A Coordinated Set of GIF/INPRO Proliferation Resistance and Safeguardability Assessment Tools

Status and Next Steps

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GIF/INPRO "Harmonization" - First Steps

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- September 2007: Boise, Idaho Global 2007, GIF/INPRO Harmonization Discussed
- December 2007: IAEA/NNSA plan for first conference call
- January 2008: Working Group established and path forward identified
- January 2008: One-page purpose and results paper developed
- February 2008: GIF/INPRO/IAEA Interface Meeting in Vienna

GIF/INPRO/IAEA Interface Meeting: Harmonization of PR&PP with INPRO

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Objective

- To identify areas of synergies and where the methodologies may complement one another
- To identify potential users of proliferation resistance assessment methodologies and their information needs
- To give guidance for interpretation of results, propose methods of presentation of results to users

Approach

- Discussions, conference calls, draft white papers among GIF/INPRO participants
- Meeting planned for May 8-9, 2008, IAEA

Overview of White Paper's proposed Table of Content

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1. Role of proliferation resistance (PR) in international nuclear energy development programs
2. Based on the definition of PR stated in the IAEA STR-332 and of their instantiation in PR&PP GIF and INPRO PR discuss goals of PR evaluations
3. GIF PR&PP INPRO PR Overview
4. Compare GIF and INPRO Approaches
5. Identify potential users of results of PR studies
6. Discuss the context in which the officials and authorities will function
7. Provide guidance for interpretation of results of both GIF and INPRO PR studies, and propose methods of presentation of results to users
8. Conclusions and plans for larger group meeting

