Post-Mission Quick Look Report

3/31/2010

Travelers:
Eileen McKenna
Peter Koltay
Yuken Wong

Travel Dates:
March 22-24, 2010

Location:
Sanmen County, China

Organization:
Multi-National Design Evaluation Program (MDEP) AP1000 Working Group

Desired Outcome:
Information exchange on AP1000 design review and on NNSA experience with construction of first AP1000 at Sanmen site. Working group discussions on specific technical topics with goal of developing common positions where possible.

Results Achieved:
Participants discussed their interactions with vendor on technical issues in support of regulatory actions being taken. Common position developed on squib valve guidelines, and positions converging on technical considerations for innovative construction techniques, and considerations for classification of control rod drive components.

Summary of Trip:
The third meeting of the MDEP AP1000 Working Group was held March 22-24, 2010, in Sanmen, China. Attendees are listed in Enclosure 1. The chairperson called the meeting into session, then offered the floor to Mr. Jiang, Deputy Director General, NNSA for opening remarks. Following introductions by all participants, the agenda topics were covered, starting first with approval of minutes from September meeting, feedback from the STC meetings, general highlights of MDEP activities since last meeting.

Next, Ms. X. Jin, Safety and Quality officer of SMNPC made a presentation concerning the progress of manufacturing and construction. She first provided an overview of the various entities involved in the Sanmen project, including CNNC (holding company), SMNPC (having about 540 employees), and other companies with varying responsibilities. At Sanmen, the nuclear island is provided by WEC, whereas the balance of plant is provided by other companies.. The construction schedule is for 56 months, with 10 month gap between the two units, with dates of Nov 2013 and Sept 2014 planned. She indicated the project was about 10 months behind, due to design changes and delays in getting drawings from W. Also reported was an 8 month delay in I&C. She mentioned planned RCP tests in

May 2010. She showed a video of major construction activities such as basemat pour, installation of bottom head of containment, etc.

Peter Koltay noted some comments about MDEP activities, such as agreement among parties that for new changes to codes and standards, these will be coordinated with other countries, to limit divergence. He also noted success with forums other than in-person meetings, such as on-line conferences, and solicited comments on improvements to organization of the MDEP library.

Each country then presented a status of their review activities for the AP1000. China reported that the construction permit for first unit was issued in March 2009, with several license conditions requiring action at specified times. These included such topics as design of shield building,Class 1 piping, CRDM classification, stack height, rod drop timing, squib valve qualification, and conformance with RG 1.207 (environmentally-assisted fatigue). For shield building, plan for now is to construct the reinforced concrete design. Some of the challenges of the review were noted, such as having to translate RAIs written in Chinese into English, getting the replies, and getting summary of responses translated back into Chinese. Metrification is also an issue (also for the UK). Some of the topics they will review before full receipt of the FSAR are fuel management strategy, LBLOCA (use of ASTRUM), and strainer design.

The site inspector made a presentation about the inspection program under the NNSA Shanghai regional office. This office is responsible for all civilian facilities in East China, including 5 units in operation and 14 under construction. Some of the specific activities they inspected included preparation for CA20 module lifting, construction of containment vessel bottom head, welding and lifting of CVBH, curing of basemat concrete and Cao1 module lifting. (CA01 is the primary loop compartments, for RV and SGs).)

Outside of Scope

Some generic areas noted were classification of SSC, codes and standards (specific mention of environmentally-assisted fatigue), need for a design freeze, and timeliness and quality of submittals.

Outside of Scope

Site Visit

The site visit at Sanmen included stops at the visitor center, at grade overlooking unit 1 (next to containment), drive by the pump house, stop at the fabrication of the containment vessel bottom head, and stop near the CA01 module. It was not possible to view inside unit 1 as the second ring of the containment vessel had been recently installed and welding was continuing. The shield building construction was at an elevation below the bottom of the CVBH. Later in the day, the civil engineering subgroup returned to the site for a closer look at the CA20 module (spent fuel pool), closer look at CA01 (this is the primary compartment; as time of return visit, crawler wheels were being installed for its move into containment on following day), and walk down to basemat level in unit 2 as well as into the construction area for the turbine building. With the closer look, it was possible to see the studs placed to support the concrete to be installed. We had some conversation with Shaw representatives assisting in oversight of the construction.

Squib Valve Sub-Group

At the September meeting, the subgroup had developed some technical guidelines for design and qualification of squib valves. Not all countries had been present at that meeting, so this meeting provided the opportunity for any further comments. Consensus was reached on the guidelines as being ready to send forth to STC for appropriate dissemination. Also noted was additional information due

Outside of Scope

Civil Engineering Sub-group

Each country was considering different information related to steel composite modules. It was outside of scope of Canada's review, China had reviewed revision 16 (with license condition), UK was looking at revision 17, and NRC had reviewed August 31, 2009 design report. NRC noted imminent arrival of revised design report (Part 1 arrived at NRC during the visit).

