Limiting Future Proliferation and Security Risks

Robert A. Bari

Brookhaven National Laboratory

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A major new technical tool for evaluation of proliferation and security risks has emerged over the past decade as part the activities of the Generation IV International Forum (GIF). The tool has been developed by a consensus group from participating countries and organizations and is termed the Proliferation Resistance and Physical Protection (PR&PP) Evaluation Methodology. For a given nuclear energy system, the methodology defines a set of challenges, analyzes system response to these challenges, and assesses outcomes. The challenges are the threats posed by potential actors (proliferant states or sub-national adversaries). It is of paramount importance in an evaluation to establish the objectives, capabilities, resources, and strategies of the adversary as well as the design and protection contexts. Technical and institutional characteristics are both used to evaluate the response of the system and to determine its resistance against proliferation threats and robustness against sabotage and terrorism threats. The outcomes of the system response are expressed in terms of a set of measures, which thereby define the PR&PP characteristics of the system.

The PR&PP evaluation methodology was initially motivated by the need to have an approach to the assessment of new nuclear energy design concepts that were envisioned within the GIF program. The methodology that has been developed now enjoys wide international consensus and has been used in applications beyond the initial purpose. Subsequent applications of the methodology could: 1) lead to refinement of the approach which would streamline and focus it to address issues of interest to end-users and 2) extend it to a more diverse set of issues that will enhance decision making in the PR&PP arenas.

These include: guiding future global fuel cycle architectures, supporting safeguards by design, enabling future nuclear energy system designs, and informing decisions with regard to external oversight and export controls. The results are intended for three types of users: system designers, program policy makers, and external stakeholders. Program policy makers will be more likely to be interested in the high-level measures that discriminate among choices, while system designers and safeguards experts will be more interested in measures that that more directly relate to the optimization of the system design. More generally, PR&PP analyses should be part of a broader integrated systems analysis taking into account performance, cost, safety, waste management, and existing infrastructure.

Risk-informing in the sense that it is done in safety is not yet possible for PR&PP. Safety has had over thirty-five years of experience with risk assessment approaches, including very active participation by the owners/operators of facilities. Moreover, PR&PP evaluations involve deliberate challenges and this makes the approach to completeness of scenarios and the quantification of initiating events much more difficult. Lastly, the PR&PP arena has not yet had a major risk study of the type performed for safety (WASH-1400 and many follow-on studies).