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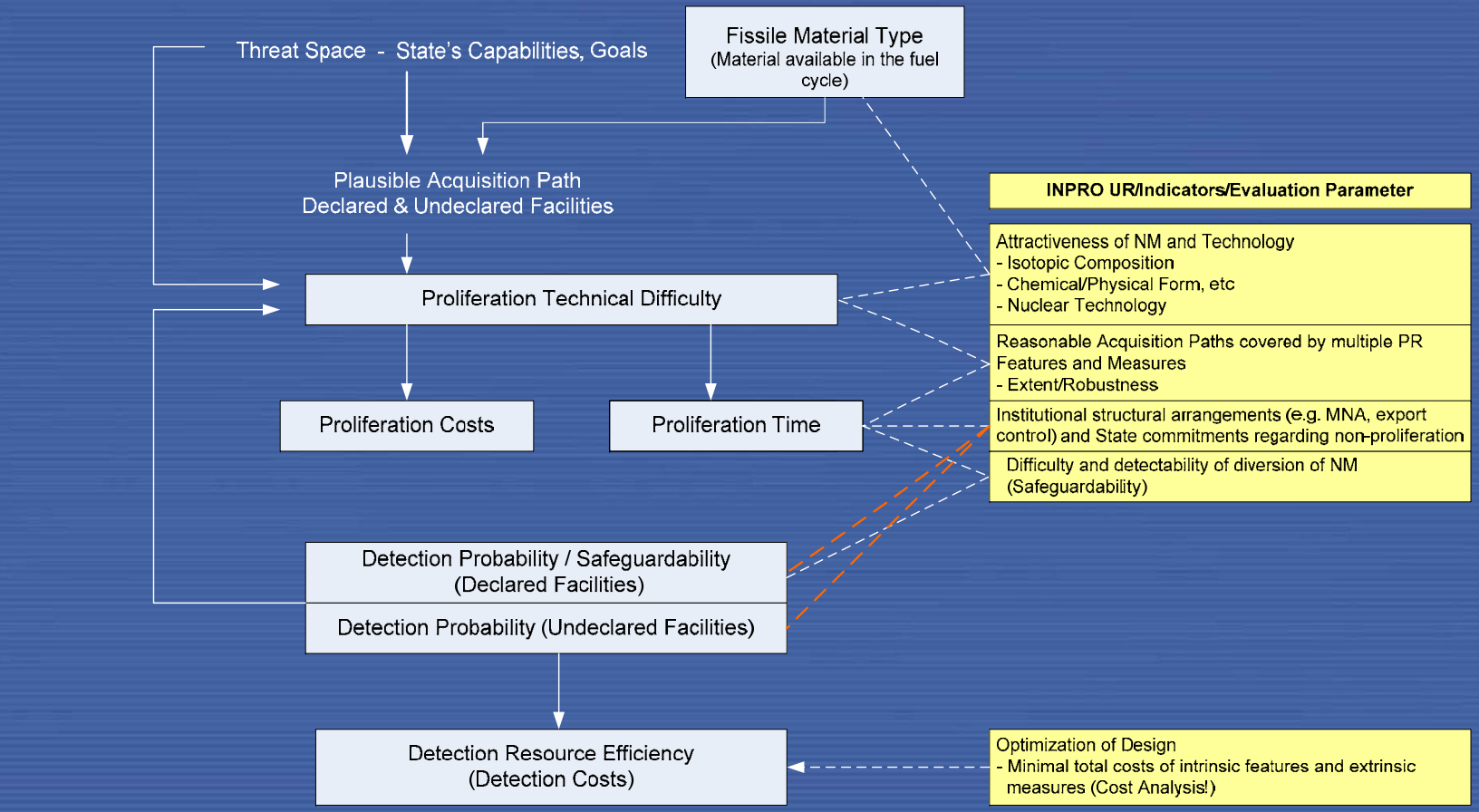
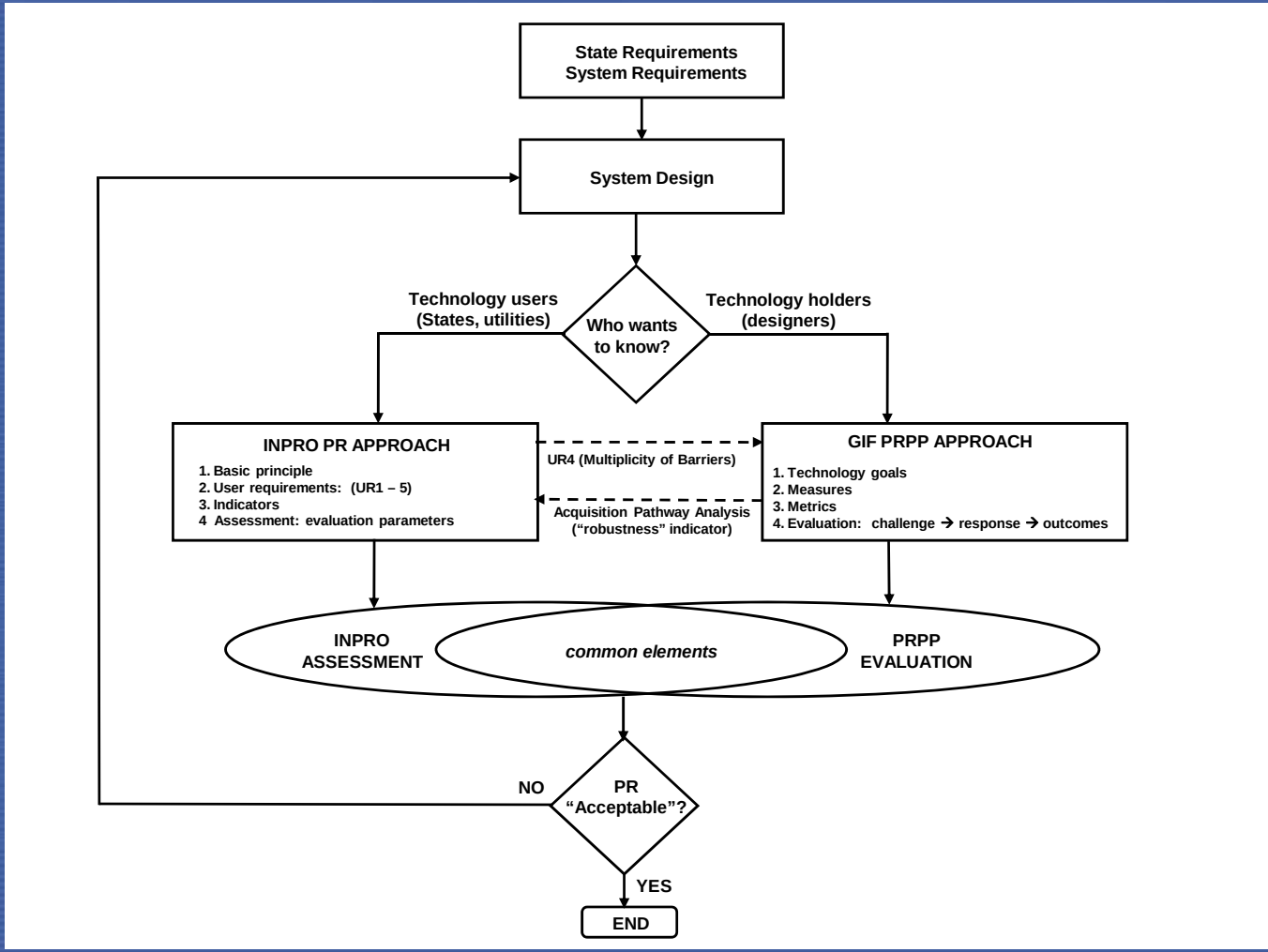
- March 2008: First version White Paper
- May 7-9, 2008: Working Group meeting in Vienna, to develop final draft
- June 2008: "APPROACHES TO EVALUATION OF PROLIFERATION RESISTANCE OF NUCLEAR ENERGY SYSTEMS"

