IAEA
International Atomic Energy Agency
Atoms for Peace and Development

INPRO activities on Proliferation Resistance

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   - TECDOC-1575 rev.1, vol.5 - concepts and application
4) Revision concept - INPRO Proliferation Resistance manual
   - Process and focus for revision of the manual
   - Improve clarity of term “Proliferation Resistance” (PR)

Overview of the 6 INPRO Areas of Assessment + Physical Protection

Areas and main messages in INPRO methodology edition 2008 (TECDOC-1575):

1) **Economics:** competitiveness against alternatives available (in the country)
2) **WM:** managing waste so that humans and environment are protected and undue burdens on future generations are avoided
3) **Infrastructure:** adequate infrastructure and effort to create / maintain it
4) **PR:** unattractiveness for a nuclear weapon program by combination of intrinsic features and extrinsic measures
5) **Environment:** impact of stressors must stay within performance envelope of current NES. Resources sufficient to run NES until end of 21 century
6) **Safety:** superiority against safety of existing plants. Large off-site releases should be prevented so that there is no need for evacuation

**** Physical Protection**: effective nuclear security regime*

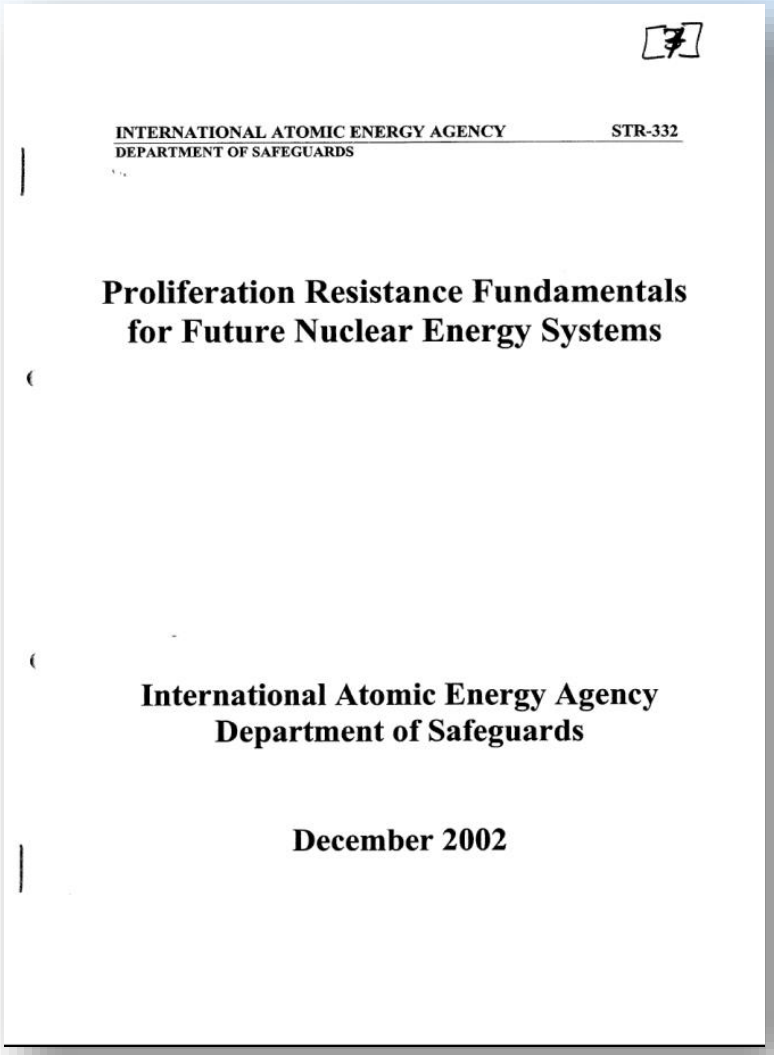
Formulation of the Basic Definition of Proliferation Resistance (PR)

Characteristic of a nuclear system that impedes diversion or undeclared production of nuclear material, or misuse of technology, by States in order to acquire nuclear weapons or other nuclear explosive devices

