



US NUCLEAR REGULATORY COMMISSION OFFICE OF INVESTIGATIONS

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DATE: DEC 8 1982

OFFICE OF INVESTIGATIONS

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REPORT OF INVESTIGATION

TITLE: SALEM NUCLEAR POWER STATION, Unit 1 Potential Tampering with No. 13 Steam Generator Wide Range Level Recorder

OI FIELD

SUPPLEMENTAL: Docket No. 50-272/82-13

CASE NUMBER: I-82-079

CONTROL OFFICE: Philadelphia

STATUS: CLOSED STATUS: CLOSED

REPORTING OFFICE: Philadelphia

PERIOD OF INVESTIGATION: May 1-5, 1982

REPORTING INVESTIGATOR:

R. Keith Christopher, Investigator Philadelphia Field Office

PARTICIPATING PERSONNEL:

REVIEWED BY:

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Acting Director, Office of Investigations

An investigation was initiated on hay 1, 1982 after the inclused reported that at approximately 8:30 a.m. on that date, a Unit 1 control room operator observed that the control room wide-range level recorder for the No. 13 steam cenerator had been inoperative for some time. Licensee troubleshooting found that two terminals in the hot shutdown panel in the Auxiliary Building were shorted, making the instrument inoperable both on the control room recorder and the hot shutdown panel indicator. It was determined that the short was caused by a formed piece of wire shorting two terminal screws on the terminal board. Licensee examination of the recorder strip chart indicated that the actual shorting of the terminal occurred between 1:00 p.m. and 2:00 p.m. on April 28, 1982.

Investigation has determined that modification work was being done in the hot shutdown panel during the last refueling outage (January 1, 1982 to April 19, 1982) that involved running spare lines in signal cables in the panel. This modification required workers to cut the tie wraps on certain cable bundles in order to run the cables. It was also determined that the piece of formed wire that was found on the terminals is an item commonly used by craft personnel to maintain control of cable bundles.

The contractor personnel who performed the work in the hot shutdown panel were identified and interviewed. While they could not confirm or deny that the formed wire in question was actually used in this particular modification, it was confirmed that this type of formed wire is used by these contractors when working with cable bundles.

Interviews of control room personnel also determined that maintenance tags from the performance department were in place in the control room on the Nos. 11, 12, 13 and 14 steam generator wide-range recorders which would indicate the performance department was working on the instruments when in fact they were not. Interviews of the operators failed to establish when the maintenance tage were placed on the recorders. Further investigation determined that the performance department had done channel calibrations and channel sensor calibrations on all of the steam generators on the same day for each calibration (January 20, 1982 and February 17, 1982) leaving open the possibility that the tags were in place at that time and were never removed. The individual who performed the calibrations was contacted and said that he would normally have placed tags on the recorders but that while he recalled doing the calibrations, he could not recall specifically affixing or removing the tags in the control room.

The Federal Bureau of Investigation was advised of the incident on May 1, 1982. On May 3, 1982, Special Agent John CAMERA formally declined investigative jurisdiction.

On April 30,1982, the International Brotherhood of Electrical Workers engaged in a strike action against the licensee making all non-management personnel unavailable for interview. The strike continued for the next ten weeks. Due to the time period elapsed between the incident and the availability of individuals for interview coupled with the high probability of the incident being a maintenance error rather than deliberate act, no further investigation was conducted. DETAILS

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Purpose of Investigation

This investigation was conducted to determine if the failure of the No. 13 steam generator wide-range level recorder was caused by an intentional act or a maintenance error, and if intentional, to identify any potential suspects who may have tampered with equipment associated with the affected system.