The Chinese license condition concerned both the connection between the RC and SC, as well as substantiating information on theoretical basis. At this time, construction is moving forward with Rev. 15 design of shield building (RC). The Chinese were very interested in the views about adequacy of inside containment walls. NRC noted that this was part of the certified design; the UK has raised its regulatory issue about them, and they are fabricated (and in process of being installed) at Sanmen.

Outside of Scope

Outside of Scope

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In lieu of specific discussions about details of composite structures, the subgroup decided to further develop the technical considerations for innovative construction methods initially prepared at September meeting. The group decided to both refine the provisions and broaden the applicability to construction techniques other than composite modules. The revised guidance is provided as Enclosure 2. The working title is "Guidelines for regulatory consideration of innovative forms of construction technology applied to safety-related structures."

With respect to future meetings, the participants concluded that we needed to await future developments, specifically complete submittal of Westinghouse report to NRC on shield building (April-May), and submittal to UK of response to the regulatory issue (due in June) before scheduling additional meetings. NEA has action to poll members in the summer about next steps.

CRDM subworking group meeting – 3/22/10

Mr. Zaozhan Sun of NNSA presented the description of CRDM. The primary function of the CRDMs is to control the average core temperature. During startup and shutdown, the control rods control changes in reactivity. Mr. Sun also presented the background of the CRDM. According to Chinese practice, the control rod drive system (CRDS) is classified as a safety-related system. Per HAF.J0053, a technical document NNSA, seismic qualification must be sufficiently prove the integrity and operability of seismic category I equipment, such as the CRDS. NNSA issued the AP1000 construction permit with a condition that Westinghouse shall validate the appropriateness of the CRDM component safety and seismic classification to illustrate how the expected functions are satisfied. Westinghouse has since agreed to change the latch mechanism from AP1000 Class D to Class C, effectively designating it a safety-related component. However, Westinghouse has not agreed to change the safety classification of the drive rod to safety related.

Outside of Scope

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CRDM subworking group meeting – 3/23/10

Mr. Sun, Zaozhan presented practices and regulatory requirements on CRDM qualifications in China. For qualification of mechanical equipment, although the qualification method can be analysis, test or experience, the environmental qualifications are, as a general rule, by test. For the seismic tests, analysis approach can be used for those equipment or components only have integrity requirements but no operability requirements, or for those having too big sizes to be seismic tested. Seismic qualification must be done by tests when analyses can not sufficiently prove the integrity and operability

of seismic category I equipment or components, such as CRDS, pumps, valves, relays, electrical equipment and measurement instrumentations. The concern of CRDM reliability is due to the delayed RCCA drop time experience in a VVER plant in China.

The NRC explained that the acceptance of the AP1000 CRDM design is based on the operationally experience of the standard CRDM design, the failed-safe design, and the analysis presented in the AP1000 application. Although the CRDM components (except the pressure boundary components) are classified as nonsafety related, in stress analysis, the moments on non-pressure boundary components are limited to those that produce stress levels in the CRDM pressure housing less than ASME Code stress limits. By limiting the stresses and deformations of the CRDM components, it provides reasonable assurance that the CRDM components will maintain their structural integrity, and perform their safety function to shutdown the reactor during design basis events.

Additionally, criteria have been developed for clearances between the latch arm and the drive rod prevent failure of the CRDM to insert due to sticking of the drive rod or latch assembly. The NRC recognizes that Westinghouse should clarify the safety and seismic classification of each CRDM component to ensure that each component is design to quality standards commensurate with the importance of its safety function. The NRC also clarified that the statement in NUREG-0800, SRP 3.9.4 that the CRDS is a system important to safety does not mean that the CRDS is a safety-related system. Important to safety systems are broader than safety-related systems, and consist of safety-related systems, and other important to safety systems such as the fire protection system and liquid radwaste systems. The NRC informed other MDEP members that NRC/DCIP plans to inspect the AP1000 CRDM supplier Newington Operations in Hew Hampshire during July 12-16, 2010, and each MDEP member is invited to observe the inspection.

Concluding Session

As noted above, no specific date was established for next meeting pending completion of several actions by Westinghouse. With respect to potential new topics for subgroup discussion, some candidates were offered:

- Invessel retention
- Impact of seismic event on control rod drop time (could be issue group rather than AP1000?)
- Reactor vessel internals testing (new revision to RG 1.20)
- Environmentally assisted fatigue (new RG 1.207)
- Reactor coolant pump design (UK noted that a German pump design would be used there)

The topic area of most immediate interest appeared to be the environmentally-assisted fatigue topic.

NEA asked if the UK would share its technical queries (and responses from W) and similarly for China to share its RAIs with the MDEP for information exchange. Also requested was copy of inspection report from audits at W contractors.

Next Steps:

Follow up actions will be identified by MDEP secretariat, NEA, and will be incorporated into the official minutes of the meeting.

Were policy issues or other items of Commission interest raised? NO

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Participant List MDEP Meeting March 22-24, 2010

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Youcai Feng	China NNSA
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