclear Production Training Plan describes the licensed and non-licensed operator training at all Duke Nuclear Stations. Any information on site-specific topics such as labeling and identification would be included in the (site-specific) modules for McGuire, Oconee, and Catawba. At McGuire identification would be covered in work request training.

On-the-job training (OJT) for Nuclear Equipment Operators (NEOs) and Reactor Operators (ROs) is part of the Employee Qualification Training System (EQTS). The NEOs initially receive one year of training at Duke Power's Technical Training Center (TTC) near McGuire in Cornelius, NC. Then there is OJT at the site until NEOs are qualified in all areas on all three units. (This normally takes about one year.)

Operators are in requalification training for two of every ten weeks. NEOs participate in the RO requalification training program (6 weeks/year) and then take the RO (and eventually SRO) tests.

Mechanical and Instrument and Electrical (IAE) maintenance personnel complete initial training in a 21-week course at the McGuire technical training center (personnel from Oconee also attend this initial training). Addition training is OJT and specialized training for specific jobs.

When information like that contained in an IE Information Notice is received by the licensee, it is reviewed at the training center where there are working groups for each technical subject. Action to be taken at each site is decided by the Safety Review Group (SRG) at the site (see the section on feedback of operating experience, below).

Feedback of Operating Experience

The Duke Power Company Nuclear Safety Assurance program is designed to provide an independent off-site and on-site review of all operating activities, to assess the implementation of safety policies and programs, and to advise upper management of the results of this program. The Operating Experience Management and Analysis (OEMA) Section includes sections for Information Management (OEP, coordination of data on incidents, trend and pattern analysis, etc.), Nuclear Safety Review Board (NSRB) Coordination (audit), and Evaluation and Analysis (event evaluation, screening, and disposition). There is a Safety Review Group (SRG) at each site to investigate, evaluate, and feedback data on site-specific events. There is an SRG chairperson at each site to monitor activities and to maintain communications with headquarters and with the other sites.

The SRG at each site is comprised of one member each from Operations, I&E, Performance (testing), and Chemistry and HP (and sometimes Design). The team members are assigned to headquarters for a year but are physically located at the site. Incident Investigation Reports (IIRs) prepared by the SRG are the bases for the LERs prepared by headquarters.

Anytime an event results from a personnel error or administrative deficiency, the groups that were involved propose a corrective action (e.g., change in training). The action must be approved by the station manager.

The IAE group has a followup session on events. IAE personnel are informed of events in a monthly meeting in which the meeting minutes are signed by the attendees. The personnel that have not signed get a copy of the minutes.

Observations at Oconee

Licensee personnel indicated that years ago problems with equipment identification arose most frequently because of deficiencies in labeling, training, and procedures. In a station drive to reduce the number of personnel errors many changes were undertaken. For example, the station began to develop a color-coding program around 1980-1981. It was recognized that aids such as good drawings of equipment layout and labeling helped in many ways. In addition to reducing the probability of errors involving equipment identification, operations and other personnel do not have to trace down systems hand-over-hand and this promotes efficient work (operations, design, etc.), improves on-the-job training, and helps to keep exposures ALARA. The changes have been made gradually (for example, many changes to unit 3 were made during the most recent outage).

Labeling and Identification

Although Oconee has no formal procedure for labeling, it is a required "station practice." NRC team members were generally impressed by the program that is being put in place.

Phenolic resin is the material used for labels (Catawba is using the same material), usually in a one-eighth inch thickness. This material resists high temperatures. The labels have white lettering and are color-coded as follows:

| | |
|---|---|
| Green | Unit 1 |
| Red | Unit 2 |
| Blue | Unit 3 |
| Black | Station Common |

The control room has one-sixteenth inch thick white labels with black lettering. It was intended that the control room label not look like component identification tags.

Labels consist of a sheet of white phenolic that is coated with a layer of color-coded material. Oconee purchased a special tag engraving machine ($8,000) that is used to engrave the tags. Exhibits 3, 4, 5 and 6 are xerographic copies of component labels used at the site. Exhibits 3, 4, and 5 show actual labels that are color-coded black, red, and blue, respectively, with white lettering. The letter-to-background contrast and the size of the labels make them highly visible and readable.

