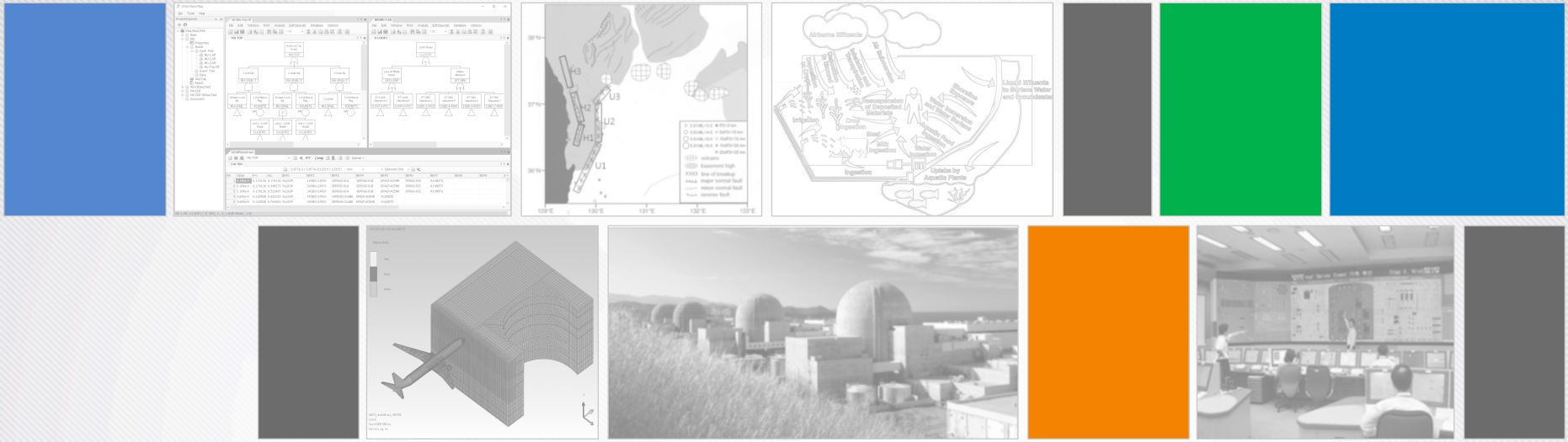


Special panel session on the future of HRA data

Jinkyun Park
Korea Atomic Energy Research Institute

PSAM 14, Los Angeles, CA, September 16-21, 2018

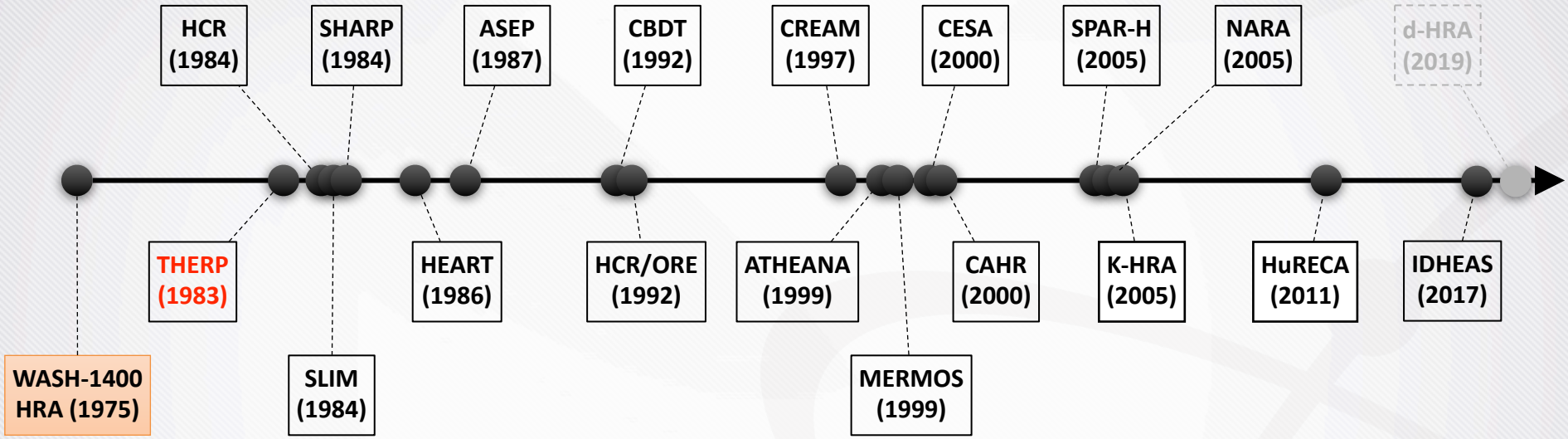
*More detailed information about this presentation can be found from:
Ronald L. Boring, Thomas Ulrich, and Bruce P. Hallbert, Jinkyun Park, Yochan Kim, and Wondea Jung (KAERI), INL/EXT-17-43719 (KAERI/TR-6968/2017), Evaluation of the sustainability and effectiveness of proposed methods and measures for operator performance in control rooms.

