Building blocks of the future fissile material (cut-off) treaty

Pavel Podvig
UN Institute for Disarmament Research

UN First Committee Side Event
United Nations, New York
20 October 2016
Issues to consider

- Key elements of the treaty
- Verifiable declarations of existing stocks
- Disparities in a non-discriminatory treaty
- Materials are at unidir.org
KEY ELEMENTS OF THE TREATY
Recent developments

- Work of the Group of Governmental Experts
  - Views submitted by States
  - GGE deliberations and final report

- Draft treaty submitted by France

- Earlier drafts (International Panel on Fissile Materials and others), expert discussions
Some FM(C)T questions

- Definitions
  - Fissile material
  - Production, production facilities

- Verification
  - Focused vs. comprehensive approach

- Scope
  - New material vs. existing stocks
  - Civilian and military material
  - Excess and disarmament material
Key elements of the treaty

- **Facility verification**
  - Production facilities
  - Detection of undeclared activity
- **Downstream verification**
  - Non-weapon use
  - Nuclear weapons

Fissile material
Non-proscribed military activity

- Naval reactors
- Military research reactors and critical assemblies
Verification at production facilities

- Production facility is a facility that produces fissile materials

- Possible exemptions
  - Facilities “not capable of producing” fissile materials?
  - Laboratory-scale facilities
  - Decommissioned and dismantled

- Facility-specific level of verification
Detection of undeclared production

- Special inspections
- Environmental sampling
- Additional Protocol-type measures
  - High confidence in the absence of undeclared production may require rather intrusive “upstream” verification, up to uranium mining
Definitions of fissile material

- **Nuclear material (Article XX of the IAEA Statute)**
  - All enriched uranium
  - All plutonium, separated or not

- **Unirradiated direct-use material**
  - Highly-enriched uranium (more than 20% U-235)
  - Separated plutonium

- **Weapon-grade material**
  - 90% HEU
  - Plutonium with 90-95% Pu-239

- **Intermediate-grade**
  - ~40-50% HEU
  - Plutonium with ~60% Pu-239
Facility verification

Production facilities

Fissile material

Non-weapon use

Downstream verification

Detection of undeclared activity

Excess and disarmament material

Nuclear weapons

FM(C)T and disarmament
DECLARATIONS OF EXISTING STOCKS
FM(C)T and existing stocks

- Shannon report:
  - The mandate “does not preclude any delegation from raising ... any of the above noted issues” – i.e. past production or management of materials

- States’ view on FM(C)T (2013):
  - **Mexico**: “The treaty negotiations should be part of a broad and comprehensive nuclear disarmament and non-proliferation process”
  - **Switzerland**: “A treaty should ... address past production of fissile material”
  - **Brazil**: GGE should “explore ... a phased process of destruction of all pre-existing weapons-grade fissile material”
Potential roles of initial declarations

- Trust and confidence-building measure
- Measure of progress toward nuclear disarmament
- Baseline for the treaty verification system
- Baseline for complete elimination
Fissile material stocks

Source: International Panel on Fissile Materials, fissilematerials.org
## Status of declarations

<table>
<thead>
<tr>
<th></th>
<th>Military material</th>
<th>Civilian material</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Detailed account of plutonium and HEU production and inventories</td>
<td>Excess military plutonium reported as civilian</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Military HEU and plutonium inventory</td>
<td>Plutonium and HEU under Euratom safeguards</td>
</tr>
<tr>
<td>France</td>
<td>—</td>
<td>Plutonium and HEU under Euratom safeguards</td>
</tr>
<tr>
<td>Russia</td>
<td>—</td>
<td>Reactor-grade plutonium</td>
</tr>
<tr>
<td>China</td>
<td>—</td>
<td>Reactor-grade plutonium</td>
</tr>
<tr>
<td>India</td>
<td>—</td>
<td>Plutonium under IAEA safeguards</td>
</tr>
</tbody>
</table>
Voluntary unverified declarations

- Lack of common standard
- Errors and inaccuracies
- Potential for misunderstanding
Verification strategies

- What is “effectively verifiable”?

- Gradual approach
  - From simple declarations to gradual opening of records

- National technical means and independent analysis

- Fully verified declarations
  - Similar to the IAEA model
Verified declarations

- Physical inventory
- Production and material balance history
Verified declarations

- **Physical inventory**
  - Lack of access to materials in active use
  - Limited accuracy of measuring material content
    - Waste, bulk material

- **Production and material balance history**
  - Limited accuracy and availability of production records
  - Potential proliferation sensitivity
  - Some removals are unverifiable
Deferred verification

Open segment

Closed segment

Material storage

Non-proscribed military use

Civilian use

Production facilities

Waste and disposal

Deployed weapons

Assembly Maintenance Disassembly
## Open and closed segments

<table>
<thead>
<tr>
<th>Closed segment</th>
<th>Open segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of material known and declared with high accuracy</td>
<td>Quantity of material declared, but may not be accurately known</td>
</tr>
<tr>
<td>Active and reserve warheads, material for maintenance</td>
<td>Civilian material, material in mixtures, waste, disposed material</td>
</tr>
<tr>
<td>No verification access</td>
<td>Open to verification</td>
</tr>
<tr>
<td>No production facilities</td>
<td>All production facilities</td>
</tr>
<tr>
<td>No material added, all removals are verified</td>
<td>Ban on production of materials for weapons is in force. All new material is subject to verification</td>
</tr>
<tr>
<td>All weapon-related activities</td>
<td>Civilian and non-proscribed military activities</td>
</tr>
<tr>
<td>Initial declaration verified when all material is removed</td>
<td>Gradually growing confidence in the absence of undeclared material</td>
</tr>
</tbody>
</table>
DEALING WITH DISPARITIES
Existing stocks
Verification objectives: IAEA approach

- Objective:
  - Timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown

- Timeliness:
  - Time that would be required to manufacture a single nuclear explosive device from diverted material

- Quantity:
  - Plutonium: 8 kg
  - HEU: 25 kg
Verification objectives: Arms control

- **Objective**
  - Detect significant violation in time that allows to respond and offset any threat that the violation may create

- **Timeliness**
  - Time required to offset the violation

- **Quantity**
  - Violation “significance” may depend on the size of existing stock
SOME CONCLUSIONS
There is a consensus on the basic structure of the treaty

Even a treaty that covers only future production would create a valuable disarmament mechanism

Verifiable declarations of existing stocks are possible

The role of existing stocks needs further discussion