Background

At midnight on April 30, 1982, all bargaining unit employees represented by the International Brotherhood of Electrical Workers (IBEW) Local 1576 initiated a strike action against the licensee. At 8:30 a.m. on May 1, 1982, the wide-range level recorder for the No. 13 steam generator was found inoperative. At approximately 3:35 p.m. on the same date, an Instrumentation and Control (I&C) engineer troubleshooting the problem found that two terminals in the hot shutdown panel were shorted making the instrument inoperable due to a foreign piece of wire being in contact with two points on the terminal strip. The recorder strip chart inficated that the instrument failed between 1:00 p.m. and 2:00 p.m. on April 28, 1982. Interview with

was interviewed on May 4, 1982. He said that at approximately 8:30 a.m. on May 1, 1982, the No. 13 steam generator wide-range level indicator on recorder LA3978 was inoperative. He said the P-250 computer and the hot shutdown panel indicator for the No. 13 steam generator were also found inoperative. Said that by reviewing the recorder chart, they were able to determine that the indicator failed between 1:00 p.m. and 2:00 p.m. on April 28, 1982. Said at this time the channel was declared inoperable (per Technical Specification) and a 7-day action statement per 3.3.3.7 (Limiting conditions for operation) was entered.

continued that at 3:45 p.m. on May 1, 1982, an I&C technician who was troubleshooting the problem in the hot shutdown panel found a piece of formed wire in the shape of a light bulb making contact with terminal points 9 and 12 on the terminal board which caused a short in one signal lead to the ground. Said there was no particular significance to the wire making contact with those terminal points since contact with any terminal points would have had the same result.

refueling outage (January 1, 1982 through April 19, 1982) by Catalytic Incorporated and he conjectured that the wire was left in the panel by the Catalytic electricians. He said he was further convinced of this when he was told that the wire formed in the manner found is in common use by craft personnel, particularly when working with cable bundles. Said the cable bundle in which the wire was found (IFW 99-CO) was in fact cut open during this modification to take out spare conductors and attach them on the terminals to provide signals to newly installed wide-range temperature indicators.

In terms of access to the area, and said the recorder is located at the 84' elevation in the Auxiliary Building near the auxiliary feedwater pumps. He said there were a large number of personnel recorded on the security key card access record and an even larger number of individuals who signed Employee Radiological Entry Permits (EREPs) for entry which was indicative of a significant amount of "piggybacking" (i.e., multiple individuals entering an area after one individual inserts his or her access card to open the door).

In reference to the Performance Department calibration tags being in place in the control room on the Nos. 11, 12, 13 and 14 Steam Generator Wide-Range Level Recorders. Said that since these are not controlled tags it is not unusual for individuals to neglect to remove the tags from the control room after their work is completed. He did state that the work done by Catalytic would not have required the tags to have been placed in the control room.

Examination of Hot Shutdown Panel/Recovery of Evidence

The hot shutdown panel indicator for the No. 13 steam generator is located on the 84' level of the Auxiliary Building near the auxiliary feedwater pumps. The Auxiliary Building is a vital area and as such entry is controlled via a key card reader; however, due to the heavy volume of traffic through the Auxiliary Building, extensive "piggybacking" into the area appears to have been a common occurrence. As such, numerous individuals are reported to have been in the building without card keying into the building. Attachment (1) is a photograph which shows the rear of the hot shutdown panel and shows a view of the cable bundles and terminal strips. Attachments (2) and (3) are photographs which portray where the wire in question was found embedded in the cable bundle as indicated by the I&C technician who discovered the wire. This wire was lying in the cable in such a manner that the open ends of the wire were making contact with terminal points Nos. (9) and (12) as shown in Attachments (5) and (6).

The performance department calibration tags (Attachment 7) which were found in place under the No. 11, 12, 13 and 14 steam generator wide-range level recorders in the control room (Attachment 8 pertains) were recovered by the investigator on May 4, 1982. The recorders are outside of the main control console and are approximately three feet from the floor. As such, the recorders and the performance department calibration tags were not readily visible without leaving the main control console.

Interview of

, Unit 1, was interviewed on May 5, 1982. (May 1, 1982) he was acting in the capacity of a control room operator during the strike action. He said he and his crew relieved the night shift at approximately 8:00 a.m., and as required for the shift turnover, he began taking instrumentation readings of the various instruments. During this tour, consistent said he observed that the No. 13 wide-range level recorder (LA-3978) had failed low. He said a continuing inquiry determined that the hot shutdown panel on the 84' elevation of the Auxiliary Building had failed high. . said this was not recorded in the control room logs but he said that the first observation of the anomaly occurred at 8:30 a.m. said he never noticed the "performance" calibration tags" on the recorders and that he had no ideas as to how long they had been in place. Component that the incident was intentional and related to the strike action because of the existing technical specification requirements that would have required a plant shutdown if the degraded condition was not corrected in a specific time. He also felt that the above type of act, which he considered to be intentional, indicated in his mind that an I&C technician was responsible for the act.

correct the problem after it was discovered and an action statement as required by Technical Specifications was entered at 10:55 a.m.

