

1. Introduction

In December 1993 the United Nations General Assembly produced a consensus resolution containing a call for a non-discriminatory, multilateral and effectively verifiable treaty on the production or cut-off of fissile ^[1] materials for nuclear weapons and for nuclear explosive devices used for non-military purposes. Proposals for the cut-off of fissile material production have, in some form, been on the international arms-control agenda since just after the use of nuclear weapons against Japan in 1945, but have never been implemented into a treaty.

A number of contributing geopolitical realities have now made the prospect of a cut-off treaty a serious option as an arms control measure. Among these realities are concerns over a repeat of the nuclear weapons program similar to that of Iraq, in North Korea and elsewhere. The security of the stockpiles of fissile material in the new states of the former USSR and the existence of excessive stockpiles of fissile material already produced by the major nuclear weapons states are also current concerns.

This report is intended to provide background research material to be used in preparation for discussions on a cut-off agreement. To provide insights into these verification aspects a systematic fissile material diversion threat/risk analysis is presented. This provides a global perspective by documenting all credible material diversion threats from facility types and other acquisition sources. From these threat paths an assessment is then made of the overall risk, to final weapon-grade material production, posed by a given type of diversion. Specific verification techniques are then systematically identified from the various diversion path signatures documented in the analysis tables. The verification techniques appropriate to the highest diversion risks can then be identified.

2. Objectives

This report comprises:

- (a) A bibliography of the unclassified literature on fissile material cut-off and verification aspects, together with a content summary of the more recent references, judged to be the most relevant and informative on the subject.
- (b) A summary of the history of various cut-off initiatives with associated references.
- (c) A threat/risk assessment, systematically listing the potential generic diversion paths of fissile material from the following:
 - known nuclear weapons facilities, dedicated to fissile material production for nuclear weapons,
 - civilian facilities that produce weapons-grade material for non-nuclear weapons purposes and civilian nuclear fuel-cycle facilities that could produce weapons grade material if desired, or facilities specifically designed for a dual-use purpose, and
 - clandestine nuclear weapons facilities and fissile material acquired clandestinely.

[1] Fissile isotopes are defined as those that can sustain a fission chain reaction with fast neutrons.