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DNF SAFETY BOARD

Department of Energy
Washington, DC 20585
November 3, 2000

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Suite 700
Washington D.C. 20004-2901

Dear Mr. Chairman:

This is in response to your September 20, 2000, letter identifying the technical issues that require resolution and formal closure to support safe and reliable operation of the Hanford Spent Nuclear Fuel (SNF) Project facilities. DOE-Richland Operations Office (RL) managers and Fluor Hanford, Inc. (FH) managers who have direct responsibility for the SNF Project have worked closely with your staff to resolve these issues.

The open issues identified in the referenced Board letter and its attached Staff Issue Report were a reiteration and amplification of topics discussed among representatives of RL, FH, and your staff during two separate video teleconferences (VTCs) conducted on August 22 and 24, 2000, respectively. The subjects of runaway thermal reactions, criticality analyses and reviews, and the status of electrical and instrumentation and control systems were reviewed during these VTCs.

Your staff visited the Hanford Site on October 11 and 12, 2000, to address and resolve each concern with the RL and SNF Project staffs and review the documentation necessary to demonstrate closure of each item. The meetings were very productive and the participants were able to reach resolution on every issue or agree on a plan and schedule for closure.

The detailed response to the Staff Issue Report and resolution of each issue is contained in the enclosure to this letter. The two-day meeting was followed by a teleconference on October 16, 2000, to further discuss closure of one remaining issue related to worker protection. The path forward for closure of that one remaining issue was agreed to during that teleconference.

If you have any further questions, please contact me at (202) 586-7710 or contact Mr. Mark W. Frei, Deputy Assistant Secretary for Project Completion, on (202) 586-0370.

Sincerely,

James M. Owendoff

for Carolyn L. Huntoon
Assistant Secretary
for Environmental Management

Enclosure

cc:
Mark Whitaker, S-3.1

ENCLOSURE

GENERAL ISSUE: RUNAWAY THERMAL REACTIONS:

- ***Specific DNFSB Staff Comment:***

  "As approved by the DOE-RL in July 2000, the design of the knockout pots will be changed to include copper cooling surfaces. This change will improve heat conduction and provide increased margin against a runaway reaction. The replacement pots are being procured and will be installed after initiation of fuel removal operations. The knockout pots currently installed in the basin do not have copper cooling surfaces and so will be subject to a loading limit. The loading limit is to be determined and included in the operating procedure."

Basis for Closure:

We also concur with the DNFSB concern that the knockout pot in the Integrated Water Treatment System (IWTS) may have more susceptibility to a rapid oxidation reaction, compared to other SNF Project systems and components. For that reason, the SNF Project is changing the knockout pot design to include internal copper cooling surfaces. This change is a measure to provide defense-in-depth and will further increase the margin of safety for thermal conductivity. The design will be complete by November 15, 2000, and the additional knockout pots are currently scheduled for installation in the K West Basin in August 2001. The SNF Project is evaluating the need for an expedited procurement, in which case the new knockout pots would be available prior to August 2001.

The SNF Project has established a conservative, safe loading limit for the existing knockout pots. The current operating procedures identify the loading limit for the existing knockout pots. The SNF Project will reword its operating procedure FTP-OP-PSI-055W to set an action limit for a gross weight for a knockout pot at 795 pounds. This procedure will be revised to add this clarification by December 31, 2000. The empty knockout pot weighs approximately 550 pounds, so this allows for 245 pounds of debris, including uranium metal, to be accumulated in the current knockout pot (i.e., without copper cooling surfaces) before action is taken.

Supporting Documentation:

FTP-OP-PSI-055W, Rev. 0-Q, "Fuel Decap/Wash Operations," dated May 22, 2000 (including in-process revision)

SNF-4424, Uranium Metal Water Reactions in the Integrated Water Treatment System Issue Closure Package," Rev. 0, released July 29, 1999

HNF-1527, "Estimates of Particulate Mass in Multi-Canister Overpacks," Rev. 3, released February 16, 2000

Resolution Achieved with by DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

- ***Specific DNFSB Staff Comments:***

"The operating procedure for the Primary Cleaning Machine should identify possible indications of a runaway reaction. The procedure should also identify preventive/mitigative actions to be taken in response to these indications."

"The procedure for the Fuel Retrieval System should identify possible indications of a runaway reaction. The procedure should also identify preventive/mitigative actions to be taken in response to these indications."

"The procedure for loading the Multi-Canister Overpack (MCO) should identify possible indications of a runaway reaction. The procedure should also identify preventive/mitigative actions to be taken in response to these indications."