Questions raised by organizer

- What is HRA going to look like [in 10 years?, beyond 10 years?]

- What are the biggest [opportunities, challenges] for using HRA data?

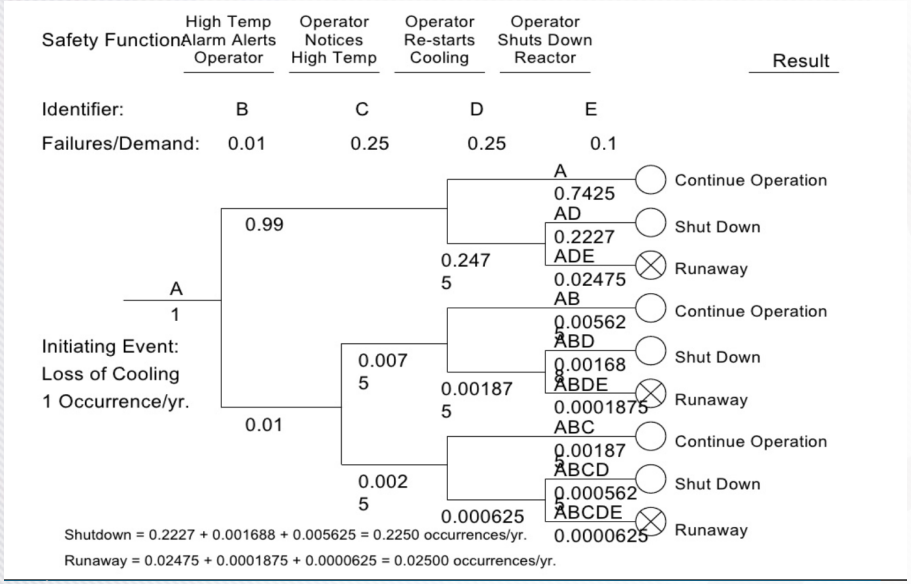
Brief history of HRA method

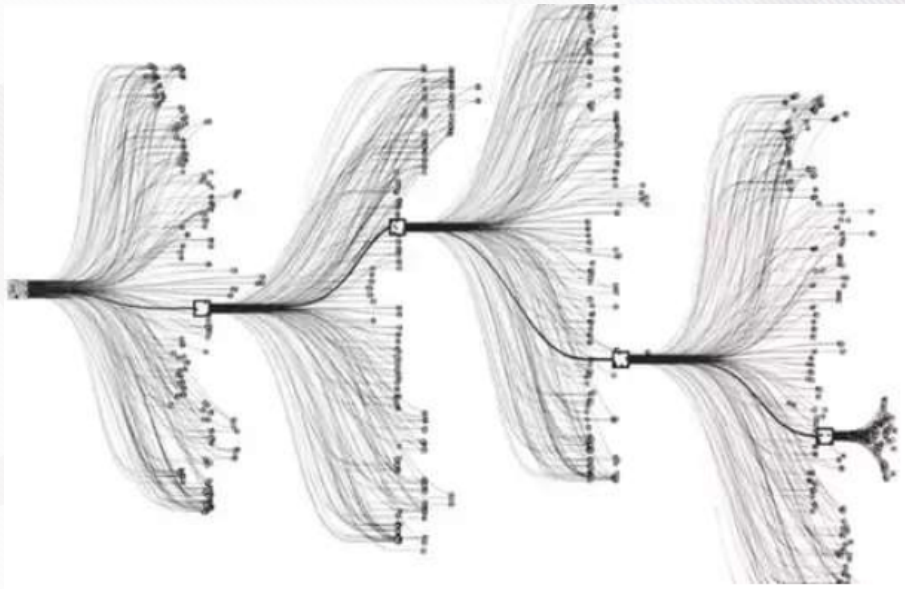


ASEP	Accident Sequence Evaluation Program
ATHEANA	A Technique for Human Error Analysis
CAHR	Connectionist Assessment of Human Reliability
CBDT	Cause-Based Decision Tree
CESA	Commission Errors Search and Assessment method
CREAM	Cognitive Reliability and Error Analysis Method
HCR/ORE	Human Cognitive Reliability/Operator Reliability Experiment
HEART	Human Error Assessment and Reduction Technique
HuRECA	Human Reliability Evaluator for Computer-based control room Action
IDHEAS	Integrated Human Event Analysis System
K-HRA	Korean Human Reliability Analysis method
MERMOS	Method 'Evaluation et de Realisation des Missions Operateurs pour la Surete (in French)
NARA	Nuclear Action Reliability Assessment