  Paper presented at the 49th INMM Annual Meeting, Nashville, based on Draft White Paper

Dependencies of Measures in the GIF PR Evaluation Methodology and their Relation to INPRO User Requirements/Indicators



Interaction of INPRO and GIF PR evaluation approaches



Proliferation Resistance Related Questions

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- Does this NES utilize material or technology suitable for use in a nuclear weapons program?
- Does the design and operation of this NES provide information or develop skills related to sensitive technologies that could be used for a nuclear weapons program?
- How can the NES design be optimized to insure that its operation will minimize the development of skills or technologies that could be used in a nuclear weapons program
- Are appropriate international commitments (regulations, obligations, and policies) in place that will provide credible assurance that the NES will be used for peaceful purposes?
- Is the design of this NES such that it can be safeguarded effectively and efficiently in a safe and economic fashion, while ensuring early detection of diversion or misuse?
- How can the design and operation of this NES be optimized to ensure that it can be safeguarded effectively and efficiently in a safe and economic fashion, while ensuring early detection of diversion or misuse?

The INPRO Collaborative Project PRADA: PR Acquisition/Diversion Pathway Analysis

- **Goal of CP PRADA: Further development of the INPRO methodology for assessing proliferation resistance (PR) of nuclear energy systems.**
  - Development of methods for the identification and analysis of pathways for the acquisition of weapons-usable nuclear material.
  - Evaluation of the multiplicity and robustness of barriers against proliferation.

The INPRO Collaborative Project PRADA: PR Acquisition/Diversion Pathway Analysis

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In order to develop the appropriate methods to evaluate the multiplicity and robustness of proliferation barriers for INPRO, the GIF pathway concept has been applied to the DUPIC fuel cycle to identify and analyse the acquisition/diversion pathway for nuclear material.

The INPRO Collaborative Project PRADA: PR Acquisition/Diversion Pathway Analysis

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- **Achievements/Conclusions made:**
  - **The assessment should be performed at three levels, the State level, INS level, and facility level including facility specific pathways**
  - **The robustness of barriers against proliferation depends on the State capabilities and the relevance of barriers is not the same at the different levels of evaluation**
  - **The robustness of barriers is not a function of the number of barriers or of their individual characteristics but is an integrated function of the whole, and is measured by determining whether the safeguards goals can be met**

The INPRO Collaborative Project PRADA: PR Acquisition/Diversion Pathway Analysis

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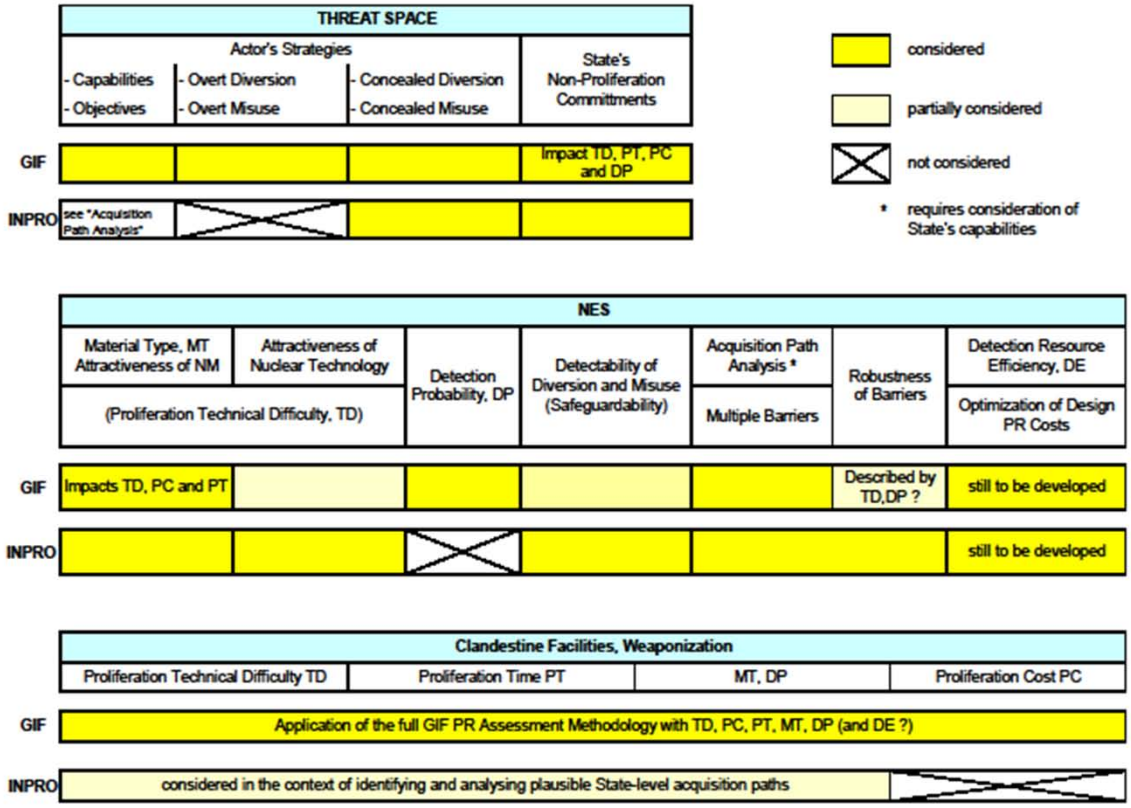
- **Achievements/Conclusions made:**
  - **The INPRO assessment methodology requires information regarding proliferation risks from more quantitative analyses performed jointly by technology developers (supplier), safeguards experts, and experts in proliferation resistance, and**
  - **The detailed application of the GIF pathway concept to the DUPIC fuel cycle to identify and analyze acquisition/diversion pathways for nuclear materials demonstrates the feasibility of merging the methodologies to form a holistic approach.**
- Report finalized for publication in November 2010.

