

## Summary of the 9th Technical Advisory Committee (TAC) Meeting

Date:	May 21 – 25, 2018
Place:	Nuclear Risk Research Center (NRRC), Central Research Institute of Electric Power Industry
Participants:	
TAC:	Mr. Stetkar (Chair), Mr. Afzali, Dr. Chokshi, Mr. Miraucourt, Prof. Takada, Prof. Yamaguchi
NRRC:	Dr. Apostolakis (Head), Experts of the Nuclear Risk Research Center
Industry:	Experts of TEPCO Holdings, TEPCO SYSTEMS, Shikoku EPCO for respective topics

### Proceedings

All the topics were discussed in full session. In addition, an open discussion took place on research for Level 2 and Level 3 PRA.

### May 21 (Mon.)

#### Topic 1: NRRC R&D Roadmap

- NRRC presented “NRRC R&D Roadmap as of February 2018”.
- TAC members commented as follows:
  - The risk from all hazards should be evaluated in a single integrated PRA. NRRC should promote research to establish the best way to integrate different models to evaluate various hazards.
  - To coordinate its research well, it is important for NRRC to have a big picture for the development of a good quality PRA which addresses all hazards in all of the operating modes at a reasonably consistent level of detail.
  - Risk communication would benefit from connecting NRRC’s various R&D activities and their outcomes. Also, we would like to know NRRC’s specific research activities on risk communication because of its importance.
  - TAC’s role is to discuss R&D activities of NRRC, but we are also highly interested in the actual application of PRA results. We would appreciate more inputs about related developments including activities of relevant organizations.

(Handouts)

## 1-1. NRRC R&D Roadmap as of February 2018

### **Topic 2: Risk Assessment Research: Thermally-Induced SGTR**

- NRRC presented current R&D status on “Thermally Induced-SGTR”.
- TAC members commented as follows:
  - TI-SGTR, which was thought not to be important in past PRAs, may have a large contribution to risk of an NPP. It is a higher priority to implement TI-SGTR modeling in PRA rather than to refine estimates of the conditional TI-SGTR probability based on domestic SG flaw data.
  - The US NRC ACRS pointed out that there are some scenarios which resulted in High/Dry/Low conditions in addition to the scenarios derived from the approach of the draft version of NUREG-2195 Appendix L. So it is important for utilities to consider on their own all conditions that can result in H/D/L.
  - TI-SGTR does not contribute to the Level 1 PRA results, but it may be dominant when Level 3 PRA is considered. Japanese utilities should not screen it out without any risk assessment even though the conditional TI-SGTR frequency is small.

(Handouts)

## 2-1. Safety Research on Thermally Induced-SGTR

### **Topic 3: Pilot Projects for PRA Improvement**

- Shikoku EPCO presented the current status of the Ikata 3 pilot project. TEPCO Holdings and TEPCO SYSTEMS presented the current status of the Kashiwazaki-Kariwa (KK) 6/7 pilot project.
- NRRC presented the establishment of a PRA peer review implementation system.
- TAC members commented as follows:
  - In the US, utilities use findings of peer reviews as learning material. You can find some gaps and learn from them by comparing a peer review result and your self-assessment result.
  - When utilities share their PRA models with NRA in developing the new inspection process, it is important to share expectations on both sides and to reach a common understanding about the required PRA

quality.

- The definition and interpretation of “safe and stable state” have to be consistent in the industry at large.
- The data collection and analysis methods should also be consistent. For example, should the standby failure rate model be used for component demand failures?

(Handouts)

3-1. Ikata Unit3 Project Status Update

3-2. Attachment: Comment resolution plan for the 1st external expert review

3-3. KK-7 Project Internal Event Operating Level 1 PRA Model Sophistication Progress Report

3-4. Attachment: 1st - 3rd Expert Review Comments

3-5. Establishment of PRA peer review implementation system

**May 22 (Tue.)**

**Topic 4-A: Risk Assessment Research: Fire PRA Guide**

- NRRC presented the current R&D status of “Fire PRA Guide”.
- TAC members commented as follows:
  - It is useful to identify fire/flooding sources in a seismic PRA walk-down. Japanese utilities can refer to EPRI seismic PRA walk-down guide in developing their good PRA.
  - There are very limited research activities on seismically induced fire PRA internationally. When NRRC can start a research in this field, it will be a great contribution.
  - The fire events should be classified by their severity with focus on fire ignition sources rather than plant response because the latter can depend on the plant characteristics.
  - The guidance for treatment of incipient fire detection should be coordinated with the guidance for collection and screening of fire event data. The fire event screening process and the fire PRA models should not "double account" for the effects of incipient fire detection.

(Handouts)

4-1. Fire PRA Guide

4-2. Fire PRA Guide Overall Progress and Roadmap

#### **Topic 4-B: PRA Data Collection**

- NRRC presented the current R&D status of “PRA Data Collection”.
- TAC members commented as follows:
  - In order to develop a generic database for the Japanese PRAs, the scope of the components and failure modes for collection should not be limited to the ones of the PRA models for the individual plants but be broad enough to cover the models of the whole industry. TAC recommends that the Japanese industry determine the scope of their data collection based on a "master list" of components and failure modes. NUREG/CR-6928 is a good reference for that list.

(Handouts)

4-3. Development of PRA parameter database

4-4. Implementation Guide on Data Collection for PRA

4-5. Development of PRA parameter database - supplement

**May 23 (Wed.)**

#### **Topic 5: External Natural Event Research**

- NRRC presented the current R&D status of “Tsunami PRA”, “Probabilistic Seismic Hazard Analysis (PSHA)” and “Seismic Fragility”.
- TAC members commented as follows:
  - When Tsunami PRA becomes practically applicable, it is expected that utilities will be able to gain new insights from results of Tsunami PRA, especially by comparing PRA results such as CDFs of the plant before and after the installation of Tsunami countermeasures based on lessons learned from Fukushima-Daiichi accident.
  - NRRC should make a practical PSHA guide for utilities with consideration of efficiency in terms of cost and duration for implementation.
  - Site response characteristic is one of the key issues in ground motion estimation, especially in the case of utilization of GMPE (Ground Motion Prediction Equation). NRRC should conduct research and development regarding these site characteristics related to ground motion estimation considering the treatment of uncertainty.
  - NRRC should develop a quantitative methodology to select and assign weights when it uses several GMPEs in evaluating ground motion.

- EPRI has provided excellent research results on seismic fragility, so we recommend NRRC to refer to them.

(Handouts)

- 5-1. Tsunami PRA Level 1 (Accident sequence evaluation) and Level 2
- 5-2. Tsunami PRA Hazard and Fragility (outdoor) assessment
- 5-3. PSHA Enhancement in Japan Based on Lessons Learned from Ikata Level-3 SSHAC Project
- 5-4. Seismic Fragility

**May 24 (Thu.)**

**Topic 6: Open Discussion**

- A discussion session took place on research for Level 2 and Level 3 PRA.

(Handouts)

- 6-1. L2PRA and L3PRA related research

**Topic 7: Exit Meeting**

TAC and NRRC had a discussion on how to organize future meetings.

**May 25 (Fri.)**

Committee internal meeting.