

NRC INTERNATIONAL TRAVEL TRIP REPORT

Traveler, Office, Division, Phone Number:

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Subject:

This was a bilateral information exchange between the US Nuclear Regulatory Commission (NRC) and China's National Nuclear Safety Administration (NNSA) to observe/discuss licensed operator training and examination processes and simulator use and capabilities at the Sanmen, China AP-1000 Construction Site

Dates of Travel and Countries/Organizations Visited:

August 1, 2015 to August 15, 2015 – Sanmen China/meet with NNSA.

Desired Outcome:

Apply lessons learned to operator training and simulators at Vogtle and V.C. Summer AP-1000 units under construction and initial licensed operator examination and performance.

Results Achieved:

Established relationships with NNSA site personnel for future dialog in the areas of operator licensing and examination and the use/maintenance of the simulator. Additionally, discussed and observed simulator training, compared the simulator fidelity to the main control room, reviewed simulator issues and differences in the operator licensing and examination process between China and the U.S.

Summary of Trip:

Met Region II personnel, Timothy Steadham and Hyung Je, in Shanghai. We had a general and security briefing at the U.S. consulate. We met the NNSA representative, Mr. Li Xuefa, at the Shanghai train station and he accompanied us to the Sanmen construction site.

At the entrance meeting we discussed expectations for the Office of New Reactors, Region-II and NNSA for the visit and developed a schedule to accomplish those items.

A meeting was held with NNSA and licensee training personnel (supervisor of initial training, supervisor of requalification training, a simulator instructor and a classroom instructor). The following are the most significant points from this initial meeting:

- The simulator portion of the licensing exam is written and administered by the utility and observed by NNSA.
- The written exam is actually the responsibility of the Chinese Nuclear Energy

Agency (NEA), their DOE, but NEA had a contractor prepare this part of the exam. The written exam consists of essay questions, similar to the exams the NRC gave prior to the multiple choice exams currently used. The written exam is considered the most difficult part of the licensing exam.

- 81 candidates have been examined to date, 74 (91%) have passed the reactor operator (RO) exam.
- Senior reactor operator (SRO) candidates come from the group that passes the RO exam and 51 have passed the SRO exam.
- If the pass rate is outside range of 80-85% the licensee must explain why exam is too easy or too hard.
- Written exam must be completed within 7 days of operating exam.
- The Exam also includes an oral board by a three person board of experts.
- Requalification consists of 12 days split between simulator and classroom given twice a year.
- Gap training and an exam are planned prior to fuel load.

A second meeting was held with NNSA and the initial and requalification training supervisors with the major discussions points being:

- During this meeting I primarily answered their questions regarding U.S. licensing processes. First, for the requalification training supervisor, we covered the NUREG-1021, Operator Licensing Examiner Standards for Power Reactors, 600 series (requalification), critical tasks, quantitative scenario attributes and crew evaluations.
- With the initial training supervisor, the discussion went through the entire process for licensing operators from candidate selection (ANSI-3.1) through initial training program content and structure, to audit exams, to licensing exam development and administration.

The initial training supervisor lead a Simulator meeting and tour – the following observation were made:

- As with the U.S. AP-1000 simulators, the Sanmen simulator does not have 'canned' simulator malfunctions but use APP files for malfunctions.
- Sanmen has one simulator and it is in use two shifts (16 hours) a day, 5 days a week. Since Sanmen has 74 individuals that have completed license class they require considerably less simulator time for initial training. Summer and Vogtle have two simulators and they are often in use 24 hours a day.
- I asked specifically about the Vogtle and V.C. Summer deficiency of control rods spontaneously shifting from auto to manual control, they stated they have not observed that issue on the Sanmen simulator.
- Westinghouse does all the Sanmen simulator fixes; Sanmen maintains a deficiency log as do U.S. utilities and Westinghouse.
- Sanmen handles the large number of alarms that occur during plant upset conditions, for example, loss of power, by using a third RO called the 'P' operator whose function is to perform peer checks and during plant upset conditions to handle the alarms. Alarms are prioritized as red, orange and yellow and no color.

- Westinghouse provided much of the Sanmen initial operator licensing instruction. From observation in the simulator (requalification session) the command and control structure is similar to that used by Westinghouse, SCANA and Southern. The conduct of briefs and procedure use also followed the structure seen at U.S. facilities. The procedures were basically the same procedures used at V.C. Summer or Vogtle.
- A shift supervisor was the simulator floor instructor. The training was very formal and the crew was engaged.
- The simulator at Sanmen is modeled to baseline (BL) 5 of the instrumentation and control platform and Haiyang is BL 7. Sanmen is going to be updated to BL 7 in October and November. It was obvious from watching the simulator in operation that it was an earlier BL. For example, with the simulator stable at 97.4% power, Tave and Tref were both indicating 301°F, over 250°F low.
- From what I observed, a BL 5 simulator would not meet NRC requirements for conduct of a licensee exam.
- The simulator decorum looked as expected.

Mr. Li Xuefa provided a plant tour – In general, the plant looks to be largely complete and it was stated that Sanmen was waiting for the reactor coolant pumps. The following observations were made:

- The Main Control Room (MCR) was powered down but since the MCR and simulator software are the same, fidelity between them is expected. From the hardware aspect, some hardware items were verified to compare the simulator to the MCR, such as the turbine trip panel, monitor layout, etc., and they looked identical in the simulator. It was noted that the ventilation system was different in the MCR compared to the simulator. About 15 feet off the floor in the MCR along the wall is a large ventilation noise attenuator that is not in the simulator and some of the supporting ventilation piping looked different. That was the major difference noted during the short observation in the MCR.
- The walk through of containment was very impressive. A good bit of work and testing was ongoing. All the major components are in place from the core flood tanks, to the steam generators, to the pressurizer, to the reactor vessel.
- Overall the physical fidelity between the simulator and the MCR was good.

Debrief – The debrief was largely a synopsis of the items listed above. We thanked our hosts for their support and allowing us to observe many items. They were gracious hosts and showed us all the things we had asked. We ensured contact information was exchanged for any further questions or follow-up discussions.

Pending Actions/Planned Next Steps for NRC:

The results of this visit will inform future activities in the licensing and examination process, particularly the simulator, for the AP-1000 new builds at V.C. Summer and Vogtle stations.

Points for Commission Consideration/Interest:

None