Basis for Closure:

We recognize that there may be greater uncertainty in predicting a rapid oxidation reaction than most other analyzed events. Flashes or rapid and unexpected reactions have never been observed at the K Basins, despite extensive fuel handling, but such reactions have been observed under certain conditions at locations other than the Hanford Site, during the handling and storage of uranium and other pyrophoric metals. The occurrence of such phenomena at some point during the two-year SNF Project fuel handling and packaging campaign is not impossible and cannot be completely discounted, but the potential has been extensively evaluated in the Project's safety documentation. According to the approved Final Safety Analysis Reports (FSAR), the hypothesized rapid oxidation reaction event at the K Basins or at the Cold Vacuum Drying Facility has been conservatively classified as an "beyond extremely unlikely event" (i.e., one with a probability of occurrence of $<1E^{-6}$/year).

The SNF Project personnel discussed the technical aspects of this issue with the DNFSB staff during an October 4, 2000, video teleconference and on several previous occasions. We are confident that all reasonable and appropriate measures have been taken to minimize the potential for a rapid oxidation reaction and to provide confidence that, if one were to occur, it would not be consequential in terms of hazard to the workers. The rapid oxidation reaction event has been thoroughly analyzed and accommodated in the design of the SNF Project systems, equipment, and facilities and the analytical model and associated calculations used for these analyses have been adequately validated. These analyses are documented in the FSARs and the related

Safety Evaluation Reports. As these documents show, even the hypothetically extreme event described in the FSARs – properly considered to be beyond the design basis – would not be catastrophic.

In light of the DNFSB's concern regarding this issue we have again examined a hypothetical rapid oxidation reaction event in the basins – this time, in an effort to predict the expected timing and dynamic behavior of such an event, should it occur. The analysis of this event, completed on October 3, 2000, was discussed in detail with your staff on October 11, 2000. We conclude that a rapid oxidation reaction in the basins would be a relatively slowly unfolding event, and the combination of existing alarms and knowledgeable personnel provides adequate protection from excessive personnel exposure.

The response of the Continuous Air Monitors (CAMs) to hypothetical thermal excursion events was specifically included in the October 3 analysis. For all hypothetical events analyzed, the excursion developed slowly, typically over a period of several hours, and a CAM alarm occurred early, typically within one hour. In the event of a rapid oxidation reaction in the basin, the facility workers would receive warning from the CAMs and would be out of the facility hours before any rapid increase in airborne radioactivity could occur.

The principal system currently in use at the basin to provide protection for the facility workers from airborne contamination is the set of CAMs located in the basin facilities. Procedures are established and facility workers are trained to respond to CAM alarms. This response involves securing the operation and exiting the air space in which the alarm has occurred. Trained personnel then investigate the alarm, taking necessary precautions including appropriate personnel protective equipment and strict adherence to procedures. Since the CAMs provide adequate warning for the hypothetical events and since the procedure for response to CAMs is in place, the SNF Project believes no procedure changes are required to protect the workers.

However, there are three additional steps the SNF Project believes are prudent to protect the workers and these steps were reviewed with your staff during the October 11-12, 2000 meetings and the October 16, 2000 teleconference. The first step involves formal training. The K West Basin operators have been given an orientation session to provide familiarization with the corrosion behavior of uranium metal, to explain the characteristics of a hypothetical thermal excursion and to emphasize prudent measures to minimize risks. This orientation session is being updated to include the insights derived from the October 3 analysis of these events and is being converted into a formal, mandatory training class for core operators and Health Physics Technicians (HPTs). The class will emphasize that a thermal excursion is one possible cause of a CAM alarm and that crews involved in response to a CAM alarm should be alert for any indication that a thermal excursion is developing or has occurred. The core operators and HPTs involved in fuel operations at the K West Basin will receive this training class prior to fuel move.

The second step that the SNF Project will take as a precautionary measure is to create an emergency action plan to address recovery of operations in the K Basins in the event that operations are ever suspended due to a rapid oxidation event. This procedure will be developed and approved prior to processing broken or corroded fuel that would generate higher quantities of scrap.

The third step involves the issue of CAM placement in the K West Basin. This issue was discussed at length during the visit and during a subsequent teleconference on October 16, 2000. Resolution of this issue is addressed in the "Worker Protection" section of this response.

