裁 军 谈 判 会 议

CD/1691
13 January 2003

CHINESE
Original: ENGLISH

2003年1月7日荷兰常驻裁军谈判会议代表致会议秘书长的信，其中转交2002年9月25日于日内瓦举行的关于禁止生产用于核武器和其他核爆炸装置的裂变材料条约的第二次可自由参加的非正式会议的纪要，该会议是荷兰就禁产条约所进行的活动的一部分

我谨转交关于禁止生产用于核武器和其他核爆炸装置的裂变材料问题的第二次可自由参加的非正式会议的纪要，该会议是荷兰就禁产条约所进行的活动的一部分。

会议由荷兰王国驻裁军谈判会议代表团于2002年9月25日星期三召开。与会者多达 100 人以上。50 多个国家的代表以及非政府组织、一些国际组织和维也纳国际原子能机构的代表参加了会议。

禁产条约的范围：托马斯·谢伊先生(原子能机构)的评述

维也纳国际原子能机构保障司三边倡议办公室主任托马斯·谢伊先生代表原子能机构在会上评述了禁止生产用于核武器和其他核爆炸装置的裂变材料条约的可能框架。其讲稿副本附于本文件之后。

谢伊先生所谈到的问题包括：

- 禁产条约可涵盖哪些内容(范围、定义、何种设施)；
- 如何核查禁产条约(宣布、核查)；
- 哪些军事利用可作为例外(舰艇推进及其他非爆炸军事用途)；
- 需考虑哪些其他相关因素(组织、费用及法律条款如生效等)。

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谢伊先生评述后，立即进行了讨论，所提到的问题包括：禁产条约核查制度的范围；禁产条约核查制度的经费筹供；储存问题，包括三边倡议与禁产条约的相关性；禁产条约与防止核恐怖主义的关系。

禁产条约核查制度的范围

关于禁产条约核查制度的范围，讨论集中于下述问题：禁产条约的核查对象应包括所有国家还是只包括生产和拥有核武器不受《不扩散条约》禁止的那些国家(即五个核武器国家和未加入《不扩散条约》的三个国家)。此外，禁产条约的核查制度是否应基本上沿袭适用于无核武器国家的原子能机构现行保障制度(INFCIRC/153 和 INFCIRC/540)，还是应分别为核武器国家和无核武器国家规定不同的核查制度。

禁产条约核查制度的经费筹供

核查制度的供资方式同这一制度的范围密切相关，具体取决于核查制度应涵盖何种设施。讨论中提到的几种供资方式包括：由生产用于核武器和其他核爆炸装置的裂变材料的国家供资，或由禁产条约所有缔约国按联合国会费分摊比额表或类似的模式分摊。

讨论中提到的未来组织的核查制度经费筹供的另一种办法是对所生产的每千吨核能收取附加费。

储存问题(包括三边倡议与禁产条约的相关性)

关于逾量裂变材料储存问题，有人指出，禁产条约谈判的职权范围(CD/1299 号文件所载的香农职权)中的有关措词很模糊。讨论中提出的三种不同看法是：(a) 在条约范围内处理储存问题更为允当；(b) 应通过另外的辅助机制(如三边倡议)来处理这个问题；(c) 根本不应在禁产条约的框架内处理这个问题。关于另外的辅助机制，会上讨论了可否利用例如三边倡议(原子能机构、俄罗斯联邦和美国之间共同监测逾量储存的框架)一类的现有机制作为处理这个问题的另一种办法。

在这方面，讨论中还提到了南非关于逾量材料储存的所谓基线模式的工作文件(CD/1671 号文件)。南非在该工作文件中指出，将裂变材料储存问题纳入谈判将十

分困难，这不但有政治方面的原因，而且有实际方面的原因。根据核武器国家自身的经验，实际的储存量与它们按过去的生产记录计算出来的应拥有的裂变材料数量之间看来存在很大的差距。

