Criscione, Lawrence

From: Criscione, Lawrence
Sent: Wednesday, November 03, 2010 3:26 PM
To: Beaulieu, David
Attachments: (b)(7)(C) testimony & NRC conclusions.pdf

Dave,

I have attached an Adobe document to this email. The first two pages of that document come from (b)(7)(C) testimony (b)(7)(C) It is very evident from his testimony that he believed the temperature decrease was caused by faulty steam line drains. This is also backed up by statements made during (b)(7)(C) testimony (b)(7)(C) and by the NRC in the OI investigation summary for Case 4-2007-049. It is also backed up in Callaway Plant CAR 200308555 which blamed the letdown isolation on a cooldown caused by faulty steam line drain valves and it is also backed up by a Callaway Plant work order (mentioned during the testimonies) for troubleshooting and repairing the steam line drain valves. By their own admission, the crew certainly believed on October 21, 2003 that the cooldown was the result of malfunctioning steam line drain valves. And in 2007/2008 the NRC concurred with this view and so did I. The last two pages come from a February 26, 2010 letter from Region IV to me. In this document, it is clear that the NRC now understands that the temperature transient was due solely to the buildup of Xenon and had nothing to do with the opening of the steam line drains. I initially was resistant to this view, but have since "seen the light". Callaway Plant, however, is still "in the dark" and it is important to elucidate the facts. I am not hard and fast that this needs to be apparent in the Information Notice, but I do believe including it adds to the information being conveyed. With the reactor critical and well above the point of adding heat, opening the steam line drains should have merely caused a slight increase in reactor power and not affected temperature at all - the temperature drop was solely due to Xenon-135 building up.

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551 degrees.

(b)(7)(C) Or higher?

(b)(7)(C) Or higher. That's minimum.

(b)(7)(C) So what kind of action do you have to take if you go below the 551?

(b)(7)(C) I have to restore temperature above 551.

(b)(7)(C) Was that recognized? Was there an attempt to restore temperature?

(b)(7)(C) Well, yes. We tripped the turbine.

(b)(7)(C) Okay.

(b)(7)(C) We initially -- in going back through, we had opened up our steam dump drain valves -- or not our steam dump drain -- our drain valves on the steam lines, and that's when we started having -- when the temperature started to lower.

The balance of plant operator closed those drain valves to restore temperature. We got dual indication in the control room that not all the drains were closed. We tried to reduce the blowdown flow -- the steam generator blowdown flow. And then we tripped the turbine.

(b)(7)(C) Was that successful in getting the temperature to come back above the minimum temperature for criticality?

(b)(7)(C) Tripping the turbine was.

(b)(7)(C) Okay.

(b)(7)(C) The drain valves -- I don't know how familiar you are with our drain valves, but probably one hand switch controls, I think, 13 different valves.

So we had EOs out in the field trying to find which drain valves were still open. We closed those, and then we were trying to maintain some steam generator blowdowns. We were throttling blowdown. And we did eventually trip the turbine.

(b)(7)(C) So you did have -- aside from the inverter, you did you have some other equipment fail, drain valves?

(b)(7)(C) Drain valves, correct. But I didn't know that until --

(b)(7)(C) Later.

(b)(7)(C) Correct.

(b)(7)(C) Okay. Do you understand what he's saying? He's saying that they had some equipment fail that got them into the condition -- the Tech Spec for minimum temperature for criticality.

(b)(7)(C) Okay.

(b)(7)(C) So that put them there,

performing the reactor and steam plant shutdown procedures. The inspection reviewed the details of these procedures and concluded that the operators followed the procedures correctly and had maintained the plant in a safe configuration with adequate shutdown margin. The inspectors evaluated the time that elapsed from when the reactor went sub-critical to the time the control rods were fully inserted into the core. The inspectors found that not inserting the control rods soon after the reactor went sub-critical was not consistent with effective command and control and good plant operational awareness. The NRC inspectors also determined that the delay in completing the shutdown by inserting the control rods was not an unsafe condition. The inspectors verified that no procedural guidance existed with respect to timeliness as to how fast the control rods needed to be inserted. The inspectors noted that the crew had completed a shutdown margin verification just prior to tripping the main turbine, as required by the shutdown procedure. The shutdown margin verification ensured that had a design basis accident occurred at that time, adequate negative reactivity was available to maintain the plant shutdown.