Supporting Documentation:

Memo, M.G. Plys, Fauske & Associates, to D.R. Duncan, et al, FH, "In-Basin Fuel Ignition Response Time," dated October 2, 2000

Memo, M.G. Plys, Fauske & Associates, to D.R. Duncan, et al, FH, "Uranium Burning Basic Knowledge for K Basins Personnel," dated October 4, 2000

HNF-PRO-5675, Rev. 0, "Radiation Protection Real-time Air Monitoring," dated April 15, 2000

DRAFT Training Element, "Uranium Corrosion Reactions During N-Fuel Handling at K-Basins," Joe Swenson, dated October 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000 and on October 16, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response and the related response to the worker protection issue regarding CAM placement in the K West Basin.

- ***Specific DNFSB Staff Comment:***

"The procedure for transport of the MCO/cask from the K-Basins to the Cold Vacuum Drying Facility (CVDF) should include a requirement to measure the pressure of the MCO/cask head space if the transfer exceeds 24 hours. If an excessive pressure is measured, it could indicate a runaway reaction. The procedure should identify preventive/mitigative actions to be taken under these circumstances."

Basis for Closure:

The procedure for transfer of the MCO cask from K Basins to the Cold Vacuum Drying Facility (CVDF) currently requires the cask to be vented through a HEPA filter. Upon receipt at CVDF the pressure in the cask is read and the cask is vented if the pressure exceeds 21 psig. The FSAR places a 24-hour limit from the time the cask is sealed to the time it is received at CVDF. If the transfer is delayed beyond 24 hours, the response procedure requires a specially trained team to measure the cask pressure, draw a gas sample, and vent the MCO cask periodically. This procedure is performed regardless of the measured pressure. Subsequent actions would be based on evaluation of the situation including conditions causing the delay, cask location, environmental conditions, and results of measurements taken. The SNF Project believes the current procedure provides a very sufficient, reliable, and straightforward method to ensure that pressure inside the MCO/Cask is properly maintained.

Supporting Documentation:

OP-12-005S, Rev. 0, "Response to Transportation Delay," dated September 22, 2000

Process Standard 700, "MCO Transport Related Controls"

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

- ***Specific DNFSB Staff Comment:***

"The procedure for receiving the MCO/cask at the CVDF should include a requirement to measure the pressure of the MCO/cask head space upon receipt. If an excessive pressure is measured, it could indicate a runaway reaction. The procedure should identify preventive/mitigative actions to be taken under these circumstances."

Basis for Closure:

CVD Operating procedure OP-94-007V governs operational activities including cask receiving in Bay 4 of the CVDF. Operating procedure OP-94-008V governs Bay 5. These procedures require the pressure inside the cask to be read upon receipt. At that point the operator is directed to enter the reading on the traveler. "Receipt" is defined as the point at which the cask is vented in the CVDF, in preparation for cask lid removal and MCO hookup to the cold vacuum drying equipment.

The traveler is the mechanism to collect processing information on MCOs. A specific traveler used for each MCO. The CVD traveler is a controlled compliance procedure, CP-70-005. The traveler provides a space for entry of cask pressure and requires that the operator initial the entry. The traveler then requires that the process control engineer confirm that the pressure of the cask was within the processing limit.

If the processing limit has been exceeded then, in accordance with Process Standard 700, a sample of MCO/cask gas is taken and analyzed and MCO heat up is delayed until gas samples are evaluated and a recovery plan developed.

Supporting Documentation:

OP-94-007V, Rev 0A, "Process MCO-Cask Process Bay 4," dated September 24, 2000

OP-94-008V, Rev 0B, "Process MCO-Cask Process Bay 5," dated October 2, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The process by which the pressure is read (summarized above) was reviewed with DNFSB staff. This process is required by the referenced supporting documents. The DNFSB staff agreed that this issue is resolved based on the above response.

GENERAL ISSUE: WORKER PROTECTION:

- ***Specific DNFSB Staff Comment:***

The September 20, 2000, letter identified these two potential scenarios, but the context was interpreted by the RL and the SNF Project to include the broader issue of how workers are protected in a hazardous environment. The DNFSB Staff Issue Report did not contain specific comments on this issue; however, the SNF Project is responding to the general comments, as follows:

Basis for Closure:

Worker protection is ensured through the verified implementation of the Integrated Environment, Safety and Health Management System (ISMS). The ISMS covers the institutional programs addressed in the approved Safety Analysis Report. The implementation of the ISMS at the SNF Project ensures that all work activities are reviewed through the Automated Job Hazards Analysis and enhanced worker planning, as well as through post-job reviews to collect feedback for continuous process improvement. The ISMS assures that the SNF Project maintains effective programs in industrial safety and health, radiological control, and as low as reasonably achievable (ALARA).