SHARP	Systematic Human Action Reliability Procedure
SLIM	Success Likelihood Index Method
SPAR-H	Standardized Plant Analysis Risk-HRA method
THERP	Technique for Human Error Rate Prediction

Two common problems of existing HRA

- **Largely focusing on estimating human error probability (HEP) based on a snap-shot of a give task context (e.g., static HRA result)**
  - Considering limited numbers of possible branches resulting in an unexpected consequences (e.g., core damage)



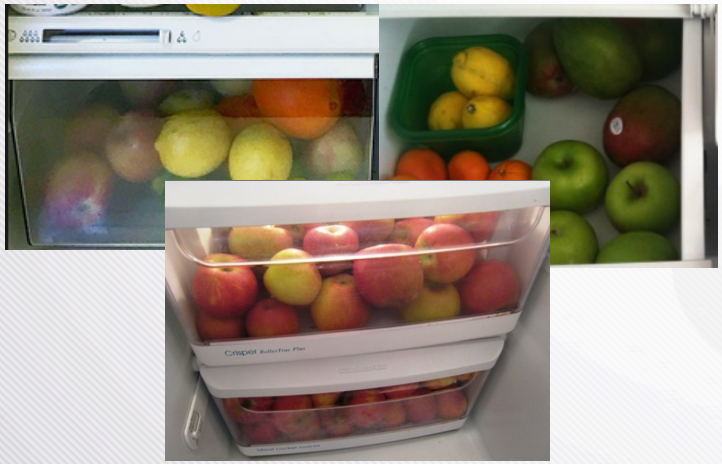


- **Most of available HRA data(bases) contain information extracted from 'failure cases experienced in specific conditions.'**

Example: 'Rotten apple in a refrigerator'

Which factor causes a rotten apple in a refrigerator?

Collecting information from similar cases



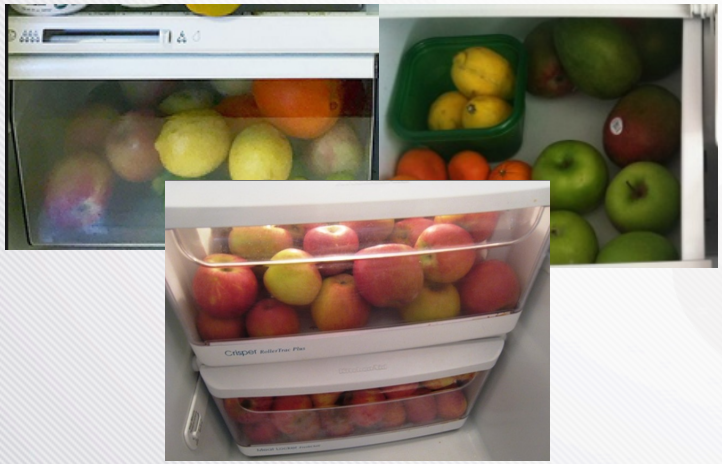
Humidity is identified as a key factor.

Estimating the chance of rotten apples based on humidity

Example: 'Rotten apple in a refrigerator'

Which factor causes a rotten apple in a refrigerator?