With respect to the Performance Department calibration tags being left under the recorders, for noted that it has occurred in the past that performance tags were left on equipment after the work has been completed. Was unable to provide any further information. was interviewed on May 4, 1982. He confirmed that with a strike, noted the failed indicator on the wide-range level recorders at approximately 8:30 a.m. on May 1, 1982. Said it was he who first removed the performance calibration tags from under the wide-range level recorders. He confirmed the tags were under both No. 11 and 12 wide-range level recorder (LA-3977) and the No. 13 and 14 level recorders (LA-3978). Said he had not noticed the tags before and that at the time of the discovery (May 1, 1982), he had queried the other operating personnel about the presence of the tags, none of whom could identify the length of time the tags had been in place. Was unable to provide any further pertinent information.

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an by the Westinghouse Instrument Services Company and that he has been working on a contract basis at Salem since June of 1980.

said that on the morning of May 1, 1982, he received a work order from the Operations Department stating that the wide-range level recorder for the No. 13 steam generator had failed low and the hot shutdown panel had failed high. said he first began troubleshooting the problem in the process racks in the control room, and when he determined that there was proper functioning there, he proceeded to examine the hot shutdown panel in the Auxiliary Building. He said the back door on the hot shutdown panel was in place at the time and that he took the panel off to examine the internal terminal strips. He said a quick examination did not identify any obvious problems so he left the area to obtain additional instruments to work on the terminal boards and found that the problem was not there. He said he then lifted a cable bundle back to get to the field side of the leads and when he did this, he saw the wire touching terminal point No. 12. said that he initially had seen the other end of the wire touching terminal point No. 9 and assumed that it was supposed to be there until he saw the other end connecting with terminal point No. 12. He said the wire was lying parallel to the terminal board, behind and to the side of the cable bundle. He said the ends of the wires were not directly connected to the terminal points but were lying up against the terminals with the wire itself being supported by the cable bundle. He said these two ends of the wire contacting those terminal points caused a short to one lead to shield ground.

said that when he removed the wire, the indicator returned to a normal reading. He said there was little resistance holding the wires to the contacts and it was mainly being held in place by resting against cable bundles. said there was no indication that the wire had been wedged into the bundles. Said that there was no particular significance to the wires touching terminal points 9 and 12 and opined that it would be a very unusual means of tampering with the panel. Said that he was initially predisposed to the throught of "sabotage" because of the last incident (see Investigation Report 50-311/80-12) but that in retrospect he is not now convinced that the incident was intentional although he was unable to completely rule out that possibility. Joint Interviews of

said he is a said that over a period of years he has worked in the construction of control wiring and that he learned the use of the piece of formed wire in question from the union electricians. He said the craft electricians routinely used this type of temporary wire to maintain control of cable bundles when it is necessary to cut tie wraps to add cable through the bundle.

said he worked with the union coafts for the last 12 years with United Engineers. He said that when he saw the piece of wire, he immediately thought it was a temporary wrap used by the construction electricians. said the use of this formed wire as a temporary cable bundle holder was commonplace during the construction of Salem Units 1 and 2. Both individuals opined that if this were done intentionally, it would have fallen within the expertise of the I&C technicians; however, both individuals agreed that if an I&C technician wanted to cause this type of disruption, he or she could have used a much more sophisiticated method of shorting the terminal boards. Additionally, neither mor mor could see any purpose to the formation of the bulbed end of the wire if someone merely wanted to jump the terminal board. Both individuals also felt that the I&C technicians would not have any had knowledge regarding the craft's personnel use of the bulbed wire shape in working on cable bundles. Both opined that the incident was not intentional but was the result of craftsmen leaving the wire in the panel following the completion of a work assignment.