The implementation and adherence to the precepts of Integrated Safety Management are key elements to providing comprehensive protection to our workers from operational events described in the September 20, 2000 letter (spray release from the Integrated Water Treatment System [IWTS] and rapid oxidation reaction). The approved safety bases, coupled with accurate operating procedures and effective work planning, provide the basic assurances that our employees will be protected while at work. Members of your staff visited the SNF Project on October 3 and 4, 2000, to conduct a review of the Project's implementation of the work planning process. SNF Project personnel, from the Project Director through the hands-on workers, described the process of how work planning is accomplished in a graded manner to protect the workers. Your staff also attended a pre-job briefing for a crew preparing to conduct below-water work in the K West Basin. Safety through good planning and worker involvement was clearly the top priority during that pre-job briefing. Feedback from your staff regarding the SNF Project's work planning process was generally positive.

The first issue identified in your letter – the potential effects of an IWTS piping failure that causes an airborne spray of water and entrained radioactive material – has been handled primarily by system and equipment design. Nearly all of the above-water IWTS piping is either wrapped in metal shielding or routed within the shielded enclosure, making the postulated event very unlikely. There are three exceptions, as follows:

a) The discharge piping and joints downstream from the ion exchange modules (IXMs) are not shielded or wrapped. This is not a concern as it is treated water in a very low-pressure system that discharges back to the basin.

b) The future flange on the southwest corner of IXM #1 is partially covered by metal shielding, but is not totally contained. The remainder of this flange will be fitted with metal shielding by November 30, 2000. This will prevent an aerosol in the event of a leak at this flange.

c) The cam lock connections on each end of the hoses at the IXM inlet connections are not currently shielded or wrapped. These connections were wrapped with plastic and absorbent rags during pressure testing of the system, but they were removed after satisfactorily completing an in-service leak test. Conventional wrapping with metal shielding or bagging with plastic and tape is not a feasible long-term solution at these locations. Instead, plastic shield devices will be installed on the cam locks and will serve as splashguards. This will eliminate the potential of an aerosol in the event of a leak at the cam lock connections. These plastic shields will be installed by November 30, 2000.

Additionally, The SNF Project has taken the action suggested by the DNFSB staff regarding mitigation of a potential spray leak. The flanged joints on the backwash lines are now fitted with lead shielding blankets, which will prevent an aerosol from dispersing into the air in the event of a spray leak from the joints.

The IWTS operating pressure in all operating modes is relatively low and well within the capability of the IWTS piping, with wide margin. Furthermore, it is our view that the SAR assessment of the radiological consequences of this postulated event is both conservative and unrealistic, as documented in DOE's Safety Evaluation Report of the K Basin SAR. Such an event would be readily detectable and could be quickly (and remotely) terminated. In the unlikely event of a spray release resulting in airborne contamination, the CAM alarms would trigger, alerting facility workers to take protective action in accordance with operating procedures.

The current revision of the K Basin SAR supports the above view regarding probability and consequences of this event. As treated in the SAR, the postulated accident is deemed an "unlikely operational accident" (paragraph 3.4.2.7) and based on the conservatively calculated unmitigated consequences "no safety SSCs or TSRs are necessary for prevention or mitigation..." (paragraph 3.4.2.7.5).

The second issue addressed under worker protection pertained to the potential for workers to be exposed to airborne radiation as a result of a rapid oxidation reaction in the K West Basin during the fuel retrieval or fuel loading processes. The SNF Project maintains its position that a rapid oxidation reaction that could result in a thermal runaway is a beyond extremely unlikely event and was considered in the Final Safety Analysis Report. However, since the SNF Project cannot demonstrate that the occurrence of such an event is impossible, we have agreed to implement certain defense-in-depth measures to provide additional protection for our workers.

The specific concern expressed by the DNFSB staff was that the current placement of the CAMs might not be adequate to protect workers at all locations in the K West Basin. The DNFSB staff did not disagree with the present location of CAMs for normal operations, but was concerned about the locations in the event of an airborne release of radiation that could result from a rapid oxidation reaction during the processes of fuel retrieval or fuel loading. The concern was that the CAMs, in the current configuration, might not ensure early detection sufficient to protect the workers.

The SNF Project discussed this item further with the DNFSB staff via teleconference on October 16, 2000, and agreed to locate CAM alarms in the K West Basin to cover the area of the South Load Out Pit and the area directly east of the fuel retrieval system. It is important to note that these additional CAMs are being placed as a defense-in-depth measure. As such, a replacement unit would be available in the event of CAM failure, but work in the basin would not be stopped while the repair work is completed. If one of the "required" CAMs (i.e., a CAM currently installed to detect airborne radiation during normal operations) were to fail, the work in the basin would be suspended in accordance with operating procedures, until the unit was repaired or replaced.