GE RTV 100% silicone rubber glue is used to attach the labels to equipment. The label and glue materials seemed to be a strong and durable combination although labels can be pried off or broken. Another potential problem is that the labels can be painted or lagged over. However, label replacement is not difficult. In addition, when a Nuclear Station Modification (NSM) and/or maintenance is completed, the work must be approved by an operations support group. The operations support group will not sign off on Form 535 (sign-off sheet) unless the labels are correct.

The label material is also used for permanent information tags. Black tags with white lettering are used for information and red tags with white lettering are used for caution tags. (It was observed that red might not have been a good choice because it was used for unit 2 tags and for fire control signs.) Black lettering on a yellow background is used for rad waste.

A licensee employee who had been involved in the control room design review at headquarters in Charlotte was later assigned the responsibility at the Oconee site for the labeling of the control room and all plant components. (The label shop is supervised by this individual. Maintenance is responsible for the vinyl signs that are also color-coded.) A manual chapter on control room labeling is in preparation. (It was not clear whether a similar administrative instruction would be prepared for the whole plant nor on what timetable.)

Oconee has a "valve book" that includes component functional names and locations and information to be on labels. (The book is consulted when writing procedures and making labels.) Personnel are required to check labels against procedures and procedures against the labels and to use a tag request form when labeling is deficient. The form contains information on the tag location, component, color, etc. This is separate from a work request. Color-blind people can work but must be more cautious.

During the site visit the NRC team inspected the control room and the turbine building. The color-coded labels they observed were clear and prominent.

In the control room for units 1 and 2 the panels for both units are side-by-side in a "mirror-image." Facing into the control room along the boundary between the units the unit 1 panels were on the left and the unit 2 panels were on the right. The unit 3 control room and equipment was completely separate. In general, units 1 and 2 are in close proximity and have shared equipment while unit 3 is physically separate.

Oconee is currently planning the way plant surfaces will appear in the future. Piping (outside the insulation) will be white and all floors will be painted grey. Signs and labels will be color-coded as they are currently. Color-coded plastic sleeves with flow direction arrows will be used on the outside of the white piping.

A major effort is required to develop a labeling and identification program at a single site. There are questions that must be answered regarding the suitability of identification schemes, label and adhesive materials, etc. For example, it was noted that Oconee plans to use "snap-on" sleeves with flow direction arrows on the outside of piping. However, it is not known whether the currently available chloride-free plastic laminate sleeves will be suitable. Furthermore, it is not clear that a single site can motivate manufacturers to produce materials that are best suited to use in nuclear power plants.


Exhibit 3. Oconee. Actual size of label for a component in the liquid waste drain system (Black Background for station common).


Exhibit 4. Oconee. Actual size of label for a component in the Unit 2 High Pressure Exhaust system (Red Background for Unit 2).


Exhibit 5. Oconee. Actual size of label for a component in the Unit 3 Auxiliary Steam system (Blue Background for Unit 3).

