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October 23, 2015
L-15-281

10 CFR 50.59(d)(2)

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
Report of Facility Changes, Tests, and Experiments

The FirstEnergy Nuclear Operating Company (FENOC) hereby submits the Perry Nuclear Power Plant Report of Facility Changes, Tests, and Experiments for the Period December 17, 2013 to October 2, 2015.

Additionally, FENOC identified a 10 CFR 50.59 evaluation from 2003 for a plant modification that should have been previously reported to the Nuclear Regulatory Commission (NRC). This omission was captured in FENOC's corrective action program for resolution, and the missing information is being provided to the NRC in the attached report.

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at (330) 315-6810.

Sincerely,

Ernest J. Harkness

Attachment:
Perry Nuclear Power Plant Report of Facility Changes, Tests, and Experiments for the Period December 17, 2013 to October 2, 2015.

cc: NRC Region III Administrator
NRC Resident Inspector
NRC Project Manager

Title:

Liquid Radwaste Control System Upgrade

Activity Description:

A plant modification replaced and upgraded the non-safety related analog and digital liquid radwaste (LRW) control system with a distributed control system (DCS). The original LRW control system consisted of two Allen-Bradley digital programmable logic controllers (PLC) and an analog-based control panel, all of which were located in the radwaste building control room (RWBCR). The modification was implemented because the original LRW control system was obsolete and was not reliable due to its age and parts availability.

Replacement of the LRW control system was implemented using software developed by Invensys and hosted on Invensys I/A hardware mounted in six new input/output (I/O) cabinets and an operator's console installed in the RWBCR. Inputs and outputs for the new system were wired to and from the original non-safety related LRW control panel and new terminal strips installed next to the original LRW PLCs. The original LRW control system operator interface was replaced with a new human machine interface (HMI), including hardware at the new operator's console located in the RWBCR.

The new DCS performs the same functions as the original system and allows certain control functions to be performed automatically. The automated functions are duplications of some of the original operations that were performed manually with the original LRW control system, such as receiving tank transfers, decant and recycle for the settling tanks, and automatic alignment to support manual transfer of resin to solid radwaste (SRW). Additionally, protective features such as process valve alignments and tank level interlocks are included with the new DCS. There are several analog loops that were part of the original LRW control system that were transferred to the new DCS. Analog I/O modules are used within the DCS to convert all analog I/O signals to digital I/O signals.

This modification installed the new I/O cabinets and the required new raceway. Power was provided to the new Invensys DCS hardware, workstations, and a few select I/O points for the annunciator horn. DCS temperature and power monitoring were also connected. New instrument and control cables were pulled and terminated to wire all remaining DCS I/O points to existing plant equipment.

The modification also installed a new partitioned sliding panel wall in front of the original LRW control panel in order to prevent operator distraction from equipment that is not in use.

Summary of Evaluation:

The new DCS performs the same design functions as the original analog and digital system. The DCS has been designed to be reliable, fault-tolerant, and suitable for the environments in which it is installed. The software utilized by the DCS was developed under a quality program and extensively tested to ensure it met design requirements.

The original LRW control system did not directly control any system, structure, or component (SSC) that mitigated the consequences of an accident. In the event of a failure of the original LRW control system or its replacement DCS, SSCs that are required to act in order to mitigate an accident are unaffected by a control system failure. The failure modes of the new DCS have been analyzed by a failure modes and effects analysis (FMEA), concluding that there are no new failure effects that would initiate an accident or create an accident of a different type.

The LRW system does not perform any safety functions. Additionally, the original LRW control system and its replacement DCS do not control any components that perform safety functions. The direct and indirect interfaces of the replacement LRW control system with any SSC important to safety have been analyzed and determined not to be adverse. Therefore, the new DCS does not (1) increase the likelihood of occurrence of previously evaluated malfunctions of an SSC important to safety, (2) increase the consequences of a malfunction of an SSC important to safety; or (3) introduce a malfunction of an SSC important to safety with a different result.