Supporting Documentation:

HNDF-SD-WM-SAR-062, Rev. 4, Sections 3.4.2.7 and 3.4.7.2.5, (SNF Project Final Safety Analysis Report)

HNF-PRO 5675, "Radiation Protection Real-time Air Monitoring," Rev. 0, dated February 23, 2000

"Evaluation of Air Flow Patterns in 105 KW Fuel Storage Basin," June 1999, transmitted by June 25, 1999 letter from E.E. Hickey (Pacific Northwest National Laboratory) to T.E. Bratvold.

"Limited Evaluation of Air Flow Patterns in 105 KW Fuel Storage Basin," June 2000, performed by E.E. Hickey and G.A. Stoetzel (Pacific Northwest National Laboratory)

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that the issue of the potential spray release from the IWTS was satisfactorily addressed by fitting the flanged joints on the backwash system with lead blankets. A system walk down on October 25, 2000, revealed that there were minor exceptions to statements made during the October 11-12 meeting. These exceptions are noted in the discussion above and appropriate corrective actions are identified. This issue is resolved, based on the above discussion and on completion of the corrective actions by November 30, 2000.

The DNFSB staff agreed that the addition of CAMs to monitor the South Load Out Pit and the area directly east of the fuel retrieval system would provide sufficient coverage for early detection and notification of a significant release of radiation in these areas. The DNFSB staff agreed that the CAMs would not have to be installed in order to begin Phase 3 of the Phased Startup Initiative or for the initial movement of spent nuclear fuel, as these processes involve intact fuel with a very low potential for a rapid oxidation reaction. The new CAMs would have to be installed and operational prior to processing broken or corroded fuel that would generate higher quantities of scrap. This issue will be resolved upon installation of the new CAMs.

GENERAL ISSUE: CRITICALITY REVIEWS:

- ***Specific DNFSB Staff Comment:***

"Los Alamos National Laboratory recently completed an upgrade (version 4C) of the

Monte Carlo N-Particle (MCNP) computer code used in the preparation of the K-Basin CSERs, correcting 40 errors in the program. An earlier version, MCNP-4B, was used by the SNFP as this was the version approved for project use. A limited review is underway and needs to be completed to ensure that the MCNP upgrades have no significant impact on previous criticality calculation."

Basis for Closure:

The September 20, 2000, letter correctly points out that revisions and corrections to the Monte Carlo N-Particle (MCNP) code have been made in version 4C and that the SNF Project used version 4B in evaluation of criticality. The Fluor Hanford Technical Authority for criticality safety has evaluated the Monte Carlo N-Particle (MCNP) code changes for impact on the application to the SNF Project. This evaluation showed no significant impacts to the SNF Project's criticality calculations and, therefore, no further action is required.

Supporting Documentation:

Letter from H. Toffer to C.T. Miller, "MCNP Code Upgrade Evaluation for the Hanford Site SNF Criticality Safety Analysis Applications," (HT-2000-106), dated October 10, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved based on the above response.

- ***Specific DNFSB Staff Comment:***

"The staff notes that the Criticality Safety Support Group (CSSG), established in accordance with the Board's Recommendation 97-2, conducted an independent review of criticality safety for the MCO in August 1999. The CSSG's report concludes that the MCO and baskets are critically safe as designed and do not require further modification. At odds with this conclusion is the CSSG's statement that the MCO evaluations lack sufficient detail in some areas to allow a complete independent review. The report also notes that some assertions and assumptions made in the CSERs are not supported by technical details. The project should assess the completeness of the MCO evaluations and the CSERs in view of the statement in the CSSG report and provide the results of the assessment and any corrective actions to the Board's staff for review."

Basis for Closure:

Subsequent to the internal DOE Memorandum (Garcia, August 17, 1999) by the Criticality Safety Support Group (CSSG), all of the supporting Criticality Safety

Evaluation Reports (CSERs) supporting SNF SARs have been updated and finalized utilizing the formal process established at Hanford. This process was also previously reviewed by the CSSG. The RL Independent Review Team reviewed all supporting CSERs during the preparation of each SNF Safety Evaluation Report (SER) in support of SNF Final Safety Analysis Reports (FSARs). All project CSERs, including those supporting the MCO, are considered complete and adequate.