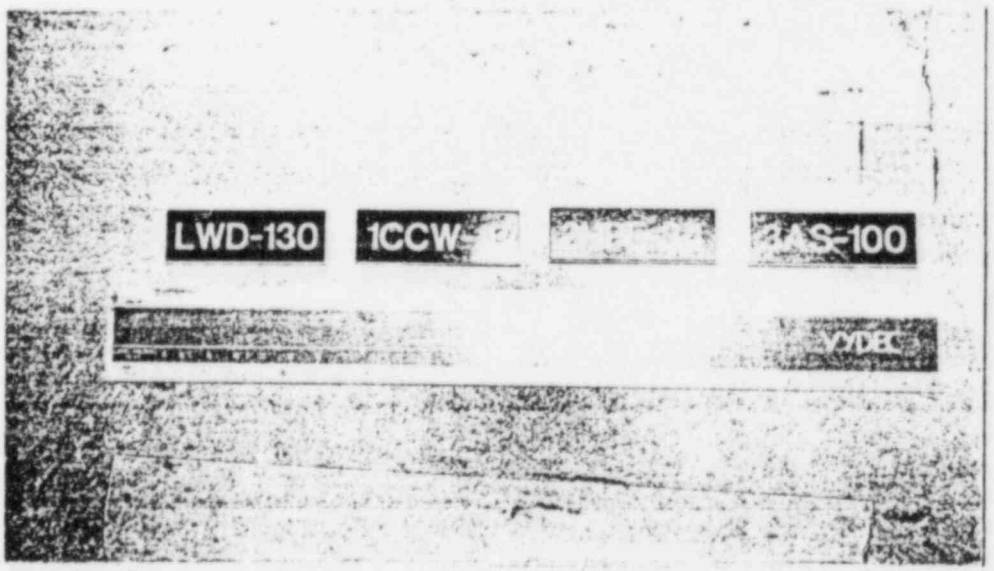


Exhibit 6. Oconee. Component labels compared at a distance.

Procedures

Currently, almost all work is done in accordance with written procedures. If none is available, then one is written. Ordinarily, an operator will not be told to do something, but to come and get the procedure and do the work according to the procedure. This has cut down on miscommunication problems.

There are three separate procedures for the three units except when the work involves shared systems. There may be common procedures with separate enclosures for the specific units and only the applicable enclosure must be brought to the job site.

The control copies of procedures are kept in color-coded binders (green, red, and blue for units 1, 2, and 3 respectively, and black for station common). The working copies must be checked against the control copy before use. Frequently a xerographic copy of the control copy will be used for the working copy.

Shift Manning Schemes

The operations staff per shift for each unit is as follows:

Unit Supervisor
Control Room (CR) Supervisor
Control Operator (CO)
Assistant CO
Basement Nuclear Equipment Operator (NEO)
3rd and 5th Floor NEO
Primary NEO (Aux. and Rx Bldg)
(An "outside guy" is shared by three units)

NEOs are qualified on all aspects of all jobs done outside the control room. A NEO must be fully qualified in all areas. If the unit 1 Basement man was unavailable to perform some job, the unit 2 man could be called on. (The unit 3 man would not be called on because of lack of physical proximity.)

Operations is on a 12-hour shift (7 PM to 7 AM, or vice versa) and operators stay on a given shift for 5 weeks. RO's and SRO's stay on the same unit for 10 weeks and then are counter-rotated to ensure a mix. Personnel work three days one week and four days the next. Discussions with licensee personnel indicated that most operations personnel strongly preferred this arrangment over the 8-hour rotating shift. It seemed to be easier physically and provided for more weekends.

There was no evidence that this particular shift manning scheme (and rotation between units, etc.) increases or decreases the potential for this type of problem. Additional information from other sites is necessary to permit a comparison.

Communications

There is no formal procedure for the control of oral communications, however, this is considered to be covered as a practice. For example, instructions given over a radio would be repeated back in certain "important" jobs.

Planning and Control of Work

System status is logged in the RO and SRO logs and is reviewed at shift turnover.

Verification of Work

The program is the same as that described for McGuire, above.

Training

The basic training program is the same as at McGuire. Identification is covered in site-specific work request training and OJT.

Although Region II observed in October 1984 that quality training was being conducted at Oconee (Ref. Inspection Report Nos. 50-269/84-25, 50-270/84-24, and 50-287/84-27 of December 21, 1984) Oconee was cited because "adequate procedures were not established or implemented to permit timely dissemination of operating experience to Mechanical and I&E personnel" (Severity Level IV Violation).

Feedback of Operating Experience

The program to review and make use of operating experience is the same as at McGuire.

Exit Meetings

Prior to leaving each site, the NRC team expressed its appreciation to the Duke Power Company, McGuire and Oconee staffs for their cooperation in planning the visit, coordinating the tour and discussions, and providing available information. Appreciation was also expressed to the NRC resident inspectors at the sites, particularly Senior Residents William Orders at McGuire and Jack Bryant at Oconee.

Should you have any questions concerning the trip report, please call me on X24495.

