

CATEGORY 1

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SUBJECT: Responds to violations noted in insp repts 50-387/97-02 & 50-388/97-02. Corrective actions: revised Safety Tagging Sys, trained personnel on new safety tagging equipment & issued hands on briefing package re significance of event.

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U.S. Nuclear Regulatory Commission
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**SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO NRC INTEGRATED INSPECTION REPORT
50-387/97-02, 50-388/97-02 : NON-SAFETY RELATED
MAINTENANCE INDUCED INCIDENTS
PLA-4632**

Docket Nos. 50-387
and 50-388

FILE R41-2

The purpose of this letter is to provide the requested response to the non-safety related maintenance induced incidents noted in the NRC Integrated Inspection Report 50-387/97-02, 50-388/97-02. The four events are briefly described in Attachment A. Three of the events had the potential to result in personnel injury; the fourth resulted in a plant transient and posed a challenge to operations.

Pennsylvania Power and Light takes all of these events very seriously. Each of these events was entered into our Condition Report process, has received an in-depth root cause evaluation resulting in specific corrective actions to prevent recurrence and identification of common issues between the events.

PP&L relies on the defense in depth principle for control of events. This principal consists of design, procedures and people. In the case of each of the events, both the procedure and the people barriers broke down to some degree.

Procedures

Our procedures in some cases lacked clarity and detail. A procedure writer's guide has been developed. Its intent is to achieve consistently written procedures that have the right level of detail, are concise, easy to read and understand, and, most of all, are accurate. An ongoing initiative is in process to improve our procedures

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Human Performance

We have recognized that in each event, there was a failure in the human performance aspect of the activities. This is the most significant issue to come out of the review of these events. It is an established Nuclear Department goal to achieve an event-free environment from a human performance stand point. We have a high priority Department initiative to improve human performance and reduce the number of human performance errors.

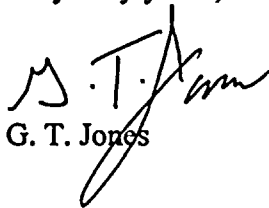
PP&L has addressed the human performance improvement issue from two perspectives: the supervisor's role and the individual's role. Nuclear Department management has emphasized its expectations to the supervisors. Training is being modified to include formal training and on the job training, which specifically addresses administrative and human performance concerns. We have also instituted a field review checklist with emphasis on human performance. Each maintenance work crew is being trained in the next round of crew training to take advantage of the crew/foreman team concept. The training will reinforce/emphasize that each member of the crew needs to be proficient in good human performance techniques.

In addition to crew training and foreman specific training, all maintenance foremen are targeted to attend Leadership Academy training. This will directly enhance their ability to effectively influence and lead their crews.

We have looked at these events individually and collectively. We have also evaluated our recent experience against industry experience as well as previous Susquehanna experience. We have identified weaknesses in our prior review of similar events. These weaknesses are understood and the appropriate actions have been taken. These issues include: root cause analysis, change management, and training and qualifications.

As stated earlier, PP&L takes all of these events very seriously. We believe that the corrective actions identified in this letter will provide long term solutions that will prevent recurrence of the identified conditions. We trust you will find this response complete and adequate for your review. PP&L welcomes the opportunity to discuss the initiatives noted above with the NRC, should the NRC feel the need for additional information is necessary. Any questions on this response should be directed to Mr. J. M. Kenny at (610)-774-7535.

Very truly yours,



G. T. Jones

Attachment



copy: NRC Region I
Mr. C. Poslusny, Jr., NRC Sr. Project Manager - OWFN
Mr. K. M. Jenison, NRC Sr. Resident Inspector - SSES

Event 1: *Personnel Working in Condenser Waterbox with Inadequate Safety Blocking*

Personnel were working in the condenser waterboxes with inappropriate industrial safety blocking, (blocking refers to the use of permit and tag system to control the status of plant components for personnel safety protection). While personnel were working in the waterbox, valves were requested to be manipulated to reduce water leakage. These valves were not part of the permit boundary but represented the real boundary between the water filled line and the drained portion of the line. The operator responsible for issuing the safety permit identified that an unsafe condition existed in that people were allowed to work in the pipe before the entire system was drained. No personnel injury was incurred although the potential existed for a significant personnel safety incident.

Summary of Root Cause

The key issue that the root cause evaluation points to is a lack of processes or protocol for handling hazards within a permitted boundary. This points to the need for training and knowledge/experience for the involved individuals to establish effective human performance as the last barrier to prevent error that put people at risk.

Summary of Key Corrective Actions

As a result of the investigation into this event a number of corrective actions have been or are scheduled to be taken. Those of significance include:

- Revision to the Safety Tagging System.
- Training personnel on the new safety tagging equipment.
- Issue an all hands briefing package discussing the significance of the event, the need to use good human performance techniques, and the impact that communications played in the event



Event 2: 12 Ton Grove Crane Tipped Over

In this event the crane tipped over due to over extending the boom when rotated to a nearly perpendicular position with reference to the crane. The boom was unloaded at the time of the incident. One member of the rigging crew was in the path of the boom as it was falling and had to jump out of the way to avoid being struck. No injury to personnel occurred.

Summary of Root Cause

The event review that followed identified a number of key contributor to the event. The individual had limited experience operating cranes. His initial training was generic in nature, was not associated with INPO Accredited Technical Training Programs, and also was not specific to this model or vintage crane. He was not aware that the crane could be tipped with no load on the boom, and therefore did not refer to the "load chart". Finally, the individual on the ground had his back to the crane when it tipped, reflecting a lack of experience on his part when working around a crane.