Supporting Documentation:

Review of criticality is documented in each of the SERs provided by the RL Independent Review Team. Further oversight of the sufficiency of the FSARs and SERs was provided by the Independent Review Panel.

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved based on the above response.

GENERAL ISSUE: REVIEWS OF ELECTRICAL AND INSTRUMENTATION & CONTROL SYSTEMS:

- ***Specific DNFSB Staff Comment:***

  "During a previous site review of the safety-significant electrical power system, the Board's staff raised the issue of the adequacy of the diesel generator (DG) to start and support all the loads in the CVDF. During the conference, project personnel presented load calculation, recently evaluated transient time-current characteristics of the DG and major loads, and built-in time delays in the DG circuitry to demonstrate that the capacity of the DG is not challenged during startup of the major loads. The Board's staff concurs with this approach and will review the completed calculations when they are available."

Basis for Closure:

This analysis has been completed. Testing of the diesel generator (DG) to confirm the analysis is now complete. Evaluation of the test results was completed October 3, 2000.

An engineering evaluation for the successful starting of the local exhaust (LE) system motor and the over-temperature trip of the DG indicates that the removal of the non-safety significant loads from the DG bus will optimize LE fan motor starting and will assure that the DG will perform satisfactorily at design ambient conditions. A design change was made to remove two non-safety loads (lighting panel [LPN-3, 25 kVA] and air compressor [7.5 HP]). However, a small lighting panel (LPN-4, 7.7 kVA) was added to provide lighting in the selected areas. New design configuration requires about 59 kVA DG load, which includes the LE fan motor (20 HP). Two tests were performed to verify adequacy of the DG ability to support CVD loads and successful starting of the LE fan motor. In the first test, the DG was run with a 50 kW resistive load for three hours at a room ambient temperature of 90 - 92 degrees F to assure adequate performance under load. The second test was performed at a room ambient temperature of 75 - 77 degrees F to simulate loss of power and demonstrate that the DG will start with in 10 seconds and the LE fan will start and deliver 1000 cfm within 60 seconds of the loss of power (SAR requirement). During the loss of power test, the DG started and stabilized voltage and frequency within 7 seconds, and the LE fan was delivering the required flow within 25 seconds after the DG voltage/frequency stabilization. This meets the SAR requirements.

Supporting Documentation:

Closure to NCR # 00-SNFP-0097 R.3, resolved October 4, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

- ***Specific DNFSB Staff Comment:***

"The recent DG trip on high cooling water temperature and an engineering resolution based on root-cause analysis were discussed. Several design modifications (e.g., larger radiators, bigger intake openings) are being considered by the DG vendor and the project to resolve this issue. The selected modification and the basis for its adequacy will be provided to the Board's staff for review."

Basis for Closure:

Testing of the diesel generator for the water temperature was completed on September 19, 2000. An evaluation of the test data was completed on October 3, 2000.

Engineering investigations indicate that the DG over-temperature conditions were exacerbated by inadequate radiator size to provide heat rejection at 100 kW load, when outside ambient temperature was above 115 degrees F (122 degrees F room temperature). It was also determined that heat from the load bank might have affected the DG room heat loads. Further analyses indicate that the DG should operate successfully at 122 degrees F room temperature when loaded to 50 percent of the rating. Design changes to improve room ambient conditions were made by relocating the load bank in the adjacent DG-2 room and replacing the existing DG room exhaust fan (1/4 HP) with a larger (3/4 HP) exhaust fan. To reduce the DG loads two non-safety loads, (air compressor [7.5 HP] and lighting panel [LPN-3]) were removed from the DG bus. Recent DG test data at 50 kW load and the radiator manufacturer's computer data were analyzed and it was concluded that the DG should perform adequately at 50 kW.

Supporting Documentation:

Closure to NCR # 00-SNFP-0097 R.3, resolved October 4, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

- ***Specific DNFSB Staff Comment:***

"In the enclosure to a letter from the Board dated December 1, 1998, the staff addressed the issue of the margin in the set point for the high-temperature trip for the cask annulus in the CVDF. Project personnel have prepared a set point calculation and will confirm the adequacy of the margin. The enclosure to the Board's letter also raised the issue that the existing alarm system for water level in the cask annulus may not be able to withstand a seismic event. Project personnel will evaluate and confirm the adequacy of this system to meet the seismic requirements."

