

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

October 12, 1994

MEMORANDUM FOR: G. W. Cunningham, Technical Director

COPIES: Board Members

FROM: Ajit Gwal

SUBJECT: Electrical and Fire Protection Systems, Idaho National Engineering Laboratory (INEL), Idaho Chemical Processing Plant (ICPP), CPP-603 and CPP-666 Fuel Basins, Report of Site Visit, July 27-28, 1994

1. Purpose: This memorandum provides a report of a visit by Defense Nuclear Facilities Safety Board (DNFSB) Staff members, Ajit Gwal and Dan Ogg, to the subject facilities on July 27-28, 1994. The review focused on electrical systems and instrumentation and control systems. A limited review of the fire protection system was also performed.
2. Summary: The review identified the following major issues and observations:
 - a. A propane-powered generator is used to supply emergency power to the Criticality Alarm System at CPP-603. In the event of a leak in the line carrying propane, and a spark or arcing due to an open battery terminal, a potential explosion hazard exists. The DNFSB staff believes that active mitigation of the potential build-up of propane or the use of a conventional diesel generator in lieu of the propane generator would eliminate this hazard.
 - b. In the staff's opinion, electric space heaters provided on the walls of the CPP-603 fuel basins create a fire hazard. With the exception of the control room, there is no fire detection system or fire protection system (FPS) in the building. Westinghouse Idaho Nuclear Company, Incorporated (WINCO) has no plans to install one.
 - c. The DNFSB staff believes that several design deficiencies exist in the electrical project upgrade for the CPP-603 building. These deficiencies are related to the short circuit rating of circuit breakers and protective device coordination. The Department of Energy (DOE) and WINCO plan to correct these design deficiencies.
 - d. WINCO has not performed studies of voltage profiles, short circuits, or protective device coordination for CPP-603 or CPP-666. Based on the information presented by WINCO, the DNFSB Staff believes that several electrical deficiencies exist in these buildings.

- e. Building CPP-603 does not have lightning protection as required by NFPA-780, Lightning Protection Code.
3. Background: The ICPP electrical, control, instrumentation and fire protection systems needed to support plant processes and plant safety are outdated and overloaded, and are not in compliance with state regulations, DOE Orders, National Electric Codes, and industry standards. Many of the installed electrical instrumentation and control systems at ICPP are old and showing the effects of aging. These factors, combined with plant-wide load growth that has reached the capacity limit of the electrical distribution systems, present potential health and safety risks during continued operation and maintenance of these systems. Upgrades to these systems are required but have been delayed for many years. The Staff performed an initial review of these upgrades and various related topics as discussed below.
4. Discussion:
- a. Propane-powered generator: Emergency power to the CPP-603 Underwater Fuel Receiving, Handling and Storage Facility is supplied by a propane-powered generator located in the adjoining CPP-603 Irradiated Fuel Storage Facility (IFSF). The only system at the underwater facility served by the generator is the Criticality Alarm System (CAS). The room that houses the propane-powered generator also contains many lead-acid batteries. The Staff believes that, in the event of a leak in the propane line and a spark or arcing due to open battery terminals, a potential explosion hazard exists. This hazard could be eliminated by mitigating the potential build-up of propane gas or by replacing the propane-powered generator with a conventional diesel generator located outside the building.
 - b. Electric Space Heaters: Electric space heaters are installed on the walls of the structure above the CPP-603 fuel basins to provide ambient temperature control. These heaters have exposed red-hot elements, creating the potential for a fire and its propagation. There are no fire detection or protection devices in the fuel basins and continuous surveillance is not provided. It is the staff's opinion that an incipient fire could go undetected for a long period of time.
 - c. ICPP Electrical and Utility Systems Upgrade Project: The DNFSB staff found that the electrical systems at ICPP, including CPP-603, are outdated and overloaded, and are not in compliance with state regulations, DOE Orders, National Electric Codes and Standards, and IEEE Standards. These factors, combined with plant-wide load growth that has utilized the full capacity of the electrical distribution system, lead to increased risk associated with continued operation and maintenance of the ICPP electrical systems. Various electrical system deficiencies were previously identified in the "ICPP Electrical Distribution System Long Range Plan and Forecast" Revision 1, September 1992, (WIN-331). Standby power deficiencies were documented in the "Status of Alternate Power at the ICPP - A Group Report," a 1988 study (SLAG-16-88). Various other deficiencies have been

identified through a series of self-assessments and feasibility studies. These deficiencies provided the basis for determining corrective action to bring the electrical systems into compliance.

