



Status of the PR&PP Methodology

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GEN Goals for PR&PP

The Technology Goals for Generation IV highlight PR&PP as one of the four goal areas along with Sustainability, Safety and Reliability, and Economics:

Generation IV nuclear energy systems will increase the assurance that they are a very unattractive and the least desirable route for diversion or theft of weapons-usable materials, and provide increased physical protection against acts of terrorism.

PR&PP Working Group: Terms of Reference

- **Advise** the PG and EG on PR&PP issues related to Gen IV nuclear energy systems
- **Maintain capability** to perform or direct PR&PP studies on request of GIF
- **Monitor** the integrity and quality of PR&PP evaluations for GIF (peer review on request)
- **Maintain configuration control** over the PR&PP methodology, its documentation and revisions
- **Strengthen the link** with GenIV system designers, in particular with GIF SSCs
- **Promote and facilitate** early consideration of PR&PP in the development and design of GenIV systems
- **Maintain cognizance** of related GIF activities, e.g., safety, economics
- **Maintain cognizance** of and interactions with non-GIF activities such as IAEA initiatives and specific national initiatives
- **Promote** PR&PP goals and broad acceptance of the PR&PP methodology

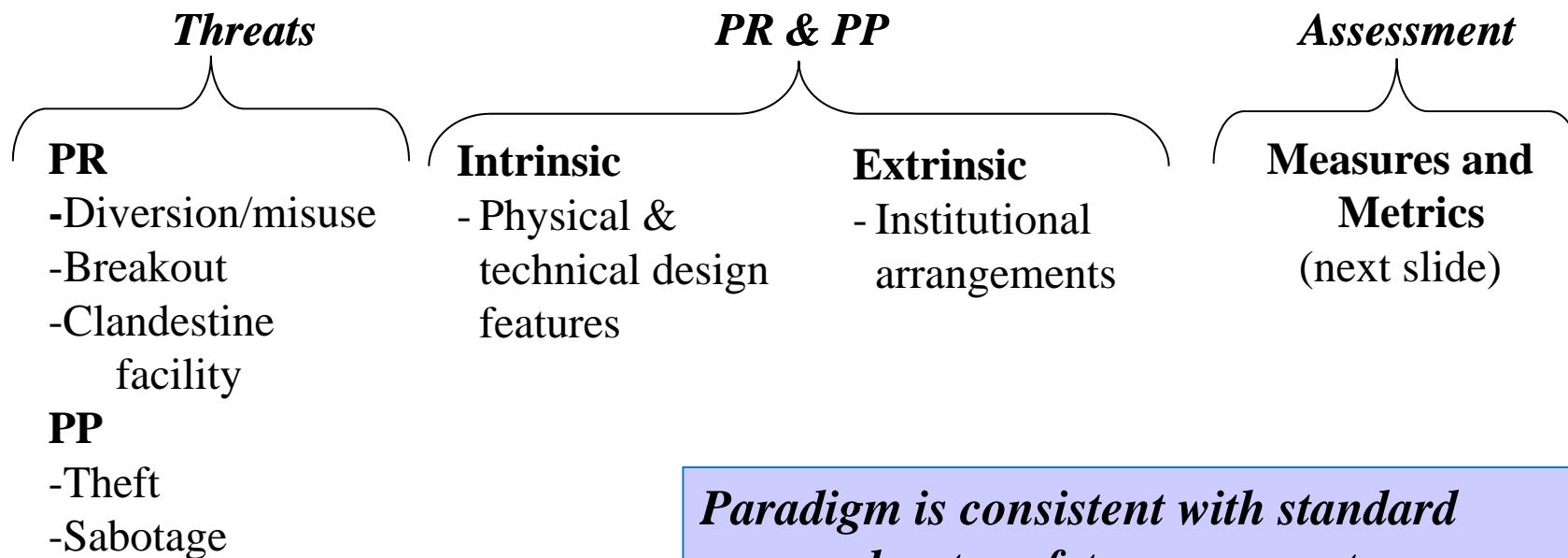
Chronology of Activities

- ***December 2002: First Meeting of PR&PP WG***
- ***2003-2006: Development of Methodology - Rev. 5***
www.gen-4.org/Technology/horizontal/PRPPEM.pdf
- ***Rev. 6 of Methodology (final draft completed late 2010):***
 - ***user guidance***
 - ***expert elicitation process***
 - ***Metric selection***
- ***Workshops with users and stakeholders: 2004 (USA), 2006 (Italy), 2006 (Japan), 2008 (South Korea), 2011 (Japan)***
- ***21st meeting of PR&PP WG in Tokai, February 23-24, 2011***

Chronology of Activities (cont'd)

- ***Presentations to peer community at major technical conferences: e.g. Global; PSAM; ESARDA, IAEA, ANS, INMM, etc.***
- ***2003-2010: Sub-group assignments of specialized topics***
- ***2003-2009: Example Sodium Fast Reactor (ESFR) Studies***
- ***2007: Initiated interactions with GIF System Steering Committees***
 - ***Joint report with SSCs near completion***
- ***2008: Initiated “Harmonization” activity with IAEA/INPRO***
- ***2011: Special Issue of ANS Journal on PR&PP Work***

PR&PP Methodology



Paradigm is consistent with standard approaches to safety assessment

Measures

Physical Protection

- **Adversary Success Probability**
- **Consequence**
- **Cost of Protection**

Proliferation Resistance

- **Technical Difficulty**
- **Detection Probability**
- **Material Type**
- **Proliferation Cost**
- **Proliferation Time**
- **Safeguards Cost**

Major Applications

- **Case Study (completed; EG review by 2010 April 30)**
 - Assessment of entire fuel-cycle for the Example Sodium Fast Reactor (ESFR)
 - Sub-groups analyzing different types of PR&PP threats
 - Purpose is to advance the methodology

<http://www.gen-4.org/Technology/horizontal/proliferation.htm>
- **Engagement with GIF SSCs (in progress)**
 - Began in mid 2007: introduce PR&PP into the six GIF designs
 - **Purpose:** Generate insights concerning design and operating features to enhance PR&PP performance of Gen IV systems
 - **Longer Term:** Establish beneficial PR&PP-related design and operation principles and practices
 - Three workshops (May 2008, July 2009, January 2010), attended by SSC representatives and industry observers
 - Products include PR&PP white papers for each system, developed jointly by SSCs and PR&PP WG members
 - Compendium report for public release (mid 2011), including chapter on cross-cutting issues (e.g. fuel cycle issues)

Knowledge Gaps

- ***Scenario Completeness***
 - ***Need to explore more fully***
 - ***Threats are stylized***
- ***Human Performance***
- ***Rolling up elements of an evaluation***
- ***Harmonizing Design Understanding with Potential Safeguards/Protection Possibilities***
- ***Conveying and Displaying Results: In particular, what we know about what we do not know***

Final Note

It is the insights gained from the disciplined process of performing evaluations that are of value, and not just the final results.

Seek benefits of PR&PP evaluations early in the design process, and revisit throughout.