[SE8-CV-2] Nuclear Safeguards System

Lance Kim
University of California, Berkeley

Full Summary

Nuclear safeguards guarding against the diversion of fissile materials remain an essential component of global nuclear governance. While often neglected in bigger picture discussions, safeguards have received renewed attention as a part of a comprehensive global response to the Fukushima event. The system of nuclear safeguards administered by the International Atomic Energy Agency (IAEA) in cooperation with member states has evolved since its inception to improve efficacy and efficiency in response to global and regional challenges. After operating for decades with relatively minimal difficulties, several challenges to the quantitative classical safeguards approach verifying the correctness of a state's declaration emerged following the discovery of the clandestine Iraqi nuclear weapons program, the North Korean weapons program, the collapse of the Soviet Union, and the South African weapons program. Today, the safeguards regime faces additional challenges arising from the expansion of nuclear energy programs, the legitimate and clandestine acquisition of nuclear fuel cycle technology, the development of new nuclear fuel cycle technologies, and the possibility of new verification missions on the horizon (e.g. Fissile Material Cutoff Treaty, nuclear weapons disarmament).

The Nonproliferation Treaty (NPT) and IAEA statute established the legal basis to safeguard declared nuclear material. Historically, the independent verification of states' declarations of nuclear activities was largely based on nuclear material accountancy (NMA) with containment and surveillance (C/S) as complementary measures. Independent verification of a state's declaration furnished by the member state's State System of Accountability and Control (SSAC) largely focused on establishing "correctness" primarily via NMA to provide quantitative estimates of Materials Unaccounted For (MUF). As a complementary measure, C/S technologies reduce inspection costs and the intrusion on facility operations by maintaining continuity of knowledge. Following the revelation of the clandestine Iraqi nuclear weapons program, the weaknesses in the classical safeguards approach became apparent and an international consensus emerged to strengthen the safeguards system to assess the completeness of a state's declaration in addition to correctness. With the adoption of the Additional Protocol (AP) by the IAEA Board of Governors (BOG), classical safeguards began evolving towards a system of integrated, more information driven safeguards

combining state declarations on a broader range of nuclear fuel cycle activities, open sources of information, and additional inspection powers and technologies (e.g. complementary access, satellite imagery, environmental sampling, laser-based design information verification, etc.) to inform conclusions on the absence of undeclared nuclear activities within a state.

Integrated, information driven safeguards are thought to improve both the efficacy and efficiency of nuclear safeguards by better allocating scarce safeguards resources. However, some inconsistencies and confusion in implementation remain unresolved. Significant overall cost savings are also unclear as spending has increased for information collection and analysis. Furthermore, much of the safeguards burden has reportedly shifted from the IAEA to the SSACs of member states. Though reductions in IAEA inspection efforts have been achieved, particularly at more easily safeguarded item counting facilities, the workload on SSAC's appears to have increased in the Republic of Korea. Further improvements in safeguards efficacy and efficiency may be attainable through risk-informed resource allocation based on the Proliferation Resistance and Physical Protection (PR&PP) methodology. Additional funding mechanisms, possibly based on a nuclear fuel use tax, may further strengthen nuclear safeguards by providing additional resources.

Regional safeguards arrangements can add further value to international safeguards with appropriate care to avoid duplicated efforts. Fukushima has highlighted the regional and global repercussions of a major accident, possibly opening a widow of opportunity and the momentum to promote regional cooperation on nuclear issues. Proposals to resurrect the ASIATOM concept as the Asian equivalent of EURATOM can start with practical steps to strengthening national safeguards authorities through collaborative training activities. Modeled after existing regional arrangements such as European Atomic Energy Community (EURATOM) and the Brazilian-Argentine Agency for Accounting and Control of Nuclear Matierials (ABAAC), new regional arrangements amongst states may serve as additional confidence building measures by building stronger partnerships, improving transparency, and sharing best practices.

In addition to international and regional safeguards, the nonproliferation regime benefits from a system of export controls (e.g. Nuclear Supplier Group (NSG), corporate restraints on technology transfer), the structure and conditions of nuclear cooperation agreements (e.g. 123 Agreements), commitments to physical security against non-state actors (e.g. UNSCR 1540), nuclear weapons free zones, and the Proliferation Security Initiative. Several proposed conditions of supply that restrain a state's freedom of action require negotiating the "haves vs. have-nots" tension in the NPT and possibly some form of compensation. Some states, such as the United Arab Emirates, have been willing to accept extensive constraints on their nuclear energy activities (e.g. forgoing sensitive fuel cycle technologies, cradle to grave supply

assurances). However, the conditions of this "gold standard" agreement may be too onerous for others limiting the broad acceptability of a universal approach to nuclear supply.