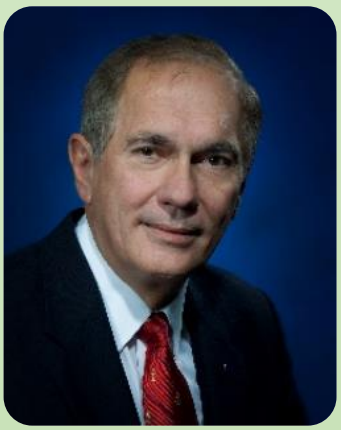
GEN IV International Forum℠
Expertise | Collaboration | Excellence

Proliferation Resistance and Physical Protection of Generation IV Reactor Systems

Summary / Objectives:

This webinar will provide an overview of the activities of the Generation IV Proliferation Resistance and Physical Protection Working Group. Topics include a presentation of the methodology developed by the group, an illustration of the methodology to an example nuclear system, and a summary of ongoing interactions between the group and the designers of the six Generation IV nuclear energy systems. Other outreach activities of the group associated with various national and international organizations will be briefly summarized.

Meet the Presenter:



Dr. Robert A. Bari is Senior Scientist Emeritus at Brookhaven National Laboratory and has over 40 years of experience in nuclear energy research. He has performed studies on safety, security and nonproliferation of advanced nuclear concepts. For 15 years Dr. Bari was co-chairman of the working group on proliferation resistance and physical protection of the Generation IV International Forum. He has served on the Board of Directors of the American Nuclear Society and as President of the International Association for Probabilistic Safety Assessment and Management. Dr. Bari was awarded the Theo J. "Tommy" Thompson Award in 2003 by the American Nuclear Society. In 2004, he received the Brookhaven National Laboratory Award for Outstanding Achievement in Science and Technology. Dr. Bari is a fellow of the American Nuclear Society and of the American Physical Society. He has participated in risk-based standards development for nuclear technologies for more than two decades. He has been a committee member of the U. S. National Academy of Sciences on Lessons Learned from the Fukushima Nuclear Accident for Improving Safety and Security of the U.S. Nuclear Plants. Dr. Bari also chaired a workshop of the U. S. National Academy of Sciences on safety and security culture held jointly between the U.S. and Brazil in 2014. He received his doctorate from Brandeis University (1970) and his bachelor's degree from Rutgers University (1965). He was awarded membership in the Phi Beta Kappa, Sigma Xi, and Sigma Pi Sigma honor societies.

Getting PR&PP Right!

The next Hiroshima/Nagasaki must be prevented.

Peace Statue in Nagasaki Peace Park

Definitions

- *Proliferation resistance* is that characteristic of a nuclear energy system that impedes the diversion or undeclared production of nuclear material, or misuse of technology, *by the host State* in order to acquire nuclear weapons or other nuclear explosive devices.
- *Physical protection* (robustness) is that characteristic of a nuclear energy system that impedes the theft of materials suitable for nuclear explosives or radiation dispersal devices, and the sabotage of facilities and transportation, *by sub-national entities and other non-host State* adversaries.

Distinction is important to articulate

PR&PP Group Major Products

- Methodology for PR&PP Evaluation
- Example Case Study
- Gen IV System Comparison Study
- Supporting Products:
  - PR&PP bibliography
  - PR&PP FAQ
- …and ongoing interactions with Gen IV designers

For reports see: https://www.gen-4.org/gif/jcms/c_9365/prpp

Value of PR&PP Evaluations for Future Designs

- Introduce PR&PP features into the design process at the earliest possible stage of concept development
- As the design matures, increasing detail can be incorporated in the PR&PP model of the system: progressive refinement
- PR&PP results can inform choices by policy makers

System Response

- Pathway analysis: Intuitive way to describe & analyze proliferation, theft, or sabotage scenarios and to identify vulnerabilities
- Segmentation & decomposition, then re-aggregation

System Response (cont'd)

- Pathways: Potential sequences of events followed by the proliferator or adversary to achieve its objectives
  - Along any pathway the proliferant state or adversary will encounter various difficulties, barriers, or obstacles, all of which are collectively called "proliferation resistance" or "physical protection robustness"
- Considers time-dependent aspects and uncertainty

CASE STUDY: EXAMPLE SODIUM FAST REACTOR (ESFR)

Case Study Objectives

- Demonstrate the Methodology for an entire system
- Confirm applicability at different levels of design detail
- Provide examples of PR&PP evaluations for future users of the Methodology
- Determine the needs for further methodology development