禁产条约与防止核恐怖主义的关系

谢伊先生讲述之后进行的讨论中提到的最后一个问题就是，禁产条约与防止核恐怖主义之间有没有关系。人们广泛认为，禁产条约在这方面的作用会很有限。尽管禁产条约将提供更多的核查机会，但普遍认为现有的一些反对恐怖主义的公约及《关于核材料的实物保护公约》在这方面起的作用较大。

谨请将本信及本信的附件作为裁军谈判会议的正式文件分发给本会议所有成员国和参加会议工作的非成员国。

荷兰常驻裁军谈判会议代表
大使
克里斯·桑德斯(签名)

Attachment*

The FM(C)T : Verification issues

Introduction by Thomas E. Shea
International Atomic Energy Agency

Exercise on banning the production of fissile material for nuclear weapons and other nuclear explosive devices: an essential step towards nuclear disarmament and non-proliferation

Organised by the Permanent Mission of the Netherlands
To the Conference on Disarmament

Geneva, 25 September 2002

* The attachment is being circulated in the language of submission only.

The FM(C)T: Verification Issues

"Informal open-ended educational and informative meeting on FM(C)T"
Convened by Permanent Mission of the Netherlands to the Conference on Disarmament, 25 September 2002

Thomas E. Shea, PhD
International Atomic Energy Agency

Caveat

- Subject has many controversial aspects
- Objectives, scope and treaty provisions are for CD to decide
- Different positions proposed over time, many in conflict
- intention to look at alternatives without recommendations
- IAEA safeguards seen as one reference to view possible FM(C)T arrangements

In 1993, the UN General Assembly passed a resolution calling for a non-discriminatory multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices.

1995: The Shannon Mandate

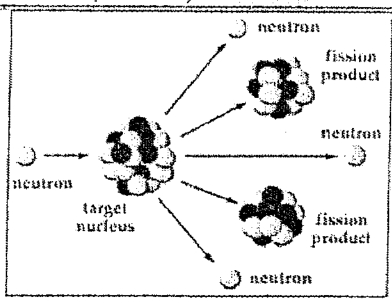
- Agreed by the CD on the basis of 1993 UNGA resolution
- An Ad Hoc Committee to be established to negotiate a fissile material cut-off treaty.
- No delegation precluded from raising the issues of the treaty's scope and verification in the Ad Hoc Committee

Scope Options

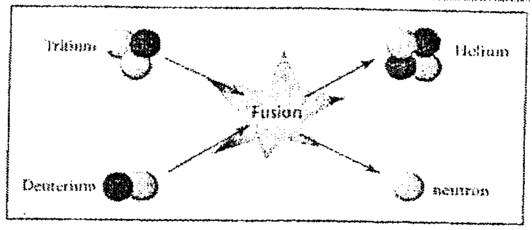
The term "FM(C)T" is used in this presentation as a range of views exists on whether the treaty might be limited to a "production cut-off", a broader "acquisition control" or a general purpose "fissile material" treaty

Fissile / Fissionable Material

The energy released by fissioning 1 kg of ^{235}U is approximately equal to 17,000,000 kgs of TNT (17 kilo tonnes, or 17 kT)

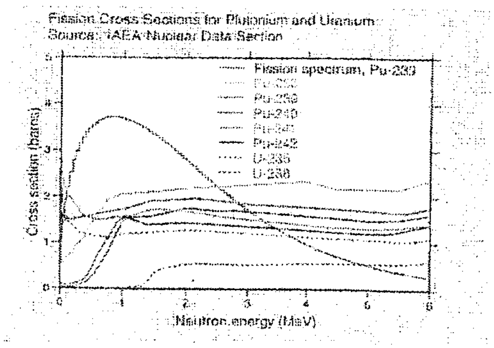


Fusion reactions do not release as much energy per reaction as fission, but because the materials are very light, fusing 1 kg of D+T yields almost five times the yield from fissioning 1 kg of plutonium or ^{235}U.