The modification to the LRW control system does not require a departure from a method of evaluation described in the Updated Safety Analysis Report (USAR), and the LRW control system does not interact, directly or indirectly, with a fission product barrier.

In conclusion, the modification does not meet any of the 10 CFR 50.59(c)(2) criteria; therefore, a license amendment is not required.

Title:

Alternative Design Code Permitted for Replacement of Reactor Water Cleanup Pump Seal Coolers

Activity Description:

A design modification was implemented to allow the existing American Society of Mechanical Engineers (ASME) Section III seal coolers for the reactor water cleanup (RWCU) pumps to be replaced with ASME Section VIII seal coolers. Design documents have been updated to reflect this information. Changes to USAR drawings and tables have also been initiated to reflect this information. The design and license bases identified ASME Section III, Class 3, non-safety, non-seismic and Quality Group C for the pump. The cooling water side, inclusive of the heat exchanger shell and external piping, is ASME Section VIII and ANSI/ASME B31.1, respectively (equivalent of Quality Group D). The design change allows the process side components of the seal cooler to be supplied as ASME Section VIII, Quality Group D.

This change was required because a Quality Group C replacement seal cooler was not readily available.

Summary of Evaluation:

The change in quality group of the RWCU pump seal cooler from Quality Group C to D has been determined to be bounded by the existing safety analyses discussed in the USAR. These safety analyses include the isolation of the non-important to safety portion of the RWCU system and the bounding USAR Chapter 15 accident for a pipe break outside of containment. The change does not result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the USAR because the source of leakage is small and bounded by existing high energy line break analyses. The change does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety previously evaluated in the USAR.

The failure modes between the old and new seal coolers remain the same. The change does not result in more than a minimal increase in the consequences of an accident previously evaluated in the USAR because the design basis accident remains bounding. The change does not result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the USAR. The SSCs important to safety are not affected by the change as the failure modes and consequences of a seal cooler failure are not changed.

The change does not create a possibility for an accident of a different type than any previously evaluated in the USAR. The failure modes and effects for the activity remain unchanged; therefore, the possibility of a different accident remains unchanged. Unacceptable results from limiting faults were reviewed, and it was concluded that a different result from the change was not credible. The change does not create a possibility for a malfunction of an SCC important to safety with a different result than any previously evaluated in the USAR. The change will not result in any new failure modes or effects; therefore, a malfunction with different results is not credible. The change does not impact a fission product barrier, and there is no departure from a method of analysis.

In conclusion, the change in seal cooler quality group does not meet any of the 10 CFR 50.59(c)(2) criteria; therefore, a license amendment is not required.

Title:

Installation of the Hydrogen Water Chemistry System (previously omitted 2003 evaluation)

Activity Description:

A hydrogen water chemistry (HWC) system was installed as part of Perry's overall optimum water chemistry project, which also includes zinc and Noble Chem™ injection.

These water chemistry controls work together to mitigate the potential for intergranular stress corrosion cracking (IGSCC) in the reactor recirculation piping and lower reactor vessel internals. The modification included the installation of hydrogen and oxygen injection supply lines, storage subsystems, control stations and the associated interfaces required to monitor the control and injection of hydrogen and oxygen into existing plant systems.

The HWC system injects hydrogen into the feedwater system. The hydrogen, in conjunction with Noble Chem™, combines with oxygen and oxides in the reactor water, lowering the electrochemical corrosion potential to mitigate the potential and growth of IGSCC of the stainless steel piping and reactor internal components. Due to recombining of free hydrogen and oxygen, this injection results in a substantial reduction of oxygen levels, thereby reducing a critical contributor to IGSCC.

However, the hydrogen injection into the feedwater system also results in an offgas mixture exiting the condenser that contains excess hydrogen. To prevent discharging this mixture and creating a potential fire or explosion hazard, the modification installed an injection connection in the condenser air removal system to add a stoichiometric amount of oxygen upstream of the recombiner to recombine the hydrogen in the offgas system.

