

ABSTRACT

Under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the International Atomic Energy Agency (IAEA) has responsibility for implementing safeguards. The mandate of the IAEA includes the inspection of declared facilities in non-nuclear-weapon states to confirm equipment and procedures and to verify self-reported data. As well, the IAEA's charge includes the detection of undeclared facilities and activities within these states. Recently, both the effectiveness and the costs of safeguards have received much increased attention: Experience in Iraq has demonstrated that safeguards against undeclared nuclear weapons development programs need to be strengthened, yet at the same time concern has increased about the rising costs of safeguards programs.

These fundamental problems are addressed in this report. Its objective is to present an assessment of current and potential levels of cost-effectiveness of inspections of nuclear materials and activities, and to suggest avenues for improvement. A specific framework demonstrating what determines required levels of inspection effectiveness is provided. With the help of the mathematical tools of Decision Theory and Game Theory, models are analyzed representing states' decisions to comply with or violate the NPT, and, if violation is chosen, where to violate. The models also include the IAEA's decisions of where and how much to inspect.

We hope that our analysis will focus the attention of policy makers on the crucial determinants of cost-effectiveness for NPT safeguards programs. Our study is timely in view of the impending NPT Extension Conference. But its ultimate goal is to contribute toward increases in effectiveness for all forms of arms control.