

Nuclear Weapons Proliferation and the Civilian Nuclear Fuel Cycle: Understanding and Reducing the Risks

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Abstract:

Although the civilian nuclear fuel cycle is not the ideal or preferred path for a proliferant state pursuing nuclear weapons, it nevertheless provides a potential source of material, technology, and equipment that can be exploited for use in nuclear weapons development; and therefore, it must be protected against diversion, misuse, and theft.

In this study, the civilian nuclear fuel cycle will be summarized and examined for its potential vulnerabilities to abuse for the purposes of developing nuclear weapons. In doing so, similarities and differences between the nuclear fuel cycle and the processes needed to produce nuclear weapons will be explored. The efforts of the nuclear nonproliferation regime to reduce the risks of nuclear proliferation will be examined, with particular focus on the role of international safeguards to account for and control the use of nuclear materials, and thus verify that nuclear material remains within the civil nuclear fuel cycle. Such verification provides assurances to the international community that countries are honoring their treaty commitments to use nuclear materials and facilities exclusively for peaceful purposes. The major characteristics of the materials subject to safeguards will be reviewed. Some of the equipment used to assay nuclear materials will be introduced, along with an explanation of the technical approach for safeguards, comprising material balance areas and complemented by containment and surveillance. The legal and policy context for international nuclear safeguards and the major international organizations for nuclear material safeguards will be summarized. Finally, the implementation of traditional safeguards will be discussed along with important, evolutionary improvements to safeguards that resulted from challenges to the international safeguards regime.