Key Properties for Fissile / Fissionable Material Use in Nuclear Explosives

- Induced fission cross section: indicates likelihood that if struck by a neutron, will fission
- Number of neutrons per fission
- Compressibility
- Spontaneous fission
- Radiation: heat from α emissions, γ-rays
- Metallurgy



Fissile Material

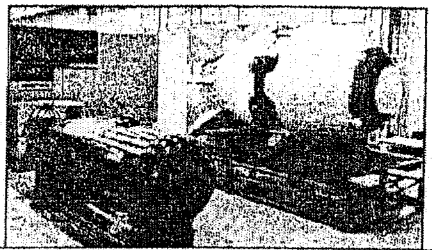
✓ Plutonium (less than 80% ^{238}Pu)
✓ Uranium (enriched to at least 20% ^{235}U)
✓ ^{233}U (intense high energy gamma rays)
✓ Neptunium (^{237}Np is fissionable, not fissile)
- Americium (Heat, gamma rays)
- Protactinium (amount)
- Curium & Californium (intense spontaneous fission neutrons)

Fissile Material – A general definition

- For the purposes of the Treaty, any nuclear material with fission properties suitable for use in an explosive nuclear, as determined by the Conference of States Parties

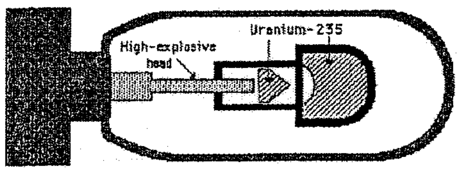
⇒When negotiating the Treaty, specific fissile materials could be defined as subject to the Treaty, with straightforward provisions for change, as may arise

Use of Fissile Material in Nuclear Weapons

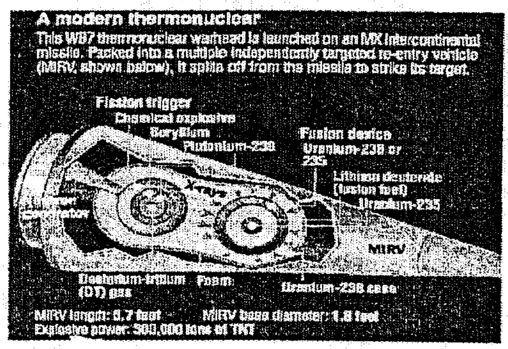


The first nuclear weapons. "Little Boy" on the left, is a gun-type weapon using 235U. It was dropped on Hiroshima, with no testing before hand. "Fat Man" on the right, is a plutonium implosion weapon. The explosive yield of each was on the order of 15 kT.

If the Fissile Material does not fission spontaneously, then a gun-type weapon is possible.



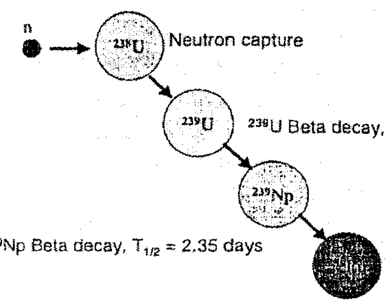
Gun-type weapons require more fissile material and are larger than implosion-type weapons.



Plutonium Production

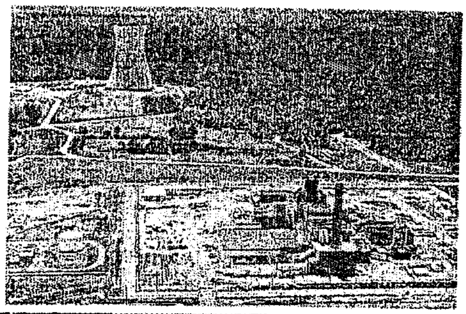
Pu does not exist in nature; it is produced through nuclear transmutation.

Plutonium is produced by nuclear transmutation, when a neutron is absorbed by ^{238}U. The half-life of ^{239}Pu is 24,400 yrs.



