

explosive device. Guarding against this possibility requires effective verification.

It is only reasonable that countries that sign an arms control agreement want some means of determining whether or not other countries are abiding by their commitments. In the case of nuclear non-proliferation, in particular the NPT, this job is primarily undertaken by the Vienna-based International Atomic Energy Agency (IAEA) through its system of nuclear safeguards. Safeguards are procedures — such as on-site inspections, audits and inventory controls — designed to provide assurance that nuclear material intended for peaceful activities is not diverted to military purposes.

Background

The IAEA was founded in 1957 with a two-fold mandate: to promote the benefits of nuclear energy and to establish a system of international safeguards. The first IAEA safeguards system was introduced in 1961, covering small electric power reactors of up to 100-megawatts capacity. In 1965, a revised system covering all reactors was introduced and in 1966 it was extended to include nuclear fuel reprocessing plants. Provisions covering conversion and fabrication plants were added in 1968. As the IAEA system developed, many nuclear suppliers and recipients gradually transferred to the Agency responsibility for verifying the peaceful uses commitment under their bilateral nuclear cooperation agreements.

Under the NPT, which came into force on March 5, 1970, States Parties that do not possess nuclear weapons — including Canada — are required to conclude an agreement with the IAEA for the application of safeguards to all nuclear material in all peaceful nuclear activities. The IAEA drew up a model NPT safeguards agreement which was approved by the Agency's Board of Governors before the end of 1970. Agreements based on this model are now applied in over 100 countries, including most of those having significant nuclear activities.

As one of the world's earliest nuclear suppliers, Canada was deeply involved in the process of developing the IAEA and its safeguards system. Canada concluded an NPT safeguards agreement with the IAEA in February 1972, at which time inspection of Canadian facilities commenced. Since 1976, Canada has required

all countries with which it engages in nuclear trade (except the nuclear-weapon states) to have either:

- ratified the NPT, and thereby accepted NPT safeguards on all their present and future nuclear activities; or
- made an equally binding commitment to non-proliferation by accepting NPT-type full-scope safeguards — that is, safeguards on the *entire* nuclear program in each country, not just on those aspects in which Canadian materials would be used.

Canada's domestic and international safeguards commitments are administered by the Atomic Energy Control Board.

How Safeguards Work

The main political objectives of safeguards are to:

- gain assurance that countries are complying with their non-proliferation and other peaceful use undertakings; and
- deter the diversion of safeguarded nuclear materials to the production of nuclear explosives, and the misuse of safeguarded facilities to produce unsafe-guarded nuclear material.

To achieve these political objectives, the IAEA has set itself the technical objective of the “timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by risk of early detection.” The “significant quantities” of nuclear material used as the IAEA's detection targets are 8 kg of plutonium or 25 kg of highly enriched uranium. These are the amounts required to manufacture a nuclear explosive device. “Timely detection” refers to the time required to convert diverted material into components for an explosive device.

To meet this technical objective, the IAEA has established a process for verifying the continued presence of nuclear material placed under safeguards. The process consists of comparing the accuracy of reports and other information provided by a country against independent, objective information collected by IAEA inspectors and from containment and surveillance equipment, such as cameras and seals, installed by the IAEA at the country's nuclear facilities. To date, the IAEA has never concluded that material under safeguards has been diverted.

Problems with Safeguards

The IAEA safeguards system has several limitations. Most of these have been a focus of international attention ever since it was discovered that Iraq — an NPT signatory — managed to conduct a clandestine nuclear program despite IAEA safeguards.

First, key installations in countries of proliferation concern are not under the IAEA system. A number of these countries have not signed the NPT, and some that have signed the Treaty have not concluded the required safeguards agreement.

Second, the Agency's definition of “significant quantities” may be too large. Iraq's hidden production was at the gram level. In addition, measurement techniques are not sufficiently accurate to keep complete track of nuclear materials in bulk form (i.e., as powders, liquids or gases). This makes it theoretically possible for a country to divert a small percentage of material for military purposes without detection, since this could appear to be a normal operating discrepancy. The problem is especially dangerous at fuel fabrication, reprocessing and enrichment plants.

Third, although the IAEA has the right to conduct “special inspections” of undeclared sites, it has — until recently — limited itself to regular inspections of declared facilities. Low IAEA budgets and human resources have also meant that far fewer inspections are conducted than are needed to fully meet the IAEA's safeguards objectives. Although the IAEA is responsible for monitoring over 900 installations in over 50 countries, some 70 percent of the safeguards budget is spent on just three countries — Canada, Germany and Japan; these have numerous safeguarded installations but are not of proliferation concern. Other problems include the fact that it is almost impossible for Agency inspectors to make unannounced visits to safeguarded installations. States are also permitted to reject particular IAEA inspectors.

In view of the Iraqi experience, steps are being taken to strengthen the safeguards system. Canada is pushing the process (see pp. 4-5). However, even if IAEA safeguards functioned perfectly, their usefulness might still be limited when applied to highly enriched uranium and plutonium, materials directly usable for nuclear weapons. Even if the IAEA reacted instantaneously to diversion, the