To alleviate safety deficiencies, to update electrical distribution systems, and to meet the latest operational safety requirements, WINCO has proposed the installation of a new utility distribution system. A major electrical system upgrade of the low voltage electrical distribution system in CPP-603 is also planned, utilizing a 2500 kVA transformer. However, if a 2500 kVA transformer were installed, the Staff believes that further study of the short circuit interrupting rating of all 480 volt equipment would be necessary. Preliminary calculations by WINCO show that all 480 volt equipment will have to be replaced. The DNFSB Staff pointed out, to the WINCO Electrical Group, design deficiencies related to the short circuit interrupting rating of 480 volt circuit breakers and the protective coordination study for the upgrade project. DOE and WINCO plan to evaluate the above deficiencies, and the DNFSB Staff will review the results as they become available.

- d. Electrical Calculations: Comprehensive short circuit, voltage profile and coordination studies performed in accordance with IEEE STD-141, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants, and STD-242, IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems, are essential to safeguard personnel and maintain a safe and reliable power system. WINCO presented studies on the electrical distribution for ICPP. However, documentation to verify the adequacy of these studies for CPP-603 and CPP-666 does not exist. The DNFSB Staff believes, based on the results of calculations performed for the electrical upgrade project, that many deficiencies exist in the electrical systems at CPP-603 and CPP-666. The Staff also believes it prudent that further calculations and studies be performed to verify design adequacy to meet building load requirements without exceeding equipment ratings.
- e. Lightning System: WINCO presented the lightning protection plan and drawings for CPP-666. However, CPP-603 does not have a lightning protection system. WINCO indicated that they will be evaluating the need for such a system that complies with NFPA-780, Lightning Protection Code.
- f. Preventive Maintenance (PM) of Electrical Equipment: Although WINCO presented a good framework for preventive maintenance, the Staff review of detailed maintenance procedures revealed a number of technical inadequacies and weaknesses, especially for electrical equipment such as batteries and diesel generators. For example, IEEE Standard - 450, Recommended Practice for Maintenance, Testing and Replacement of Large Lead Storage Batteries, is not referenced or used in the preventive maintenance procedures for batteries. WINCO has submitted various preventive maintenance documents to show that the intent

of IEEE-Standards is met in the procedures. The DNFSB Staff will review these documents and report separately on any resulting issues.

- g. Fire Protection System: With the exception of the control room, which is equipped with a sprinkler protection system, CPP-603 does not have a fire detection system or FPS. Although WINCO stated that much of the building consists of fuel storage pools and cells for which a fire is a very remote possibility, WINCO has ignored the existence of the electric space heaters on the CPP-603 building walls. The DNFSB Staff firmly believes that a potential fire hazard exists and will be following the resolution of this issue. WINCO has completed and forwarded a Fire Hazards Analysis (FHA) of CPP-603 to DOE for approval. A FHA for CPP-666 is scheduled to be completed by December, 1994. The DNFSB Staff plans to thoroughly review the FPSs for CPP-603 and CPP-666 after receipt of the FHAs and the evaluation of the impact of electric space heaters in the CPP-603.
5. Future Staff Actions: The DNFSB Staff intends to perform the following reviews to assess the progress of WINCO in resolving the issues, identified in this memorandum. A follow-up visit is planned for February 1995.
- a. Review the resolution of a potential explosion hazard due to the presence of propane in the vicinity of batteries in the propane-powered generator room.
 - b. Review the resolution of the need for a fire detection and protection system in CPP-603 due to the existence of electric space heaters.
 - c. Review the ICPP, CPP-603, and CPP-666 electrical upgrade projects.
 - d. Review the studies of voltage profiles, and short circuit and protective device coordination for CPP-603 and CPP-666 when completed by WINCO.
 - e. Review WINCO's evaluation of the need for lightning protection in building CPP-603 to comply with National Fire Protection Association Codes and Standards.
 - f. Review documents submitted by WINCO on electrical equipment maintenance.
 - g. Review the FHAs for CPP-603 and CPP-666.