E. A. Trager, J.

Eugene A. Trager
Nonreactor Assessment Staff
Office for Analysis and Evaluation
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Enclosure:
As Stated

Subject: Trip Report for McGuire and Oconee Site Visits
Regarding Wrong Unit/Wrong Train Events

cc: C. Heltemes
F. Hebdon
J. Funches
V. Brownlee
C. Cwalina
W. Orders
J. Bryant
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H. Nicolaras

ENCLOSURE (1)

Wrong Unit/Wrong Train Events at McGuire

1. LER 369-81-180 - "Containment Temperature Exceeded the Technical Specification Limit" (Wrong Unit Event)

The following information was contained in the coded LER summary sheet on the event description, probable consequences, cause description, and corrective actions:

> "While at 48% power, the containment temperature exceeded Technical Specification 3.b.1.5 limits (120°F) and two temperature sensors indicated as high as 145°F. This was reportable pursuant to T.S. 6.9.1.13(b). For personnel safety, the containment was evacuated. The containment temperature was only excessive for about 10 minutes and was quickly brought under control once the Unit 1 Containment Ventilation Cooling Water valve was reopened. Thus, no heat damage to containment and equipment occurred.
>
> "Due to an administrative deficiency, Unit 1 containment ventilation return isolation valve 1RN153 (B1F) had been mislabeled 1RN863 (Unit 2 Containment Ventilation Return Isolation), by construction and was closed inadvertently isolating containment ventilation cooling water to the Unit 1 containment ventilation system. The valve was reopened, the metal valve labels switched and construction valve documentation changed."

AEOD special study AEOD/S401 dated January 1984, included the following concerning certain human factors aspects of the event:

> "Incorrect identification of equipment is likely to lead to errors. When the NEO initially closed 1RN153 (mislabelled 1RN863) he noticed he seemed to be throttling flow though no flow should have existed and he notified the assistant operating engineer who verified that 1RN863 should be closed.
>
> "This is significant because the NEO observed and reported that he seemed to be throttling flow. The problem was the lack of followup on the NEOs report. This may have been because of the timing of the event (before fuel loading there was perhaps a less cautious atmosphere)."

The licensee's incident investigation report (IIR) on this event was complete and was a good basis for the LER. The event indicated a breakdown in construction quality control, because the construction drawing was wrong and the valve had the same incorrect label.

2. LER 370-84-021 - "Reactor Trip on Erroneous Signal"
(Wrong Channel Event)

The following information on the event was contained in the LER abstract:

> "On August 31, 1984 McGuire Unit 2 tripped from 100% power on an inadvertant 2 out of 4 channel power range hight flux rate signal. The signal was generated during performance of a test procedure as one channel of the circuit was taken out of service for testing, and a power supply lead in a second channel was mistakenly lifted, resulting in the 2 out of 4 logic trip.
>
> "Personnel error is considered to have been the major cause of the event. All plant systems responded as intended following the trip. Corrective actions include counseling and instruction to appropriate personnel to avoid similar errors of this nature in the future, procedural enhancements which recognize, and thereby guard against, the potential for such errors, and improved labeling of nuclear instrumentation cabinets."

The following information was contained in the evaluation section of LER text:

> "On the day of the event, IAE [instrument and electrical] technical A removed the instrument fuses on the front of the N/I cabinet for P/R [power range] channel 43. IAE technician A walked around a row of cabinets to get to the back of the N/I cabinet containing P/R channel 43 to disconnect channel 43's input plugs. (IAE technician B, who was assisting with the test, stayed at the front of the cabinets). IAE technician A opened the cabinet door for P/R channel 42 instead of the door for channel 43, and disconnected the input plugs on channel 42. This now placed both P/R channels 43 and 42 in the trip mode. With two P/R channels in the trip mode, a reactor trip was initiated.
>
> "The label for P/R channel 43 is on a column between the cabinet doors for channel 43 and 42. Had the label been on the door itself, it may have caught the technicians attention and helped him realize that he was opening the wrong door. There are no labels inside the cabinet to identify the instrumentation contained within. Once the incorrect door was opened, it was unlikely that the technician would have realized he was working on the wrong channel."