Interview of Same and Andrews

was interviewed by telephone on May 5, 1982. He recalled assigning electricians to work on the hot shutdown panel during the outage in the latter part of January to run spares into the cable bundle. He did not work on the panel himself and said he doesn't know exactly how the electricians completed the job. Said his observation was limited to examining the finished job to ensure that the terminal ends were correctly done. He said that his examination found no problem with the completed job but also stated that his inspection would not have involved pulling the cable bundles back and, for that reason, he in all probability would not have seen the wire if it was in place at that time. The identified the electricians who worked on the modification in the panel as Interview of

interviewed by telephone on May 5, 1982. Confirmed that he had worked at Salem Unit 1 during the last outage and he recalled working on the hot shutdown panel with the last outage and he recalled working on the hot latter part of January 1982. He also recalled that their work involved the running of spare lines and signal cables in the panel and that they had cut the tie wraps off of some of the cable bundles in order to run the spares. said he could not recall specific details of the work he performed on that job and did not recall the use of the bulbed shaped wire piece as described above. He said he uses various methods to control cable bundles that he has to cut into, including the use of regular tie wraps, and temporary wire to keep the bundles together. Said while he did not recall using the specific type of wire as described, it is entirely possible that he did. Provided no further information.

Review of Design Change Report (DCR) (IEC-1127)

During the last refueling outage (January 1, 1982 through April 19, 1982) design modifications were made to the Unit 1 hot shutdown panel as a result of the TMI modification requirements (NUREG 0737). These changes primarily involve the addition of four additional channels of instrumentation. Modifications were being done in the terminal blocks but not specifically to terminal points 9 and 12 on the terminal strip in the hot shutdown panel. A review of the DCR revealed that the cable bundle that was supporting the formed piece of wire was in fact undone and retied in order to install the required additional instrumentation.

INVESTIGATOR'S NOTE: Taking into account the physical panel layout and the proximity of the cable bundle into the affected terminal points, it appears highly probable that this formed piece of wire was used as a temporary wire wrap to hold the cable bundles while the permanent electrical terminations were made and then inadvertently not removed from the panel upon completion of the work.

Review of Technical Specification Surveillance Requirements

The Limiting Conditions for Operation (LCO) requires that the accident monitoring instrumentation channels be operable as shown in Table 3.3-11A and 3.3-1B of LCO 3.3.3.7. The surveillance requirements as shown in 4.3.3.7 of the LCO require each accident monitoring instrumentation channel to be demonstrated operable by performance of a channel check and channel calibration at the frequency shown in Table 4.3-11 of the LCO. Table 4.3-11 of the LCO requires that the channel check be done monthly and the channel calibration be done during each refueling outage.

A review of the applicable surveillance procedures and channel check records on May 5, 1982 determined that the last channel check was performed on April 27, 1982 (one day before the instrument failure) and recorded the check as satisfactory at 56% on the No. 13 steam generator wide-range level. The channel calibration data was also reviewed on May 5, 1982. This review determined that the channel calibrations were performed during the outage on January 20, 1982 and the sensor calibrations on February 17, 1982. During these calibrations the wide-range level indicators in the control room would be tagged out by the I&C technicians performing the calibration. The channel and sensor calibrations were completed for all of the steam generators on the same day on each occasion (January 20, 1982 and February 17, 1982) which may account for the performance department calibration tags being on all of the steam generator wide-range level recorders.

INVESTIGATOR'S NOTE: performed the calibration and channel check was contacted after the termination of the IBEW strike. He could not recall either affixing or removing the calibration tags in the control room during the calibration but acknowledged that he normally would have placed those tags on the wide-range levels recorders in the control room when he did the calibrations.

III. STATUS OF INVESTIGATION

Since the IBEW strike negated the ability to perform timely interviews of technicians and possible witnesses, coupled with the results of the investigation to date, no further investigation is considered justified. Accordingly, this investigation is considered closed.

IV. ATTACHMENTS

Attachment 1 through 3:	Photographs of hot shutdown panel.
Attachment 4:	Diagram of terminal board for hot shutdown panel.
Attachment 5 and 6:	Photographs of the formed wire.
Attachment 7:	Photograph of the performance department calibration tags.
Attachment 8:	Photograph of the steam generator wide-range level recorders.

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CABLE BUNDLE 1FW99-C-Ø

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CABLE BUNDLE 1FW99-C-Ø AND TERMINAL POINTS 9 AND 12