Basis for Closure:

Issues related to instrumentation set points and margin to specified limits related to MCO heat removal in the CVDF are resolved, as follows:

- Cask Annulus Water Level Set Points and Margin

The safety parameter limit for the level switch is greater than ten percent of gauge (>10%) and the switch error is ten percent of gauge (±10%). Therefore, the set point requirement is greater than twenty percent of gauge (>20%). The actual switch set point used is fifty-percent of gauge. Since the water level gauge is located approximately one and a half feet above the MCO, this provides a margin, and allows for operator action to verify low level. The annulus water level gauge is seismically qualified and can be read by personnel after a seismic event.

Sensor error and set point calculations are listed in SNF-4451 Rev.3, *Cold Vacuum Drying (CVD) Set Point Determination* (this document was forwarded to the DNFSB Staff on September 14, 2000). The evaluation for seismic adequacy has been completed; seismic testing of the Penberthy Liquid Level Gauge was satisfactorily completed with the level gauge filled with water.

- Cask Annulus High Temperature Trip Set Points and Margin

The test mockup operating temperature was 46.0 ± 1.0 degrees C. If one-year calibration cycles were chosen for the temperature switch, the switch errors would be ±3.1 degrees C. With a safety parameter limit of <50 degrees C, this would require a trip set point of 46.9 degrees C, or the 0.9 degrees C above the normal operating temperature listed above. Because of the overlap in the switch and the operating temperature, this could result in inadvertent safety class helium purges unless the operating temperature was reduced to <42.8 degrees C, which would lengthen the drying process.

To deal with the issue, the switch calibration cycle was changed to three months. The switch errors are ±1.9 degrees C allowing for a trip set point of <48.1 degrees C. Additionally, the operating temperature has been lowered to 45 degrees C ± 1.0 degrees C. There is a 3.1 degrees C margin between the nominal values and there should be no inadvertent trips, as demonstrated by extensive operational sequence testing.

The trip setpoint is determined based on the analytical limit (maximum allowable before trip operates) and the channel uncertainties. During the calibration period, drift and other terms included in the channel uncertainties can cause the trip to operate above the original settings. These changes are expected and are already accounted for in the setpoint calculation. Therefore, once the trip is calibrated, a threshold "allowable" value can be used to assess the instrument's expected performance during surveillances during the calibration period. During the three month calibration interval, the tempered water temperature switch allowable value (AV) equals 49.48 degrees C. When testing the trip, this AV provides a maximum allowable limit above the trip setpoint value. If it operates within these values, it is still within its calibration and is operating correctly.

Supporting Documentation:

HNF-3882, "Cask/MCO Annulus Liquid Level Gauge/Level Switch Low," released September 3, 2000

SNF-4451 Rev. 3, "Cold Vacuum Drying (CVD) Set Point Determination," released September 4, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

- ***Specific DNFSB Staff Comment:***

"In the enclosure to a letter from the Board dated February 25, 1998, the staff addressed the issue of the calibration of the electrical switchgear protective relays in the K-West Basin facility. The project has completed all work on the protective relays manufactured by General Electric Company. However, an evaluation to confirm the status of the solid-state trip devices manufactured by ITE needs to be performed."

Basis for Closure:

The SNF Project began testing the General Electric Company's relays in early August 2000 and testing is ongoing, as resources allow. We concur with the DNFSB observation regarding the need to confirm the functionality of the solid-state trip devices. Test packages are being developed to test the remaining solid-state trip devices manufactured by Asea Brown Boveri. The high reliability shown in industry data for these recently installed switches supports confidence that these tests can be deferred until after the start of spent nuclear fuel removal from the K West Basin.

The DNFSB issue of calibration of K East/K West circuit breakers originally involved the 480 Volt breakers that support the operating equipment in the K West Basin. The 480 Volt system is fed from a 13.8 KV to 480Y/277 Volt transformer located in the electrical equipment room of 105 KW. The 480 Volt circuit breakers are protected by solid state overload relays located on Bus A and Bus B of the 480 Volt switchgear. In November 1999, three of the twelve solid state relays were modified, for the new systems being installed at the time, and recalibrated. The remaining nine solid-state relays will be checked for calibration between Nov. 20, 2000 and Feb. 28, 2001, in accordance with work package number 1K-00-2411. This will require a series of facility power outages, which will affect equipment that is used to move spent fuel. Therefore, a thorough planning effort will be required to allow this process to be completed without significantly interrupting operations.

In June 1999, the DNFSB staff raised the issue of the 4,160 Volt protection relays and their calibration currency. The status of these relay calibrations is that about 30 of the 60 relays have been checked for calibration and fixed and/or repaired as required. This is being worked on a contingency basis due to a lack of plant maintenance craft resources.