Finally, the corrective action of the LER text contained the following:

> "Appropriate individuals have reviewed the incident and have been made aware of techniques to reduce the liklihood of recurrence of similar events. An evaluation will be performed by November 1, 1984 to identify appropriate procedural improvements."

In discussions with licensee personnel during the site visit the following were established:

-- The IAE technician was working on channel 43, but had worked on 42 the previous day.

-- The back of the panels for the channels were labeled with small black tags. Color-coded labels have since been installed on the panels to improve channel identification (red, white, blue, and yellow for I, II, III, and IV, respectively).

-- The orientation of the channels on the front of the cabinets is the reverse of that on the rear of the cabinets. That is, on the front 42 is to the left of 43 and on the rear 42 is to the right of 43. Adequate labeling becomes even more crucial under these conditions.

-- One contributing factor was that the label for channel 43 was on a column between the cabinet doors for channels 42 and 43 making the label/component relationship ambiguous. The labels are now on the appropriate cabinet doors themselves as well, and "Think" signs have been installed under the keyhole in the cabinets (see Exhibits E1-1 and E1-2). However, there are still no labels inside the cabinets to identify which unit or channel the instrumentation within is associated with. That is, once the doors are open the unit and channel identity of the equipment is not labeled.

-- The procedure has been changed to require a dual verification of channel identity, and there is a separate procedure for each channel.

-- The IAE technician who made the error was interviewed. He stated that there had been problems with turbine runback at that time. He was worried because he knew that if it happened when he was running the test the plant would trip. He felt that those concerns and his familiarity with the system may have caused him to be less vigilant. That person thought that the current panel labeling is an improvement.

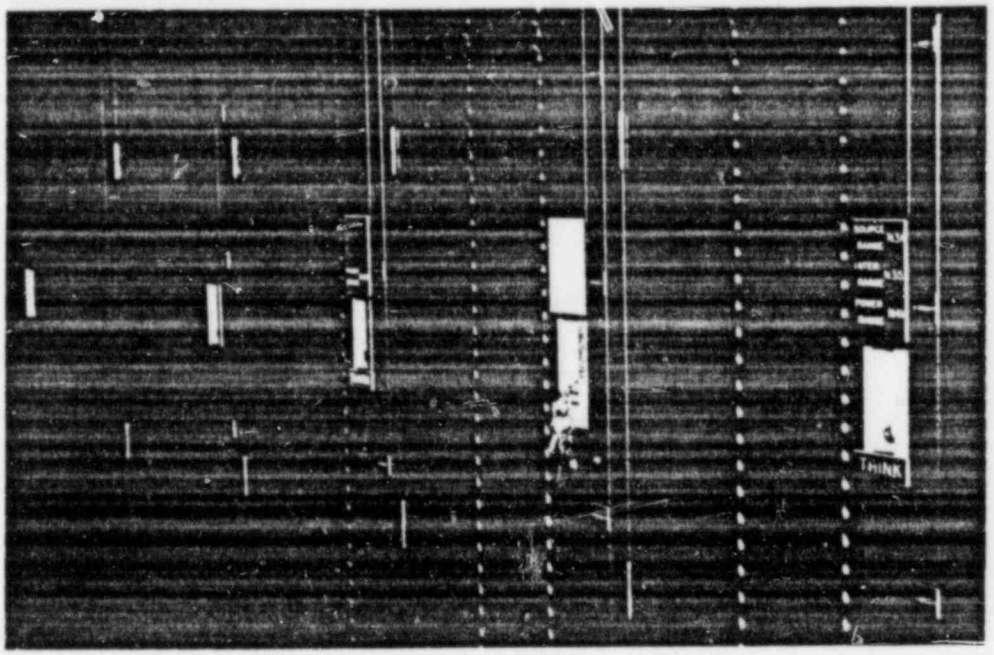


Exhibit E1-1. McGuire. Current Nuclear Instrumentation Cabinet Labeling.

