

International Management of Uranium Enrichment

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Abstract

Concerns have been raised regarding both the adequacy of current Atomic Energy Agency (IAEA) safeguards for meeting the objective of timely detection of a potential diversion of materials or technology from uranium enrichment plants, and the breakout scenario, where a country withdraws from the Nuclear Nonproliferation Treaty (NPT) and its IAEA safeguards agreements, and then uses its enrichment technology to provide fissile materials for the manufacture of nuclear weapons. Moreover, the current application of IAEA safeguards discriminates between weapon-states and non-weapon states. To address these concerns the authors propose an improved uranium enrichment safeguards and licensing structure that insures universal, non-discriminatory application of safeguards, physical security, inspection, and operating license requirements, while preserving the current commercial enrichment service structure.

Introduction

There is concern regarding the adequacy of IAEA safeguards for meeting the fundamental standard of ensuring “timely warning” of the diversion from modern uranium enrichment plants of nuclear materials in peaceful use, which requires that the interval between the diversion of safeguarded material and its detection by the IAEA be sufficiently brief that appropriate measures can be taken to prevent the government or organization concerned from converting this material into a nuclear explosive device. In the case of highly-enriched uranium product in hexafluoride form, the required conversion time is very short.

It is also the case that the current safeguards arrangements for these facilities present no significant obstacle, in the event of a nation’s decision to withdraw from the NPT and its IAEA safeguards agreements, to the subsequent use of the enrichment technology to provide fissile materials for the manufacture of nuclear weapons. It appears unlikely that these problems can be resolved satisfactorily without implementing some form of internationalization of uranium enrichment. Several different proposals have been made along these lines, including proposals by the Russian, German and Saudi Arabian

governments.¹ Below we propose a structure, similar in some respects to the German proposal, for such an international arrangement designed to radically improve the international community's ability to ensure the peaceful use of uranium enrichment plants and related facilities, while making it more difficult and politically costly for states to misuse the technology. Our proposal is designed to apply universally without discriminating between nuclear weapon states and non-weapon states. It also attempts to preserve the existing commercial structure for providing enrichment services without placing onerous or undue restrictions on commercial firms that provide enrichment services.

IAEA Additional Protocol on Enrichment

Our proposal requires an "Additional Protocol on Isotope Separation and Enrichment" to existing safeguards agreements between the IAEA and all State-members of the IAEA having such facilities or planning to acquire them. Under such agreements the States would agree to the arrangements set forth below. States that do not agree to this new Additional Protocol, as well as the existing Additional Protocol that provides for IAEA inspections of undeclared sites, would not be supplied enrichment services, equipment, or feed material by States that have agreed to these protocols.

Considerations under the Additional Enrichment Protocol

There are several considerations that need to be addressed under the new enrichment management structure:

- International control and management
- Territorial sovereignty
- Facility ownership and operations
- Customer supply
- Component manufacturing and supply
- Safeguards
- Physical security
- Health, Safety and waste management

International Control and Management Structure

Under our proposal the IAEA would establish an "International Nuclear Fuel Agency" (INFA). INFA would report to the IAEA Board of Governors. The IAEA Board of Governors would appoint the Board of Directors of the INFA and establish their terms of service. The Board of INFA would appoint the senior officers of INFA. The INFA would provide managerial-level governance over all uranium enrichment activities, including those not covered under existing IAEA safeguards. INFA's purview would apply equally to weapons and non-weapons states. INFA would enter into an INFA-State "Lease

¹ See, for example, the proposal by the German government to the IAEA at: <http://www.auswaertiges-amt.de/diplo/en/Aussenpolitik/Themen/Abbruestung/Nukleares/MESP-Ueberblick.html>

Agreement and Management Contract” with each state currently hosting, or planning to host uranium enrichment facilities, for the purpose of establishing extra-territorial rights, physical security and other arrangements outlined below. INFA would establish a schedule of tariffs on enrichment services sufficient to cover the full cost of its operations. Since the SWU-cost represents a small fraction of the levelized, fully-amortized cost of nuclear generated electricity, these tariffs would not adversely affect the economic viability of nuclear power.

Territorial Sovereignty

The INFA would lease enrichment sites under long-term agreements with the host-nations. The INFA-State Lease Agreements would confer on INFA for a defined period (e.g., 50-99 years) extra-territorial leasehold rights over all sites where uranium enrichment takes place or where new uranium facilities are under construction.² The INFA’s extra-territorial leasehold rights would remain in force even if the State chose to withdraw from the Nonproliferation Treaty (NPT) or its safeguards agreement with the IAEA.

No state or commercial entity would be permitted to construct or operate a uranium enrichment facility except at sites where the INFA had such extra-territorial rights and where enrichment activities were under INFA’s territorial jurisdiction. States would in effect relinquish sovereignty over the site for the period of construction, operation and decommissioning of the enrichment facility.

The INFA, with the concurrence of the host state’s nuclear regulatory authorities, would approve and license all existing and new uranium enrichment facilities. The licenses would set forth requirements related to ownership, operations, safeguards, physical security, health and safety in much the same way that state regulatory agencies license nuclear facilities. The license would specify: limits on enrichment level, e.g., prohibiting U-235 concentrations equal to or greater than 20 percent; limits on plant capacity; and limits on inventories of feed materials and enriched product stored at the site.