The DNFSB staff asked about the 13.8 KV protection relays located in the 165 KW building during the October 11-12, 2000 visit. The 13.8 KV switchgear and buses are operated and maintained by DynCorp Tri-Cities Services. DynCorp is a subcontractor to Fluor Hanford and is responsible for the operation and maintenance of the site electrical utilities. The calibration of the protective relays for the 13.8 KV switchgear has been performed and is current.

Supporting Documentation:

Work Package 1K-99-02654M, "Modify and Test 105 KW Switchgear Breaker Settings," (completed December 9, 1999).

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

GENERAL ISSUE: MCO CASK DROP:

"The Navy Crane Center (NCC) conducted an assessment of the hoisting and rigging for the SNFP during the week of May 22, 2000. The NCC stated that they consider the K-West 32 ton bridge crane safe, but noted several deficiencies which could affect reliable service during critical lifts. The project developed a plan to implement the recommendations; however, the Board's staff considers the implementation to be untimely. The planned ORR lifting demonstration with a dummy loaded MCO-cask represent an equal risk of a wall-to-floor joint failure as the post-ORR lifts of an MCO/cask loaded with radioactive fuel. Prior to lifting heavy loads in the K-West Basin, such as during the ORR with dummy fuel in the MCO/cask assembly, the following open issues require action by the project:"

- ***Specific DNFSB Staff Comment:***

  "The last load test of the K-West 32 ton bridge crane was in November 1999, when repairs were made to the main hoist electric brake. This load test was done using 24 tons, which is only approximately 80 percent of the weight of a loaded MCO/cask. The contractor has indicated that upgrades are planned for the crane's programmable logic controller and that the load test will be performed following these upgrades. The current schedule has the load test being performed in October 2000, which is after the planned ORR lifting demonstrations with a dummy loaded MCO/cask. The K-West 32 ton bridge crane should be load tested using a load equal to a fully loaded MCO/cask assembly."

Basis for Closure:

The 32-ton transfer bay bridge crane in 105 KW was successfully load tested to 32-tons on September 15, 2000.

Supporting Documentation:

Work Package 1K-00-01309M, Sections J5 and J7 for Load Test, dated September 15, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

- ***Specific DNFSB Staff Comment:***

"The K-West 32 ton bridge crane has had a history of electrical faults and trips since it was redesigned. Following the upgrades and load test identified above, the contractor plans to exercise the crane, but a schedule has not been established. The K-West 32 ton bridge crane should be extensively exercised to verify reliability."

Basis for Closure:

The project has long recognized the importance of event-free cask lifting operations. To that end, we have completed the steps recommended by the Navy Crane Center and cited in the September 20, 2000 letter. Information documenting these actions was reviewed with your staff on October 12, 2000.

For perspective, we note that our primary objective in this area is to achieve extremely high confidence that a cask drop event will not occur – that is, we are placing first emphasis on prevention, rather than mitigation. The crane testing and exercise activities are part of this emphasis. An equally important part is our extensive operational procedure and training effort

The 32-ton transfer bay bridge crane in 105 KW has been extensively exercised, as recommended by the Navy Crane Center report. This includes over 50 crane operations in the startup and testing phase.

Supporting Documentation:

32-Ton Crane Operating Record (HOI No.: 418/423), August 15, 2000 through October 6, 2000

Work Package 1K-00-01309M, Section J5, "Craft/Resource Usage Log and Maintenance Record," September 14, 2000 through September 15, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.

- ***Specific DNFSB Staff Comment:***

"The sealant injection equipment designed to mitigate potential basin leaks in the unlikely event of a cask drop, including appropriate procedures, training and drills in the use of that equipment, should be available prior to the planned ORR lifting demonstrations with a dummy loaded MCO/cask. A drill demonstrating the use of the sealant injection system, without using actual sealant, should be conducted."

Basis for Closure:

The SNF Project conducted two drills, specifically addressing the basin leak mitigation response. These drills were conducted on April 20, 2000 and April 24, 2000, and included the use of the sealant delivery system. The April 20 drill was conducted in "coached" format, allowing player/controller interaction. The April 24 drill was conducted in "critiqued" format. The April 24 drill player roster included 105 KW personnel who did not participate in the April 20 drill.

Supporting Documentation:

Spent Nuclear Fuels Project Drill Approval Form, "EP-CLS Leak Mitigation," dated April 20, 2000

Spent Nuclear Fuels Project Drill Approval Form, "EP-CLS Leak Mitigation," dated April 24, 2000

Resolution Achieved with DNFSB Technical Staff on October 11-12, 2000:

The DNFSB staff agreed that this issue is resolved, based on the above response.