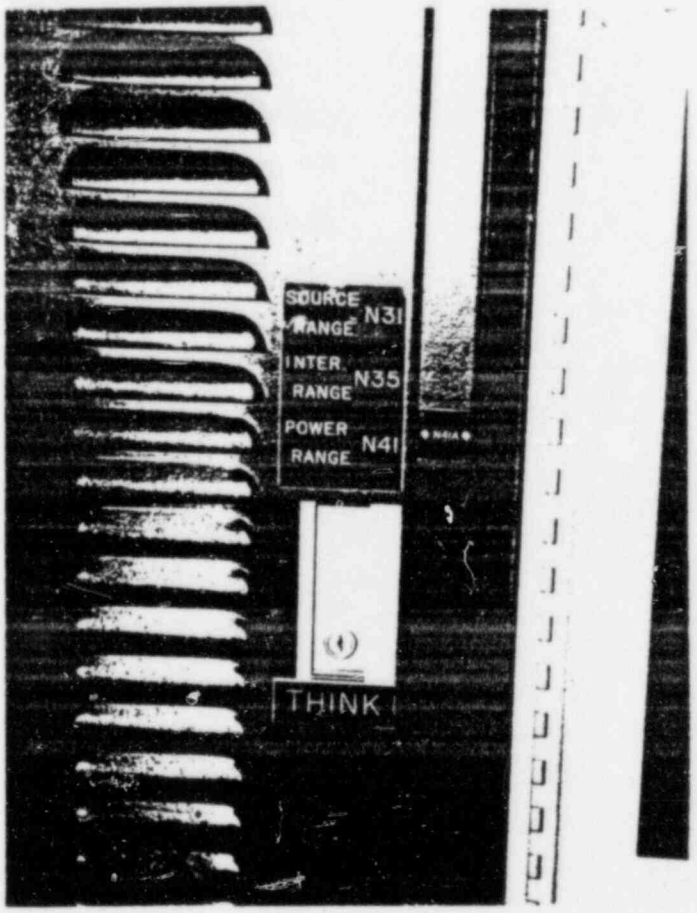


Exhibit E1-2. McGuire. Current Nuclear Instrumentation Cabinet (Front)

3. LER 370-84-034 - "Actuation of Reactor" (Wrong Unit Event)

The following information on the event was contained in the LER abstract:

> "On December 21, 198[4], Unit 2 tripped from 100% power when preventive maintenance on Unit 1 125 VAC Vital Instrument and Control Power resulted in a Unit 2 inverter being erroneously removed from service, instead of the adjacent Unit 1 inverter. The resulting loss of power to the analog controllers for steam generator (S/G) level, feedwater flow, and steam flow resulted in a feedwater transient, which was corrected by switching to manual control and transferring the controllers to another channel. However, the transfer to another channel was done incompletely, in that one of thirteen controller switches was not moved to the alternate channel. When control was returned to the automatic mode, the contribution of this inoperable input to automatic control caused the level in S/G C to fall to the low-low trip setpoint.
>
> "The cause of the event was personnel error because an operator and an independent verifier failed to identify properly the equipment to be removed from service. In addition, the transfer of the steam generator program to an alternate channel was performed incorrectly.
>
> "Corrective action will include a re-emphasis with operators on the importance of following procedures, and verification. Also, the S/G low-low level trip setpoint will be lowered to allow operators more time to diagnose and compensate for S/G level transients.

The text of the LER event is thorough and accurately reflects the licensee's Incident Investigation Report (IIR) for this event.

In discussions with licensee personnel during the site visit the following were established:

-- An operator and an "independent" verifier (actually dual verification was performed) were tagging out the B train static inverter for units 1 and 2. The procedure was generic to the eight inverters for units 1 and 2.* Conversations with the individuals involved indicated that the generic nature of the procedure confused the verifier. The procedure has been revised so that unit 1 is separate from unit 2.

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*The 120 VAC vital instrumentation and control power system consists of four DC/AC inverters per unit supplied with 125 VDC from the charger/battery for the associated channel, and a regulated AC power supply (1 KRP, 2 KRP) is provided for each unit as an alternate source for the AC vital loads. The procedure was a "shared" procedure for startup and shutdown of the inverters of both units.

-- The procedure in question is infrequently performed. The staff involved indicated that the average non-licensed operator does not do a battery room job more than once a year and that it is some of the most "confusing" work.