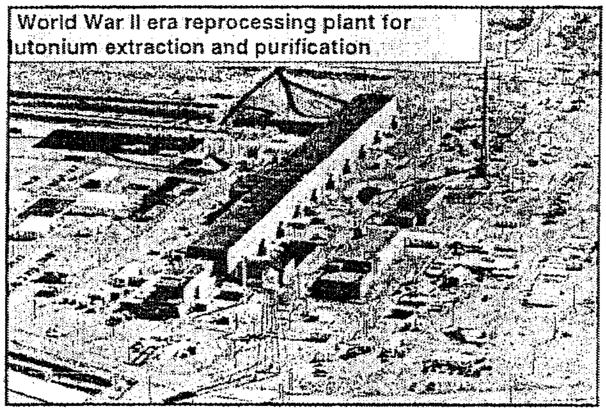
Plutonium Production

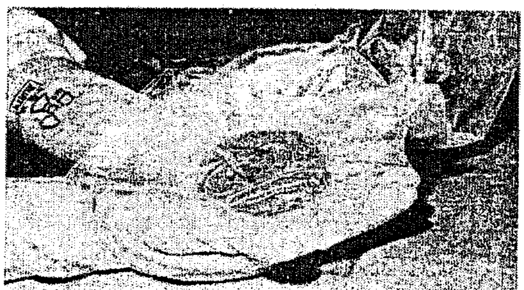
- Obtain uranium ore and process to fuel form
- Produce fuel
- Irradiate in nuclear reactor
- Transport to reprocessing plant
- Chop/dissolve fuel cladding
- Separate fission products
- Separate and purify plutonium
- Convert to metal



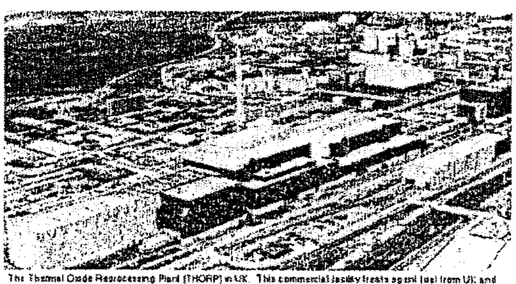
A Plutonium Production Reactor

World War II era reprocessing plant for lutonium extraction and purification





A 2 kg plutonium metal button. Note that with "weapon-grade" plutonium, the radioactivity is low enough so that the plutonium can be handled with appropriate protection.



The Thermal Oxide Reprocessing Plant (THORP) in UK. This commercial facility treats spent fuel from UK and overseas reactors, separating the high-level waste from uranium & plutonium. The smaller black building on the right is the vitrification plant for this waste.

Production of High Enriched Uranium (HEU)

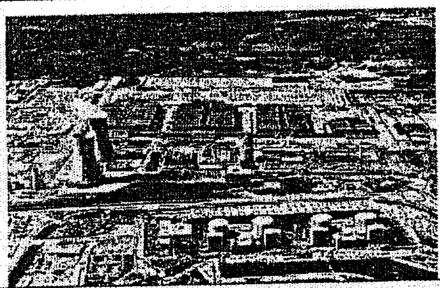
Uranium is found in mineral ores and in water. As found in nature, the percentage of the 235U isotope is 0.71%. The ^{235}U content of uranium is "enriched" to high levels for use in nuclear weapons.

HEU for Nuclear Weapons

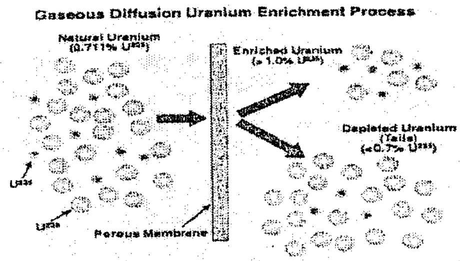
- Obtain uranium ore
- Process to enrichment feed form (UF_6 in most cases)
- Enrich ^{235}U to desired level (up to 93% used in nuclear weapons)
- Convert HEU to metal

