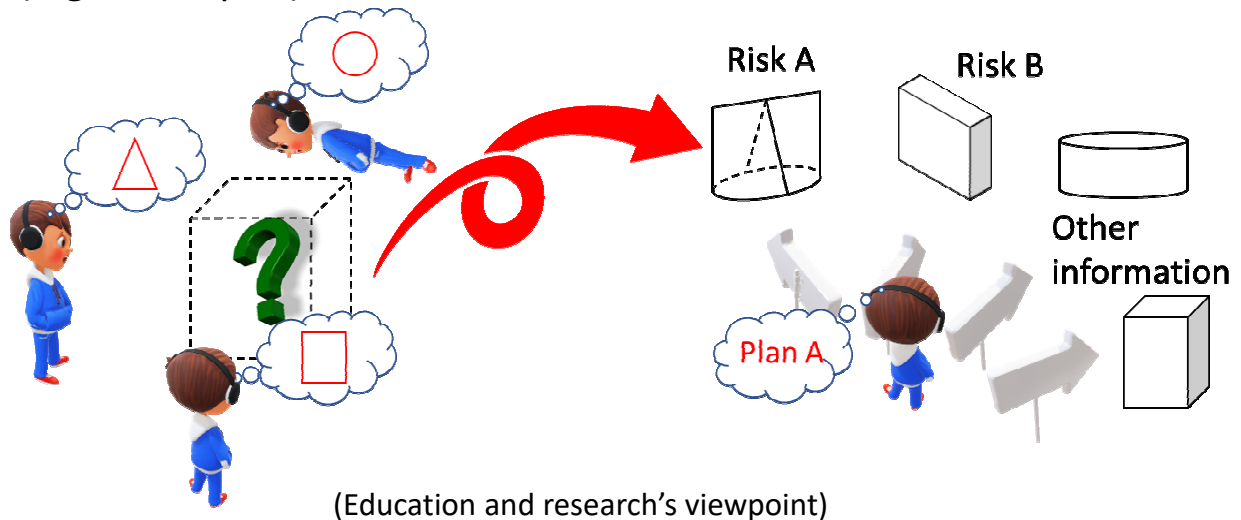


What is Risk Integrated Engineering?

- ✓ Deeper understanding of multiple aspects of risk (e.g. risk triplet)

- ✓ Decision making utilizing risk information (e.g. IRIDM*)

* Integrated Risk Informed Decision Making



(Education and research's viewpoint)

- Essence of risk
(detail of each risk will vary individually according as a situation.)
- R&D of methodology (technique)

- Fundamental way of thinking
(Practical decision making also vary individually according as a situation.)

Short speech from panelists

- ✓ Needs and expectations from Industry
Mr. Tetsuo Shimeno (ATENA*¹)
- ✓ Needs and expectations from Institute
Dr. Takeshi Yokoo (NRRC*²)
- ✓ Needs and expectations as Asian network of risk research
Dr. Silva Kampanart (TINT*³)
- ✓ R&D (severe accident research)
Prof. Nejdet Erkan (Univ. of Tokyo)
- ✓ R&D (quantitative risk assessment)
Prof. Sunghyon Jang (Univ. of Tokyo)

*1 Atomic Energy Association

*2 Nuclear Risk Research Center, CRIEPI

*3 Thailand Institute of Nuclear Technology
(สถาบันเทคโนโลยีนิวเคลียร์แห่งชาติ)

Needs and expectations from Industry

Mr. Tetsuo Shimeno

- ✓ Required change of the mindset
- ✓ Integrated Risk Informed Decision Making
 - Integration brings “wise” and “robust” decisions
 - Typical misunderstanding about CDF increase
- ✓ Emerging needs for engineers with Risk Integrated Engineering way of thinking and action
 - Knowledge, experience, and good exploitation
 - Take a bird’s-eye view, simplify, prioritize by triage in case of emergency
- ✓ Interactive collaboration with Resilience Engineering

Needs and expectations from Institute

Dr. Takeshi Yokoo

To train researchers and engineers who will lead the development of risk assessment technologies, and the implementation of risk-informed approaches in various fields of the real world, through

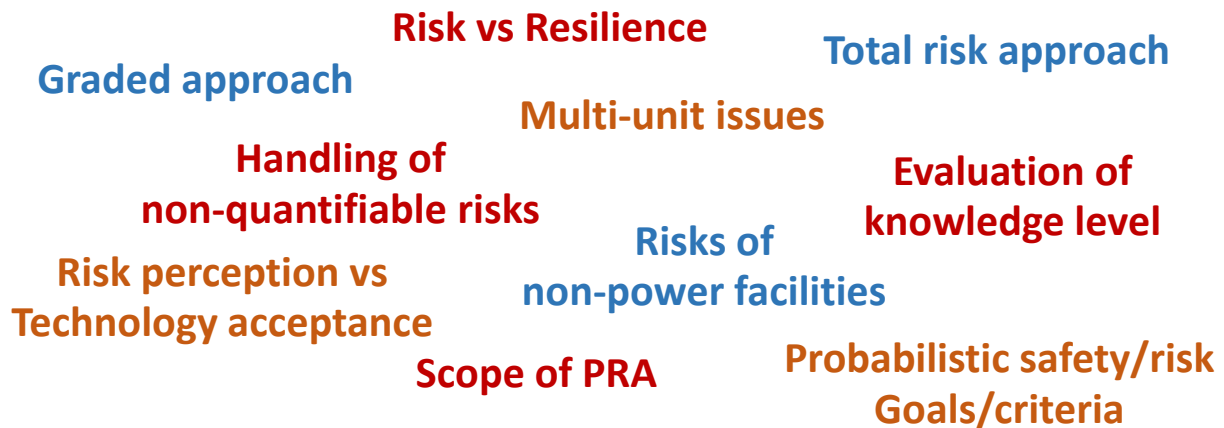
- ✓ giving chances of experiencing actual PRAs in the industry and properly understanding the R&D needs,
- ✓ encouraging/supporting R&D to advance the frontiers
- ✓ such as finer HRA technique, better SA modeling,,,,,
- ✓ especially, comprehensive methodology to quantify epistemic uncertainties.

Needs and expectations as Asian network of risk research

Dr. Silva Kampanart

- Integration of risk-related engineering
- Benefiting R&D and HRD
- Accounting for Asian situation and cultural context

- **Risk** in a broader sense
- **Nuclear** in a broader sense
- **Customer-oriented**



R&D (severe accident research)

Prof. Nejdert Erkan

- ✓ *Lack of knowledge about the nuclear accidents* may result in under-estimation of risk and accident mitigation measures in the operating NPPs.
- ✓ *Lack of knowledge about the nuclear accidents* may result in the designs that vulnerable to the safety threats.

Without a comprehensive knowledge about various phenomena existing in a severe accident, one cannot be a good Risk Estimator. Might become a Risk Speculator.

R&D (quantitative risk assessment)

Prof. Sunghyon Jang

Needed improvements within current PRA framework

PRA lessons learned from Fukushima dai-ich NPP accident

- Extending the PRA scope
- Treating feedback loops
- Reconsidering 'game over' modeling
- Treating long duration scenarios
- Improving and expanding external hazard analysis
- Improving HRA

Prominent techniques to overcome these challenges

- **Simulation based method** (Dynamic PRA)
- **Hybrid causal logic method** (Composed of three layers of ESDs, FT, and Bayesian Belief Networks)