-- The shift had been extremely busy that night, a factor that may have influenced the decision to do both unit 1 and unit 2 inverters in one trip to the battery room.

-- The operator was an experienced (8-10 years) licensed control room operator while the "independent verifier" was relatively new (about one year of training and one year on the job). It was not felt that overtime or training were contributing factors.

4. LER 370-85-010 - "UHI Vent Lines Overpressurized Causing PRT Sight Glass to Fail" (Wrong Component Event)

The following information on the event was contained in the LER abstract:

> "On May 2, 1985, while venting the UHI (Upper Head Injection) piping inside the reactor building upstream of the UHI check valves, a mislabeled valve was opened causing the UHI lines to the PRT (Pressurizer Relief Tank) to be overpressurized and subjected to high temperature. The vent line sight glass cracked, and a valve diaphragm (valve 2NC-215) ruptured. The mislabeled valve was closed and the damage was repaired.
>
> "This incident is attributed to an Administrative Deficiency, because valves in containment may not be properly labelled. Personnel error was a contributing factor as an unknown person mislabeled the valve.
>
> "The sight glass has been replaced and the valve repaired. All UHI vent valves have been labelled and maintenance procedures have been revised to assure valves are labelled after maintenance has been performed."

The text of the LER also notes that "as there was no labeling on the valve, the operator was misled by a handwritten sign approximately six inches above the valve." In addition, a check of the eight UHI line high point vent valves after the event revealed that only valve 2NI-294 was labeled.

During the site visit the following was brought out:

-- Ice condenser plants have a small containment and the area where the event occurred is particularly cramped. Although two people were present at the time only one could fit into the area of the valve(s).

-- The person who made the error had felt there was no reason to doubt the incorrect sign. It had large, prominent red lettering.

-- Although the operator who manipulated the valve was experienced (had been working since 1980), he had never manipulated these particular valves before.

-- The environment in the area proximate to the valves is stressful; it is dark, very cramped, noisy, hot and humid. The operator has to be dressed out and there are high temperature surfaces to avoid touching.

5. LER 370-84-005 - "Reactor Trip Breaker on Train B was Opened During Breaker Time Response Testing" (Wrong Train)

The following information was contained in the LER abstract:

> "A Unit 2 reactor trip was initiated on February 2, 1984 at 1111 during performance of the "Solid State Protection System (SSPS) Periodic Test Above Reactor Coolant System Pressure of 1955 PSI." The trip occurred when an Instrument and Electrical (IAE) Specialist, who was preparing to place the Train B bypass breaker in the "TEST" position, mistakenly opened the compartment for the Train B reactor trip breaker and accidently pushed the red TRIP pushbutton. Unit 2 was in Mode 1 at 89% when this incident occurred."

Neither the LER nor the licensee's investigation contains a discussion of the factors that contributed to the error by the IAE specialist. As the equipment cabinets were adjacent, physical identification of the equipment may have been deficient.

This event was not discussed during the site visit.

6. McGuire Incident Investigation Report (No LER) - Wrong Nitrogen Sample Valves Removed (Wrong Unit)

On May 29, 1984 at approximately 1500, the unit one nitrogen sample isolation valves 1NC-49 and 1NC-50 were removed instead of 2NC-49 and 2NC-50. Approximately ten minutes later, the Control Room received a low pressure alarm on the pressurizer relief tank (PRT). An investigation by Radioactive Waste personnel revealed a nitrogen leak in the Auxiliary Building on the line connecting the PRT to the shutdown waste gas decay tanks. Valves 1GN-45 and 1NC-53B were closed to stop the nitrogen leak. The shutdown waste gas decay tank was isolated prior to the start of the job. The two valves that were removed were reinstalled on May 30, 1984.

The licensees investigation of this event was thorough. It found that when operations gave the SMS technicians permission to begin work, the technicians were given the red tag stubs to verify the isolation of the system. When they went to the work area, they did not physically verify that the system isolation performed by operations personnel was correct. They simply verified that the correct valves were red tagged by looking at a flow diagram.