Derived at Meeting in Como, Italy

IAEA STR-332

December 2002



INTERNATIONAL ATOMIC ENERGY AGENCY STR-332
DEPARTMENT OF SAFEGUARDS

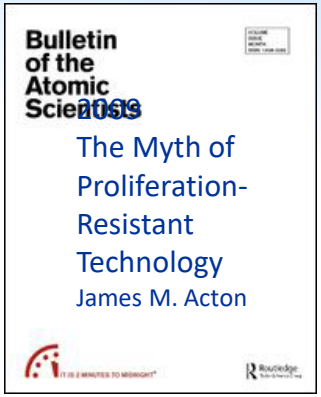
Proliferation Resistance Fundamentals for Future Nuclear Energy Systems

International Atomic Energy Agency
Department of Safeguards

December 2002

Opinions on PR and INPRO

- ***Research into new reactor technologies, including fast reactors, is being coordinated within two multilateral frameworks, the U.S.-led GIF and the IAEA led INPRO***
- ***Ideally, the IAEA would take the lead in this process and, indeed, it has been developing a methodology for assessing proliferation resistance within INPRO.***
- ***Given that the IAEA never criticizes states' fuel cycle choices, however, it's not clear whether it's capable of leading this effort effectively.***



INPRO Proliferation Resistance Manual 2008: INPRO PR Basic Principles

PR intrinsic features and extrinsic measures shall be implemented throughout the full life cycle for NESs to help ensure that NESs will continue to be an unattractive means to acquire fissile material for a nuclear weapons program

1) **Both intrinsic features / extrinsic measures are essential**

2) **Neither shall be considered sufficient by itself**

INPRO PR Manual 2008:
INPRO Five User Requirements (UR)

1) The **States' commitments,** obligations and policies regarding non-proliferation and its implementation should be adequate to fulfil international standards in the non-proliferation regime.

2) The **attractiveness of nuclear material and nuclear technology** in a NES for a nuclear weapons program should be low. This includes the attractiveness of undeclared nuclear material that could credibly be produced or processed in the NES.

3) The **diversion** of nuclear material (NM) should be reasonably **difficult and detectable**. Diversion includes the use of an innovative nuclear energy system (INS) facility for the production or processing of undeclared material.

4) Innovative nuclear energy systems should incorporate multiple **PR features and measures.**

5) The combination of intrinsic features and extrinsic measures, compatible with other design considerations, should be **optimized** (in the design/engineering phase) to provide cost-efficient proliferation resistance.

INPRO collaboration with GIF Proliferation Resistance & Physical Protection WG

- Harmonize characteristics of PR features and formulate measures and metrics for comparing the robustness of nuclear systems *against* proliferation

- Potential linkage between **Sustainability** and **PR**

  - **Sustainability of nuclear fuel resources impact choice**

    - *Nuclear Fuel Material*
    - *Fuel Cycle Depending on the Optimal Fuel Option*
    - *Used Fuel Management*
    - *Optimal + Available Fuel Supply Chain*

Conclusion

- **INPRO methodology in all assessment areas uses assessment method separated from the analysis of PR**
- **Two parallel activities currently ongoing in INPRO**
  - **PROSA** collaborative project (final report compilation and editing) – development / improvement / enhancement of INPRO PR analysis method– *Report in final stages in Printing Process*
  - Revision of the **INPRO Methodology Proliferation Resistance Manual** – INPRO PR assessment method development (links to analytical methods and concept of sustainable development) with the goals:
    - ❑ Make the assessment methodology simpler and easier to use
    - ❑ Allow for different users and depths of analysis as part of assessment
    - ❑ Demonstrate value of the refined assessment methodology to the users
- **The CM to revise the INPRO PR manual – Commenced 4Q 2020**
  - Contribution from global selection of subject area experts
  - Broader audience / expertise *gained* with the invited consultancy experts
  - Consensus on structure of PR Manual and utility of URs a main goal

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INPRO 2020 - Celebrated 20 Years 2021 - Planning for the Future

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IAEA Nuclear Energy

INPRO

INTERNATIONAL PROJECT ON INNOVATIVE NUCLEAR REACTORS AND FUEL CYCLES

INTERNATIONAL PROJECT ON INNOVATIVE NUCLEAR REACTORS AND FUEL CYCLES

- *Developing sustainable nuclear energy scenarios*
- *Investigating institutional and technical innovations*
- *Assessing the sustainability of nuclear energy systems*
- *Facilitating dialogue between technology holders and users*

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