6. Relevance of Tritium to a Cut-off Agreement

The developed nuclear weapons states use tritium to boost the yield of their fission weapons and the fission triggers of their thermonuclear weapons. The efficiency and compactness of advanced nuclear weapons is achieved with the use of this isotope. Tritium is not, however, included as a nuclear material under the proposed cut-off treaty, so the potential relevance and implications of tritium cut-off are not part of this report. Tritium decays with a 12-year half-life, so if tritium replacement in weapons was cut-off, the number of weapons using it would necessarily be reduced in about a decade by about 50%. The fissile isotopes discussed in this report, by contrast, have half-lifes of thousands of years, which ensures that once adequate stockpiles are available, further production is unnecessary for replenishment. Plutonium weapons do periodically need reprocessing and rework to remove some undesirable radioactive-decay product buildup [Bib. ref (v)], but most of the material remains usable.

The radioactive decay of tritium is sometimes referred to as the tritium factor because of its important potential for reducing nuclear weapon stockpiles. Specific references discussing the implications of a tritium cut-off are provided in the following Bibliography references: [Lanouette W., 1989, Mark J.C., 1988; Wilkie T., 1984 and Epstein W., 1980].

7. Conclusions

7.1 General Comments

On the basis of this preliminary analysis, a verification package for a cut-off agreement would focus particular attention upon the dominant risks summarized in the sections below. As noted in Section 5.1 verification strategy should not be limited, however, to dominant risks, but should be broad in scope, in particular for potential undeclared-facility diversions. This would ensure that verification that focuses on high risk diversion paths does not result in encouraging the use of other paths, not selected for verification. The dynamic nature of an analysis of this type should be recognized, in view of ongoing technical and political changes. Verification methods for undeclared facility types are not currently part of the IAEA safeguards system but recent work at the IAEA is now putting into place a program to strengthen safeguards by developing undeclared-facility verification methods. These methods would primarily use technical means, including various types of intelligence information which, when detection confidence is high, combined with special inspections should provide confirmation of an undeclared facility purpose. In particular, methods to identify the potential existence of undeclared gas centrifuge, electromagnetic, thermal diffusion and aerodynamic U-235 enrichment facilities should be developed.

A cut-off agreement should have sufficient flexibility to be able to implement verification methods for material acquisition that are being, or may be, developed for potential future production. This would mean that the existing safeguards systems for declared facilities, of routine inspections verifying materials accounting, containment and in situ surveillance, should be under continual development.

Front-end fissile material diversion paths (e.g., acquisition of natural uranium ore from undeclared sources) should also receive attention, with a broad scope verification regime. This is because potential timeliness advantages may be gained from diversion identification at an early stage, despite the relatively low importance assigned to an anomaly in this type of facility.

Synergies between verification methods which could optimize verification cost and verification effectiveness are not accounted for. The analysis method presented could be readily adapted to provide this type of more detailed information.