

February 8, 2016

MEMORANDUM TO: Michael Junge, Chief
Operator Licensing and Human Performance Branch
Division of Construction, Inspection
& Operational Programs
Office of New Reactors

FROM: Jim Kellum and Joe DeMarshall **/RA/**
Operator Licensing and Human Performance Branch
Division of Construction, Inspection
& Operational Programs
Office of New Reactors

SUBJECT: SUMMARY MARCH 10-13, 2014 AP-1000 SIMULATOR FACTORY
ACCEPTANCE TESTING OBSERVATION AT WESTINGHOUSE FACILITIES
IN CRANBERRY TOWNSHIP, PA

During the week of March 10th 2014, the U.S. Nuclear Regulatory Commission (NRC) staff observed the Westinghouse staff perform factory acceptance testing (FAT) for the AP-1000 simulators slated for Vogtle 3 and 4 and Summer 2 and 3. Jim Kellum and Joe DeMarshall of the Office of New Reactors conducted the observation from Monday March 10, 2014 through Thursday March 13, 2014 with an informal exit held on Thursday afternoon. Mike Junge, Operator Licensing Branch Chief, also participated in the observation on Wednesday and Thursday during the week of the observation. The goal of the observation was to watch the process being used by Westinghouse to perform FAT for the AP-1000 simulators per ANSI-3.5-1998, American National Standard for Nuclear Power Plant Simulators for Use in Operator Training and Examination.

The Westinghouse staff was knowledgeable and very helpful. They fully supported our observation needs. Upon arrival the NRC staff was informed the testing was ahead of schedule and some of the tests we had previously intended to observe in this selected week had already been done. The NRC staff requested a revised list of scheduled tests for the week, the deficiencies (Westinghouse internally called RITs items) from the previous week's tests and the test for a locked RCP rotor. The locked rotor test had RITs items from prior testing and the staff asked to see the test run again.

The first day the staff primarily reviewed the tests and documents provided, observed one test on service water loss of air and watched the testing personnel's shift turnover. Given that this was the first test observed, we had numerous questions which were largely process related to understand how the FAT was being conducted and how deficiencies were documented and resolved. There were two RITs items written up on the first test. RITs items are processed as follows: After being generated, the RITs are sent to the modeling folks who then correct the issue. After the issue is corrected, approximately on a weekly basis, the simulator load is updated with the fixes completed during the week by the modelers and the testing folks then retest to ensure the fix is acceptable.

On day two, the staff observed a main generator trip from 100% power and subsequent Rapid Power Reduction. Reactor power stabilized at 0.06%. Conditions seemed reasonable for no operator action.

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Next, we observed a locked rotor on an RCP. This was after the fix was made from a previous test. The RITs for this test previously stated that on some occasions an ESFAS actuation was received for this transient and was not expected. We ran the test approximately 3 times and it preformed correctly. It was then run on the other test platform and 4 out of 5 times the ESFAS actuation was received. This causes the staff to question the validity of all the testing because, according to Westinghouse, the two platforms had the same software and hardware; how could the results be different? Westinghouse staff investigated and determined that the test procedure was not properly run on the second platform. That being the case, then the question is why was the procedure not followed? Again a validity concern if the procedure is not followed as written.

The third test for day 2 was a 25% steamline break. While the direction of parameter response seemed correct the staff thought the severity of the malfunction was not of expected magnitude, affecting simulator fidelity. Power went to 107% and MWe decreased by 66 and stabilized. The staff called the NRC TTC in Chattanooga and asked them to run a 25% steamline break on the Westinghouse simulator there. The results were 109% power, lowering MWe and reactor trip, although it nearly stabilized. The Westinghouse staff also explained, after talking with the modelers, that the AP-1000 malfunction is a 25% pipe break whereas the TTC break is 25% of the 100% break steam flow. Following this investigation, the staff determined the FAT test for the steamline break was satisfactory. One additional issue noted was that there was an error in the test procedure regarding expected steam header pressure response.

Day three – Mike Junge arrived for observation. Westinghouse provided more information on the locked rotor. They explained that the test procedure required 60 seconds to stabilize prior to going to run on the simulator and that the results from the second simulator were because the malfunction was inserted after only about 10 seconds. This confirmed the earlier report of the test not being run properly.

Next, Westinghouse ran the “RNS Suction Line Break Inside Containment” malfunction test procedure. The test was run at severity levels of 100% and 50% to determine if the scaling portion of the malfunction was working properly. The 100% test ran fine, however the 50% test was unsuccessful in that it yielded the same results as the 100% test. Investigation determined that the ramp time specified in the procedure for the 50% break was improperly set. The test procedure specified a 60 second ramp time for the 100% break, and a 30 second ramp time for the 50% break. The different ramp time values essentially resulted in identical ramp rates for both runs. The test procedure should have specified a ramp time of 60 seconds for both severity levels. Westinghouse initiated a RITs to correct the procedure. This was the second procedure issue in six test procedures observed by the staff. The staff had previously been informed by Westinghouse that all observed scenario and malfunction test procedures were run during pre-FAT testing. These procedures issues should have been identified during the pre-FAT.

Day four – We observed the loading of the latest software with the RITs fixes since the previous load. The loading of the updated software was methodical and the testing of the new load was appropriate. A controlled plant shutdown from 100% reactor power was also observed.

An informal exit with Westinghouse staff was held on the afternoon of March, 13th. The topics discussed were as listed above but basically to summarize they were:

that the Westinghouse staff were professional, knowledgeable and helpful
the process being used by Westinghouse for FAT testing was acceptable
the loading of the new software load was appropriately vetted
the locked rotor issue,

M. Junge

- 3 -

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the procedure issues and

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The staff answered several questions by Westinghouse and the observation was concluded.

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