Facility Ownership and Operations

Capital assets at the enrichment sites would be owned by commercial entities, including State-owned commercial enterprises. The company or companies responsible for operating enrichment facilities must be approved and licensed by INFA. Similarly, new enrichment facilities would be built and operated by commercial entities.

The INFA at its sole discretion would have the authority to shut down any licensed facility and seize control of the materials, equipment, records and other assets at any enrichment site in the event that the INFA believed there was an existing breach, or an imminent threat to breach, any of the conditions set forth in the INFA-State Agreement or facility license.

² This would be similar to the Multilateral Enrichment Sanctuary (MES) under the German proposal. See, <http://www.auswaertiges-amt.de/diplo/de/Aussenpolitik/Themen/Abruestung/Downloads/MESP-Sitzstaatsabkommen.pdf>

Customer Supply

Customers would order enrichment services from enrichment facility operators, much as they do today. INFA would have the responsibility and obligation to insure that all customers who are in compliance with IAEA safeguards have an available source of enrichment supply. INFA would have the standby authority, to be used as necessary in the event of a breakdown in commercial supply arrangements, to direct one or more enrichment facility operators to provide enrichment services to customers to insure an adequate supply of enrichment services.

Component Manufacturing, Testing and Supply

The INFA would maintain a list of sensitive uranium enrichment components and materials. Only manufacturers with a valid license from the INFA would be permitted to produce such components. The INFA would approve the location and license existing and new facilities that manufacture and test sensitive uranium enrichment components. Manufacturing and testing such components without a valid INFA license would represent a serious breach of a country's IAEA safeguards obligations and a crime under international law. Brokerage and resale of such components by third parties would be prohibited. All purchase orders for sensitive enrichment components would be placed through INFA, and all shipping and delivery would be handled by a small number of INFA-licensed shippers and be routed directly from the factory to the customer's plant, without transshipment or intermediaries. Each unit in a batch of sensitive components would be assigned a unique and difficult-to replicate "tag" indicating its date and location of production and its status as an INFA-licensed product. Products not bearing this tag could not be used in an INFA licensed facility.

Safeguards

The IAEA would retain responsibility for establishing safeguards requirements, conducting safeguards inspections and enforcing the terms of safeguards agreements. The IAEA would prepare an IAEA-INFA Agreement. This agreement would set forth the steps that INFA must take in the event that the IAEA finds that any State or INFA licensed facility is not in compliance with an IAEA-State safeguards agreements or facility license, including INFA's authority and obligation to shut down any enrichment facility found to be in non-compliance with any safeguards agreement with the IAEA, and to take operational control of materials and or equipment at the site.

The IAEA-INFA Agreement would provide the IAEA with unimpeded access to the site for the purpose of monitoring and enforcing IAEA safeguards, and provide the IAEA with the authority to establish independent monitoring of materials, equipment and personnel entering and leaving the site.

Physical Security

The host nation would provide for physical security under its INFA-State Agreement. INFA, however, would have ultimate responsibility for insuring the physical security of each site. If at any time it is not satisfied with the physical security arrangements provided by the host nation, or in the event of a breach of the INFA-State Agreement or facility license, then the INFA at its sole discretion could supplement, replace or take

command of the security forces at the site. A provision of INFA's agreement with the IAEA would obligate the IAEA and its member states to maintain a cadre of trained security personnel to perform this supplemental security mission wherever and whenever the need arises to bolster security at an INFA site.

Health, Safety and Waste Management

INFA would be responsible for establishing baseline international health, safety, environmental and waste management and disposal criteria and requirements, and enforce these standards at the site. Host nations would retain the discretion to establish more (but not less) protective health, safety, environmental and waste management standards, and the right to enforce enrichment facility compliance with these more protective standards.

Conclusion

We propose a modification to IAEA safeguards requirements for uranium enrichment activities that would be universally applied and non-discriminatory. The heart of this proposal is that the IAEA would establish a new "International Nuclear Fuel Agency" (INFA) to license uranium enrichment activities. The role of the IAEA would not be diminished, as it would continue to be responsible for establishing safeguards requirements and conducting safeguards inspections. The INFA would provide managerial-level governance over all uranium enrichment activities, including those not covered under existing IAEA safeguards. INFA's purview would apply equally to weapons and non-weapons states.

States would grant INFA extra-territorial rights at all sites where uranium enrichment activities are conducted, similar in some respects to rights of governments to maintain and secure their embassies in other countries. No enrichment activities could be conducted other than at INFA sites. In our view granting these extra-territorial rights to INFA would increase considerably the political and other costs should a host country contemplate unlawfully removing INFA and taking over the site. Likewise, accepting INFA jurisdiction and management would send a strong signal to the international community that a host country does not view its acquisition of nuclear fuel cycle facilities as a nuclear security hedge for later incorporation into a nuclear deterrent capability.

If this proposal were to be adopted, it should have minimal impact on current commercial aspects of supplying enrichment services. No significant changes in operations are imposed upon commercial enrichment suppliers beyond additional licensing requirements imposed by INFA. The granting of extra-territorial rights to INFA could be done in such a manner as to have no significant economic impact on the commercial enrichment firms. For example, USEC, Inc., a commercial supplier of uranium enrichment services, currently conducts enrichment activities on land owned by the U.S. government. It could just as easily operate with INFA having extra-territorial real property rights. We conclude by noting that the INFA model could be extended beyond enrichment plants, and applied to all sensitive nuclear fuel cycle facilities.

Please provide comments on this proposal to:

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