The NRC's Office of Investigations, Region IV Field Office, initiated an investigation to determine whether there was willful misconduct in the control room personnel's failure to document the temperature transient. On November 6, 2007, the NRC staff met with you to investigate whether there was willful misconduct in the control room personnel's failure to document the temperature transient. The investigator also interviewed 11 individuals who were knowledgeable of facts pertinent to your concern, including the (b)(7)(C) (b)(7)(C) on duty during the October 21, 2003, shutdown. Based on the evidence developed during the investigation, the Office of Investigations determined the allegation that control room personnel at the Callaway Plant willfully failed to document a temperature transient on October 21, 2003, was not substantiated.

Based on the NRC's assessment of the October 2003 shutdown, the operating crew did not anticipate the impact of the rapid shutdown from the reactivity management perspective which then resulted in transients on the plant at the low power operating levels. The inspectors performed a reactivity balance for several periods of time associated with the shutdown to better understand what was controlling the power of the reactor. The NRC assessment of the transient was that operators did not recognize that the reactor was responding to the steady state main turbine demand through the reactor coolant system temperature decrease, which then caused the decrease in pressurizer level and the letdown system isolation. Xenon was controlling the shutdown rate of the reactor for at least 2 hours prior to the turbine trip and following the last control rod insertion. After the turbine trip, the reactor coolant system temperature increased to the programmed level adding negative reactivity. This, along with the Xenon accumulation, shut the reactor down and continued to increase the shutdown margin until the control rods were completely inserted.

The NRC determined that the temperature and pressurizer level transient just prior to the turbine trip was caused by the negative reactivity being added by the Xenon. Because Xenon continued to build in rapidly and insert negative reactivity during the down power from 100-percent power when operators attempted to stabilize the reactor power with a constant main turbine load, a temperature transient (decrease) on the reactor plant occurred providing the necessary positive reactivity to maintain power As a result of the temperature decrease, there was also a decrease in the pressurizer level and the subsequent letdown isolation. Earlier, Control Banks C and D had been inserted along with a reduction in turbine load to balance reactor and turbine power levels to approximately 7-percent. The NRC performed an approximate reactivity balance for the reactor at the point where average temperature (Tavg) began to decrease. The reactivity balance indicates that the continued buildup of Xenon poison in the core without a corresponding reduction in turbine load caused the decrease in Tavg and related plant responses The NRC found that the temperature transient that resulted in the core temperature falling below the minimum technical specification required temperature for criticality was required to be entered into the licensee's corrective action program. The NRC documented the associated non-cited violation in NRC Inspection Report 05000483/2007003 In addition, the NRC resident inspectors at the Callaway Plant communicated NRC perspectives regarding the operating crew's performance, including the command and control aspects of the evolution, with Callaway Plant management.

The NRC found that reactivity management at the low power levels, where the plant configuration induced the plant transient to maintain reactor power, was not effective or adequately supported by procedures, and that tripping the main turbine and/or reactor could have prevented the temperature and pressurizer level transient. The NRC noted that the pre-evolution practice training provided to the operators did not include operation after the point where the operators tripped the main turbine.

Consideration of Off-normal and Shutdown Procedures and Training Impacts and Improvements

The inspectors reviewed the licensee's training materials to determine how the licensee addressed activities and lessons learned from the October 2003 unit shutdown. The licensee did not demonstrate appropriate awareness of reactivity implications based on their actions and the plant configuration, including the impact of Xenon with a steady main turbine power output and later maintaining the control rods withdrawn after the plant was shutdown The inspectors noted that operator training for low power operations did not adequately address the impact of system responses, command and control with procedural implementation, and reactivity management

The inspectors reviewed both initial license training and licensed operator continuing training materials as it is currently being implemented The inspectors identified that both the initial license and licensed operator continuing training incorporated plant shutdowns from a low power of 20 to 30 percent power to a Mode 3 condition. This training included both simulator and classroom discussions on the performance of the task and the necessary procedures to accomplishment the evolution. Emphasis was placed on the actions required by the procedure and the sequence of these actions. In addition, the licensee created a job performance measure for the licensed operator continuing training to prepare a Xenon prediction for changes in power The licensee also has performed several pre-evolution practice-training activities for various plant power changes and critical evolutions during plant startup and shutdown