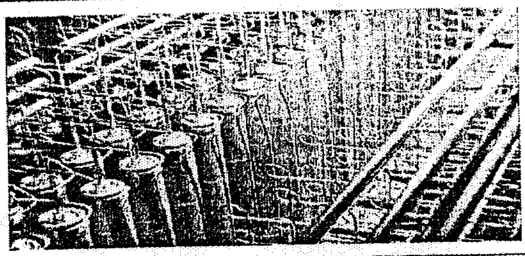
Uranium Enrichment Technologies

1. Gaseous Diffusion
2. Centrifuge
3. Electro-magnetic (Calutron)
4. Aerodynamic (South African & Becker)
5. Chemical Exchange
6. Atomic Vapor Laser Enrichment
7. Molecular Laser Enrichment
8. Plasma Enrichment



The Tricastin enrichment plant in France (beyond cooling towers) with the four nuclear reactors in the foreground that provide over 3000 MWe power for it.





Uranium enrichment based on isotopic mass differences requires thousands of stages / machines. Shown are gaseous centrifuges.

Plutonium isotopic enrichment has been demonstrated, but is not common.

Other Issues:

- Should exports / imports be controlled?
- If submarine reactor spent fuel is reprocessed should the HEU recovered be considered to be production?
- If fresh fuels intentionally contain high levels of fission products to inhibit diversion and theft, how should such materials be treated?

Present Situation

- 5 NPT States possess nuclear weapons - China, France, Russia, UK, US. 2 other States have tested - India, Pakistan. 1 other State possesses fissile material not subject to IAEA safeguards – Israel
- Cuba announced it would sign NPT and ratify Tlatelolco. All States with nuclear activities other the 8 above will be subject to comprehensive IAEA safeguards, including a ban on production of fissile material for use in nuclear weapons or other nuclear explosives

States Party to a comprehensive IAEA Safeguards Agreement are, in effect, already subject to a ban on production of fissile material for use in nuclear weapons or other nuclear explosives

Verification under IAEA Safeguards Aiming to detect:

- Diversion of significant quantities of nuclear material from declared flows / inventories
- Misuse of declared facilities or certain equipment for unreported production of fissile material
- Clandestine production / processing of fissile materials in undeclared facilities

Verification under IAEA Safeguards Guidelines

- Detection amounts chosen to prevent production of the first nuclear weapon
- Detection timeliness geared to "abrupt" & "protracted" diversion strategies
- Detection probabilities geared to strategic value of material

2001 IAEA Safeguards Costs

- Safeguards Staff: 616
- Regular budget expenditure: $70M
- Extra-budgetary program expenditure: $20M

IAEA inspectors performing *in situ* verification of seals on fresh fuel assemblies

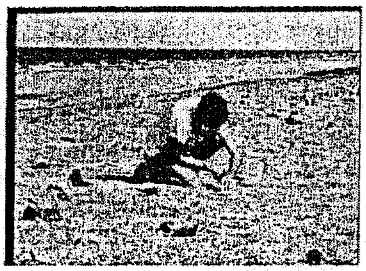
IAEA Safeguards Implementation

TABLE I. VERIFICATION ACTIVITIES

	1998	1999	2000
Inspections conducted	2507	2495	2467
Person-days of inspection	10 071	10 100	10 264
Seals applied to nuclear material or safeguards equipment, detached and subsequently verified (including seals applied jointly with EURATOM)	[illegible]	[illegible]	25 494
Optical surveillance films reviewed	932	1271	878
Video tapes reviewed	4084	6033	5200
Nuclear material samples analysed	645	653	626
Nuclear material analytical results reported	1610	1387	1401
Environmental samples analysed	497	511	246
Nuclear material under safeguards (tonnes)			
Plutonium contained in irradiated fuel	511	578	645.8
Separated plutonium outside reactor core	62.4	73.3	72.2
Recycled plutonium in fuel elements in reactor cores	7.2	8.0	10.7
High enriched uranium	21.4	21.2	23.0
Low enriched uranium	40 493	51 597	46 974
Source material	[illegible]	85 190	94 677

Environmental Sampling

- Baseline samples collected in all enrichment facilities and hot cells
- IAEA Clean Lab
- Environmental Sample Labs in IAEA Member States and Euratom



Collecting environmental samples. The detection capability is sufficient to find and analyze particles containing on the order of 0.000000000000001 grams of nuclear material.