Summary of Key Corrective Actions

A number of significant corrective actions are in place. They include:

- Site wide training on the event has been completed.
- Review of all crane operators training and experience. In the absence of substantial experience, appropriate actions are taken.
- Train the rigging crew on safety when operating around a crane, establishing expectations regarding "eyes on the boom and hook."

In addition, there are actions scheduled for future completion which enhance and complement the actions noted above:

- Continue follow-up training and coaching on crane safety at regular intervals.
- Reinforce the human performance tools of self-checking and risk assessment.
- Revise crane operator training to include structured on-the-job training, sufficient minimum practice standards, and task certification.
- Evaluate other Non-Susquehanna Training Center Training for similar deficiencies.

Event 3: SDHR PVC Piping Rupture

A piping failure occurred in the temporary portion of the Supplemental Decay Heat Removal (SDHR) System immediately following the start of the #2 pump during pre-operational checks. SDHR is used to provide alternate cooling water to the fuel pool heat exchangers during unit refueling outages to allow service water (normal cooling water supply) to be removed from service. In this event the PVC piping on the pump discharge ruptured immediately following the start of the pump. As a reaction to the rupture, the PVC pipe moved enough to strike an individual in the leg causing a minor injury.

Summary of Root Cause

A more detailed description of this event is necessary to understand the conclusions reached. A nearly identical arrangement had been used during the previous outage. Between outages, the vendor that supplied the pump skid made changes that he believed would enhance the pump operation, and were of minor nature. These changes, which included the addition of spring mounts for the pumps, resulted in allowing the torsion experienced during the pump start to be transmitted to the PVC pipe, causing the rupture. The fact that the piping was not completely vented contributed to the event by allowing the torque component to increase under startup conditions. This equipment is installed each outage, and as such is assembled and disassembled each outage; therefore the fit-up is not the same for each evolution.

The vendor made changes to the skid to allow better operation. In his view these were minor changes but they resulted in two significant differences. The first, discussed above, resulted in transmitting torsion to the piping. The second consequence was that the additions/changes changed the overall elevation of the skid making the fit-up more difficult. The engineering team involved knew of the changes but failed to identify their significance.

The root causes of the event include : the use of PVC piping, poor initial fit-up of the piping, poor venting of the piping, and the springs mounted to the frame of the pump skid. In addition , the injured worker displayed poor human performance skills in that he failed to move "out of harm's way" during the pump start.



Summary of Key Corrective Actions

The corrective actions for this event are both short and long term.

The short term actions have been completed, and included:

- Replacement of the PVC pipe.
- Chocking the spring mounts.
- Installing sufficient vents.
- Procedural changes to start pumps with discharge valve closed, and to including requiring all personnel to stand clear when starting equipment.

The longer term actions include:

- Raising the awareness of plant personnel of personal safety and at risk situations.
- Ensuring adequate steps are taken to ensure proper pipe fit-up.



Event 4: Core Boring Resulted in Offgas Isolation and Reactor Manual Scram

Core bore activities were being performed per a Work Authorization (WA) in Unit 1. The scope of the WA was to excavate a 36" diameter hole through the floor slab with a core drill. The floor thickness is approximately 4'7" at the location of the core bore. The core drilling process required the use of water as a lubrication and cooling medium. A collection system was in place for the slurry created by the excavation process.

The core drill cut partially through the metal decking under the concrete slab and released a slurry of water and concrete dust through the cut. A funnel was installed on the elevation below the cut in order to capture the slurry. The slurry filled the funnel and overflowed due to clogging of a strainer in the throat of the funnel. The slurry then splashed onto the top of the shoring scaffold. The slurry ran off of the shoring scaffold onto an adjacent pipe that runs directly over the Unit 1 Offgas Recombiner Hydrogen Analyzer Panel. The water/concrete dust slurry dripped from the pipe onto the Hydrogen Analyzer Panel and an adjacent instrument panel. The mixture wetted the Hydrogen Analyzer electronics located in the panel.

The wetted electronics for the "A" Channel Hydrogen Analyzer caused a Hi-Hi Hydrogen signal to be generated which initiated an "Isolate Offgas" signal. This signal closed the steam jet suction valves per design.

Attempts were made to restore the original system configuration and place the Common Recombiner back into service. These actions were not successful, and with Main Condenser vacuum deteriorating, the mode switch was placed in Shutdown which initiated a Reactor Scram.

Summary of Root Cause

- Inadequate pre-planning of the risk associated with the work activity. It is PP&L's expectation that all work is approached in a manner that expects success, but plans for failure.
- Procedural inadequacies for the Offgas system required the operator to make interpretations on the guidance provided which resulted in abnormal system response.



Summary of Key Corrective Actions

This event should be viewed in two aspects, one of maintenance which initiated the transient, and one of operation in response to the transient. Corrective actions have been identified for both work groups and delineated below.

Maintenance Activities:

- Reinforce our work practice standard with all supervision (expect success, plan for failure).
- Review all major modification work for risk. Make changes required before allowing work to continue.
- Revise work package procedures to include guidance for risk assessment.

Operation Response

- Revise operating and off-normal procedures.
- Re-evaluate training frequencies for operators on the Offgas System.
- Develop training in response to this event for distribution plant wide, describing the condition leading up to the transient, the offgas response, and the importance of offgas to plant operation.