

Perspectives on the Safety of Nuclear Facilities

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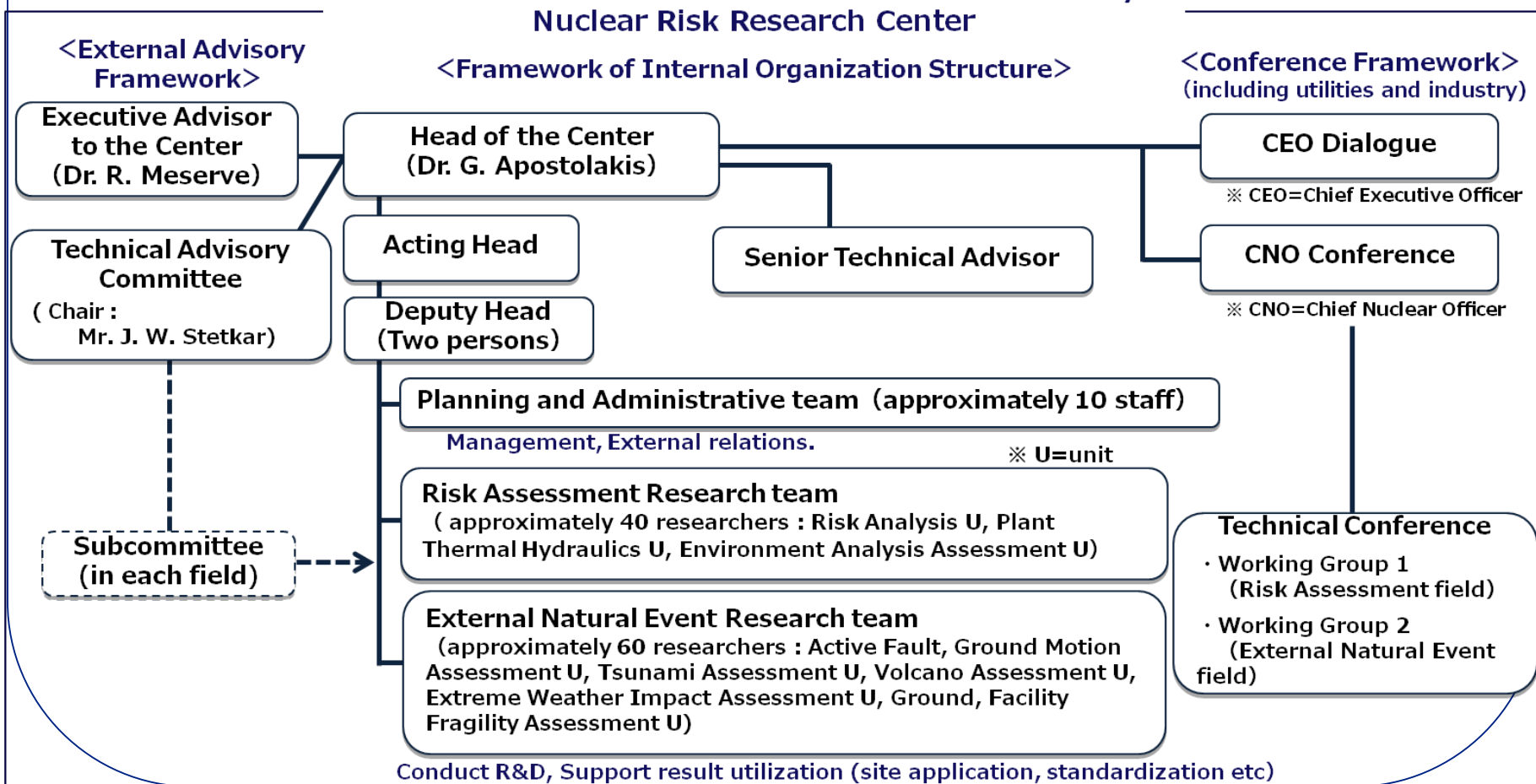
The Nuclear Risk Research Center

Date of Establishment: Oct 1, 2014

Location: Central Research Institute of Electric Power Industry, Tokyo

Research activities are conducted mainly in Abiko and Komae

Number of members: Approximately 110



NRRC Mission/Near Term Goals

1.Mission Statement

- **To assist nuclear operators and nuclear industry to continually improve the safety of nuclear facilities by developing and employing modern methods of Probabilistic Risk Assessment(PRA), risk-informed decision making and risk communication.**

2.Near Term Goals

- **Review existing PRAs (and improve, as necessary)**
- **Seismic PRA**
- **Tsunami PRA**
- **Infrastructure (HRA/Other (fires, Internal floods, others)/ Risk communication methods)**

Committees

- **Technical Advisory Committee**
 - J. Stetkar, A. Afzali, N. Chokshi, X. Pouget-Abadie, T. Takada, A. Yamaguchi
 - Letter reports and NRRC/industry replies are published in the website
- **PRA Promotion Team**
 - Senior utility and FEPC managers
 - Observers for Mitsubishi, Hitachi, Toshiba, et al
 - Interacts with NRRC management routinely

Human Reliability Analysis

- **Utilize the IDHEAS Framework**
 - **Identification and feasibility assessment**
 - **Human Failure Event narrative (crew response tree, crew failure modes, performance influencing factors)**
 - **Quantification (decision trees)**

- **HRA in extreme environments**
 - **Mobile equipment**
 - **Retrieval, transportation, installation**
 - **Historical record**

Seismic Risk

- **Pilot plant: A unit at a site with a second unit next to it**
- **Interactions between the units will be investigated**
- **SSHAC process for hazard assessment**

Multi-unit Issues

- **U.S.A.**
 - **Currently at most 3 units**
 - **Vogtle will have 4**
 - **Adjacent sites: Salem 1&2 and Hope Creek (3 total); Nine Mile Point 1&2 and FitzPatrick (3 total)**
- **Canada**
 - **Pickering: 6**
 - **Darlington: 4**
 - **Bruce Power: 8**
- **Japan**
 - **Kashiwazaki-Kariwa: 7**

Current Situation

- **General Design Criterion 5: Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.**
- **U.S. Safety Goals are applied to single units.**
- **PRAs, with few exceptions, are performed for single units.**

CNSC Workshop

November 17-20, 2014

- **MUPSA Infrastructure**
 - Lack of experience and guidance for performing MUPSA
- **Selection of Initiating Events**
 - Most external events involve multi-unit challenges
- **Accident Sequence Modeling**
 - Need to account for multi-unit dependencies including functional, human, and spatial dependencies
 - Need to consider the timing of releases from different units
- **Site Based Risk Metrics**
 - Need for additional risk metrics beyond CDF and LERF to fully express the risk profile of a multi-unit site

CNSC Workshop (continued)

- **Accident Progression and Source term Characterization**
 - **Need to define new release categories that adequately describe the releases from multi-unit accidents. This includes release magnitudes, energies, and timing from reactor units, spent fuel storage, and other radiological sources**
- **Evaluation of Radiological Consequences**
 - **Includes consideration of different points of release from the plant, possible differences in time of release, and release energies for plume rise considerations.**
- **Site-Based Safety Goals**
 - **Need to define multi-unit site based acceptance criteria for evaluating the integrated risks from a multi-unit site PSA**