Status of Additional Protocol

Approved by IAEA Board of Governors: 72

Signed: 67

In Force: 28

(As of 23 September 2002)

FM(C)T Verification

FM(C)T verification effectiveness & costs depend upon:

- The scope of the Treaty
- The amounts of fissile material that are important to detect (treaty violation)
- The maximum acceptable time interval between a violation and its detection
- The degree of certainty desired
- The number of facilities, their operational status and locations

Approaches vary widely in the international community

Within the Eight States:

- Focus restricted to FM / related facilities
- Focus makes treaty negotiable
- Effective within limited scope
- Lower cost
- Protects sensitive information

Outside the Eight:

- Wide Scope: similar to comprehensive IAEA safeguards
- Effective (compare with non-nuclear weapon States)
- Broad scope = least discriminatory

My understanding of the views of the Russian Federation

- FM Definition:
  - Pu: > 95% ^{239}Pu
  - HEU: > 90% ^{235}u
- Subject to verification:
  - enrichment plants
  - reprocessing plants, separated Pu
  - relevant production

No verification:

- Former military and dual-use facilities
- Fuel production facilities for naval propulsion

My understanding of the views of the United Kingdom

FM Definition:

- Unirradiated Pu < 80% ^{238}Pu
- Unirradiated U > 20% or more ^{235}U or ^{233}U
- Neptunium, Americium

Subject to verification:

- All enrichment facilities
- Reprocessing facilities
- Until material no longer meets FM definition
- Decommissioned / closed facilities

Not subject to verification:

- Existing civil and military stocks
- Spent fuel (before reprocessing)

My understanding of the views of Japan

Subject to verification:

- Civil processes and facilities that involve FM until the material no longer meets the FM Definition
- Naval fuel production (using a "special verification regime"

Not subject to verification

- Existing Stocks

Possible option:

- Declare fissile material / facilities at EIF, excluding FM for nuclear weapons ...
- Material / facilities not verified, but provide basis for future verification.

My understanding of the views of the South Africa

Covered:

- All peaceful facilities containing FM (e.g. enrichment, reprocessing, MOX fuel fabrication, HEU downgrading)
- Former FM production facilities
- Material declared excess to defense needs, using a "special verification regime" for sensitive characteristics
- Facilities producing HEU for naval reactors

Not covered:

- FM in existing weapons and reserves
- Weapon fabrication, storage and dismantling facilities
- Fuel fabrication and reprocessing facilities for naval reactors
- No mention of civil stocks, undeclared production

Basic Questions

- The treaty could require each Party not to *produce*, import (?) or otherwise acquire (?) *fissile material* for use in nuclear weapons ...
- Would it also affect supply? For example, would each Party to the Treaty be prohibited from transferring to any recipient whatsoever *fissile material* for ... ?
- What about facilities, equipment or material for production?

Elements of FM(C)T Verification

- Access to INFORMATION
- Access for INSPECTIONS
- Capability for ANALYSIS
- Responsibility for EVALUATION
- Authority to RESOLVE ANOMALIES
- Provisions for presenting verification findings to a designated body
- Conditions for bringing SUSPICIONS to the UN SECURITY COUNCIL

Verification under an FM(C)T -- a wide range of views exist

- Former Military Production Facilities
- Peaceful Nuclear Facilities and Stocks
- Clandestine Production Facilities
- Non-Explosive Military Applications
- Excess Military Stocks

Verification under an FM(C)T:

Former Military Production Facilities

- HEU Enrichment Plants
- Plutonium Reprocessing Plants
- Plutonium Production Reactors (?)