Collecting information from similar cases



HRA data

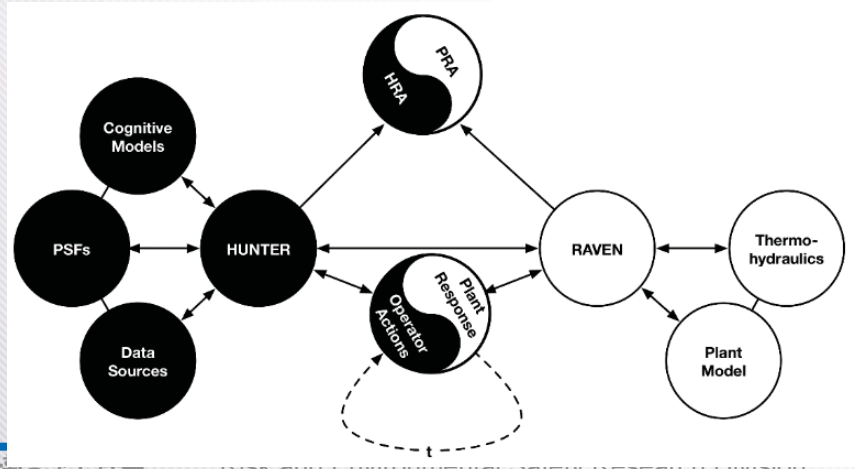
Humidity is identified as a key factor.

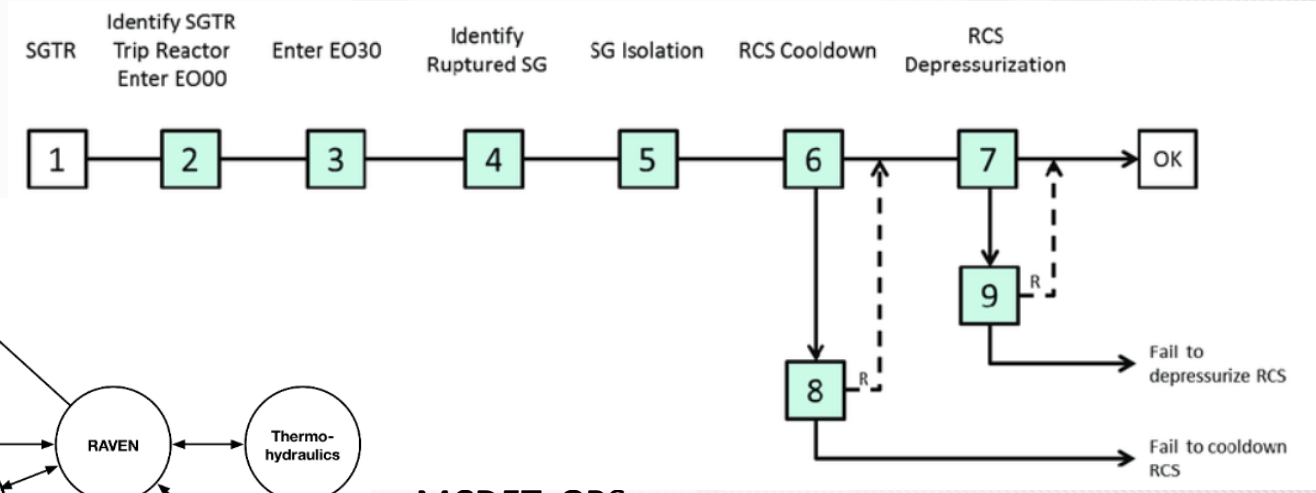
Estimating the chance of rotten apples based on humidity

HRA method

Personal thought about the first question

- **What is HRA going to look like [in 10 years?, beyond 10 years?]**
  - In 10 years: Focusing on the development of an HRA method that can identify (or represent) all possible branches resulting in unexpected consequences (i.e., dynamic HRA method).
  - Beyond 10 years: Focusing on the development of an implementation tool that allows us to estimate the HEPs of all possible branches (i.e., dynamic HRA tool)





- MCDET, GRS
- ISA, SNSC
- HUNTER, INL

- IDHEAS, USNRC
- d-HRA method, KAERI

Personal thought about the second

- **What are the biggest [opportunities, challenges] for using HRA data?**
  - Opportunity: Securing HRA data that can support a dynamic HRA tool
  - Challenge: Developing a novel framework to collect HRA data;
    1) Used for both existing HRA methods and a dynamic HRA tool
    2) Collect HRA data from both failure and success cases

- SACADA, USNRC
- HuREX, KAERI
- Micro-task, INL & IFE

Main causes resulting in rotten apples in diverse situations

THANK YOU