The licensee investigation also found that the technicians had opportunities to correct their mistake. All the valves in the immediate vicinity were clearly marked unit one valves. It should be noted that the unit 2 valves were approximately ten feet away and were obstructed from view by supports and other valves, and detection of the unit 2 valves would have been easier if they had read the work request and noted that deficiency tags had been hung.

The investigation also noted that after the valves had been removed, the work request stated they be repaired in the machine shop. SMS personnel were working an eight-hour day and the end of their shift was near; therefore, repair of the valves in the shop was rescheduled for the following day. The SMS technicians left the plant unaware they had removed unit 1 valves by mistake. Had they worked on the valves immediately, correct independent verification would have revealed their mistake.

This event was not discussed during the site visit.

7. McGuire Incident Investigation Report (No LER) - DG Failure Due to Repairs on Wrong Component

Diesel Generator (D/G) 1A experienced an invalid failure (start attempt number 249) on February 6, 1985. D/G 1A had been successfully started and loaded to 4000 KW to verify operability after the completion of maintenance repairs. The run test was terminated prior to the end of the test period due to fuel oil spraying from the fuel oil injector pump for cylinder number 2. The run was considered a failure since it was shutdown due to an abnormal operating condition.

The repairs performed prior to the failure were for leaking fuel oil injectors and pumps for cylinders 14, 2L (10), and 3. Because the work request for the repairs incorrectly specified cylinder 2L (10) for repair instead of cylinder 2, cylinder 2 was not repaired prior to running D/G 1A to verify repairs were adequate.

The corrective action resulting from this event was to hold crew meetings with operations personnel to reinforce the importance of hanging W/R identification tags for components needing repair.

This event was not discussed during the site visit.

ENCLOSURE (2)

Wrong Unit/Wrong Train Events at Oconee

1. LER 269-82-012 - RBS made inoperable (Wrong Train Event)

The following information was contained in the coded LER summary sheet on the event description, probable consequences, cause description, and corrective actions:

> "On June 23, 1982 both trains of reactor building spray (RBS) were inoperable due to the B train RBS pump being out of service while the A train RBS pump suction valve was shut. The reactor building cooling system was operable, and capable of limiting containment pressure below design pressure during a LOCA; thus, the health and safety of the public were not affected by this incident.
>
> "The cause of this incident was personnel error. The B train was made operable by racking in the RBS pump breaker. The Assistant Shift Supervisor was counseled regarding his error, and all operators will review this incident."

AEOD special study AEOD/S401, dated January 1984, included the following concerning certain human factors aspects of this event:

> "Although the technical specification may not have been entirely clear, the problem resulted because the Assistant Shift Supervisor failed to consider consequences of the RBS lineup for testing (lack of planning)."

No additional information on this event was provided during the site visit.

2. Oconee Non-Routine Event Report 085-010-3 - Wrong Deborating Demineralizer Placed in Service (Wrong Train Event)

On March 11, 1985, while unit 3 was at 100% power, a Nuclear Control Operator (NCO) and an Assistant Nuclear Control Operator (ANCO) valved in deborating demineralizer 3A instead of deborating demineralizer 3B. Deboration of the reactor coolant system (RCS) continued for 5 minutes until the ANCO noted (because of a neutron error building up) that the wrong demineralizer had been used.

This incident was classified as a personnel error because the ANCO opened valve 3CS-27 instead of 3CS-32 (while 3CS-32 was closed) and the NCO "independently" verified this wrong evolution. A contributing factor was the different method of labeling used in units 1 and 3. The valve number for the valve used for lithium control for unit 1 is the same used for the deboration for unit 3, and vice versa. The NCO and ANCO had been assigned to unit 1 until February 17, 1985, and after requalification training were assigned to unit 3 starting

on March 4, 1985. While assigned to unit 1, they had performed the delithification procedure using the unit 1 deborating demineralizer. On March 11, they made the attempt, for the first time since being assigned to unit 1, to perform the similar procedure on unit 3.

Operations management had been consulted about whether the opposite valve numbering should be changed. They decided to make no physical changes to the valve numbering because the status of the deborating demineralizers would change in the future, and that the procedures were adequate.

The OSRG concluded this event was not a recurring problem and was not reportable.

This event was not discussed during the site visit.

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