Proliferation Resistance Assessment
GIF – INPRO Comparison



A Coordinated Set of GIF/INPRO PR and Safeguardability Assessment Tools – Next Steps

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a) INPRO Consultancy:

- Reach a consensus on the relationship between the GIF measures Material Type (MT) and Technical Difficulty (TD), and the INPRO Evaluation Parameter associated with UR-2 “Attractiveness of Nuclear Material and Technology”
- Explore the relative attractiveness of Nuclear Material for use in a weapons program (Material Type MT (GIF) / Material Quality (INPRO)) depending on State specific factors.
- Determine the relevant metrics/evaluation parameters describing material characteristics that make the handling of that material in the relevant fuel cycle facilities or in subsequent clandestine processing facilities more difficult (GIF TD). This includes the difficulty to establish subsequent clandestine processes or the number of process steps required to bring the material to a form that could be used in a nuclear weapon. This will require a State-level acquisition path analysis.

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Note:

If a given Member State is not a signatory of both the NPT and the additional protocol, then the IAEA is only able to conclude that, for this State, declared nuclear material remained in peaceful activities. For such a State an assessment is limited basically to the INS/facility level confirming that IAEA safeguards can be implemented effectively and efficiently.

Nevertheless, evaluation at the State level might provide useful information about Proliferation Time (PT).

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INPRO Consultancy, cont'd:

- Determine the relevant metrics/evaluation parameters from a greater set for INPRO UR-3 "Difficulty and Detectability of Diversion" and GIF DP - coarse pathway analysis.
- Describe the process of evaluating whether safeguards goals can be met. (e.g. "Facility Safeguardability Analysis In Support of Safeguards-by-Design", INL/EXT-10-18751)

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b) Revision of the INPRO Manual in the Area of Proliferation Resistance

The revision will include

- a better explanation of the rationale for Acceptance Limits,
- a reformatting of the evaluation tables to improve clarity, and
- a restructuring of the evaluation tables to provide needed details to the user.

The revision will reflect

- the set of barriers (metrics/indicators) that are in common for both methodologies,
- the different levels of assessment (State level, INS/NES level and facility level).
- The revision will describe the analysis methods to provide data needed by an INPRO assessor, and it will determine the relevance of barriers for each level of evaluation.

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c) Further explore/specify the set of structured proliferation resistance related questions to be used to provide a basis for providing the information needs of PR study users.
– **Consultancy, if necessary**
  - Determine, which element of the methodologies is most appropriate to answer the question.
  - Describe both methodologies as a “Coordinated Set of GIF/INPRO Proliferation Resistance and Safeguardability Assessment Tools”

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d) Test the validity of the refined methodologies and their usefulness by assessing/evaluating an NES with open fuel cycle in an emerging nuclear State. (estimated duration ca. 12-18 months)

e) Lessons learned: based on the results of Step d), agree upon a structured high-level presentation of PR assessment conclusions. - Consultancy

…Thank you for your attention