In addition, lower dissolved oxygen content in the associated water systems can result in accelerated general corrosion and flow-assisted corrosion of carbon steel piping systems such as feedwater, condensate, main steam, extraction steam, and heater drain systems. Low oxygen concentration in fluids passing through carbon steel piping results in accelerated corrosion due to stripping of the oxide layer. To counter this effect in the affected carbon steel water system piping, the modification installed an injection connection in the hotwell pump suction pipe header to facilitate the addition of oxygen into the condensate system.

Summary of Evaluation:

This evaluation demonstrates that the design of the HWC system is in general compliance with the guidance set forth in Electric Power Research Institute (EPRI) NP-5283-SR-A, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations." The EPRI document provides design, construction and operational guidelines for permanent hydrogen injection systems at boiling water reactors (BWRs).

Site specific evaluations have been performed and included a review of plant systems, accident evaluations, and potential dose consequences (occupational and boundary). Although, the HWC system adds minor combustible loading to the heater bay and turbine buildings, the HWC system will not result in more than a minimal increase in the frequency of a fire in these areas.

The blast analysis determined that the pressures exerted on the structures important to safety are less than those caused by a design basis tornado. Although the fuel handling building roll up door will fail and will blow inward, there will be no significant radiological consequences if the roll up door fails during a blast.

Plant sumps were assessed for operational safety by determining that hydrogen accumulation in the sump airspace caused by HWC conditions will not exceed the lower flammability limit of 4 percent by volume. Therefore the likelihood of a fire in the plant sumps that might affect the sump or surrounding equipment has not increased, and the subsequent likelihood of a failure of any SSC in these areas due to a fire has not increased.

Operation of HWC systems can result in increased corrosion rates in carbon steel piping due to reduced dissolved oxygen levels. The reduced oxygen content will not affect stainless steel piping. Perry has a Flow Accelerated Corrosion (FAC) program that monitors systems susceptible to pipe wall thinning due to process fluid effects in carbon steel piping. The FAC program will provide equivalent protection from failure with and without HWC system operation.

The piping associated with the HWC system is designed to industry codes and standards. Adding an additional connection to the condenser air removal system and the condensate system piping will not increase the possibility of failure of these components. Therefore, the HWC system will not result in more than a minimal increase in the likelihood of occurrence of a malfunction of the condenser air removal system and the condensate system piping.

All HWC system components are designed and installed in accordance with the safety classification of the area in which they are located (plant yard, turbine building, heater bay building) and the interfacing system design requirements. There are no direct interfaces between the HWC system injection piping and components and any safety-related equipment or equipment important to safety. Operation of the HWC system will not change the function of equipment important to safety nor will it more than minimally increase the radiological consequences of the failure of equipment important to safety.

Rupture of the hydrogen injection piping upstream of the connection to the feedwater system has been evaluated, and FENOC has concluded that it would not result in more than a minimal increase in the dose consequences of a malfunction of an SSC important to safety as previously evaluated in the USAR.

Rupture of the oxygen injection piping upstream of the connection to the condensate system has been evaluated, and FENOC has concluded that radiological impact would be bounded by the existing analysis for feedwater system failure.

Rupture of the oxygen injection piping upstream of the connection to the condenser air removal system has been evaluated, and FENOC has concluded that radiological impact would be bounded by the existing analysis for offgas system failure.

Studies on fuel effects from HWC indicate no adverse effects on fuel clad integrity. Therefore, additional operation of HWC will not result in more than a minimal increase in the consequences of an accident previously evaluated in the USAR.

USAR Chapter 15 accidents were reviewed. The Chapter 15 applicable accident scenarios associated with HWC system operation have been evaluated and found not to be impacted by the HWC System.

In conclusion, the modification does not meet any of the 10 CFR 50.59(c)(2) criteria; therefore, a license amendment is not required.