⇒If shut down, monitoring simple and inexpensive. If in operation, costs and complexities increase, especially if sensitive operations / materials near by.

Verification under an FM(C)T:

Peaceful Nuclear Facilities and Stocks

- <u>Civil Reprocessing Plants</u>
- Existing Pu Stocks (?)
- <u>Enrichment Plants</u>
- HEU Stocks (?)
- Conversion / fuel fabrication plants
- Reactors fueled with fissile material
- Other reactors
- Hot cells
- Waste conditioning plants & geological repositories (?)

Verification under an FM(C)T:

Clandestine Production Facilities

- Undeclared Facilities
- Infrastructure – i.e., R&D, production capability similar to that covered under INFCIRC/540

Verification under an FM(C)T:

Non-Explosive Military Applications

4. Transparency on submarines (?)
3. Verification of working inventory and scrap (?)
2. Transparency measures for naval reactor fuel fabrication (managed access) (?)
1. Stocks for Naval Reactor and Space Power reactor manufacturing (?)

Verification under an FM(C)T:
Alternatives for Excess Military Stocks

5. Proportional declaration of excess stocks
4. Verification of excess stocks; and
3. Voluntary submission of excess stocks with classified characteristics; and
2. Voluntary submission of excess military stocks in unclassified form; and
1. No provisions, or

Stocks

- Fissile material produced through peaceful nuclear activities
- Fissile material declared as excess to the defence requirements of a State
- Strategic reserves of fissile material maintained for military applications
- Working stocks of fissile material in military programs
- Fissile materials in deployed and stockpiled weapons and naval reactors

What types of inspections would be included?

- Routine, ad hoc inspections (declared activities)
- Complementary and managed access (unreported operations or clandestine facilities)
- Special inspections (suspicions arising from inspections or access)
- As in CTBT & CWC: challenge-type inspections?

Verification Methods, Applications and Costs: Examples

Verification Methods for Declared Facilities under FM(C)T

- Design information verification
- Material accountancy
- Containment/surveillance
- Environmental sampling (Note Security Concern)
- Remote monitoring
- Open-source & other info, satellite imagery

Declared Reprocessing Plants: Operational Categories

Cost

5. Full reprocessing operations -- may require continuous inspection presence
4. Non-reprocessing operations
3. Operational standby
2. Under decommissioning
1. Decommissioned or abandoned

Approximate Verification Costs for Reprocessing Plants

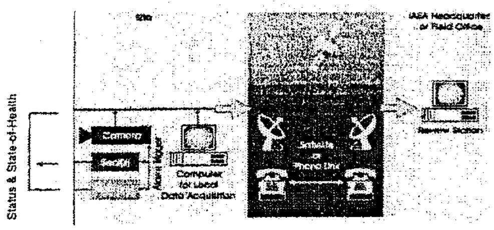
Plant Category	Number of Plants	Equipment Costs: All Plants/Cat.	Total Inspection Days/Year	Inspection Cost Per Year
1	8	0	8	$60,000
2	12	$280,000	54	380,000
3	2	$2,400,000	40	290,000
4	12	$3,000,000	360	2,600,000
5	13	19,000,000	6560	47,200,000
TOTALS	47	25,000,000	7022	50,000,000

Note that these estimates are intended to be indicative; the actual amounts depend upon a host of factors.

Questions for Verification of Reprocessing Plants

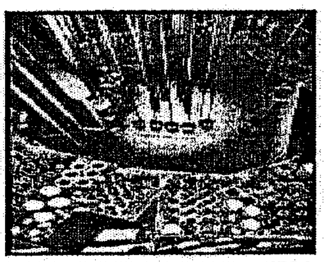
- Where would inspections begin? At the spent fuel storage pond? The Head-End? The Pu separation process?
- Would inspections follow the uranium stream?
- Would wastes be subject to inspection?
- The analytical laboratory?

One way to keep the costs down: Unattended & Remote Monitoring



Detecting Unreported / Clandestine Fissile Material Production

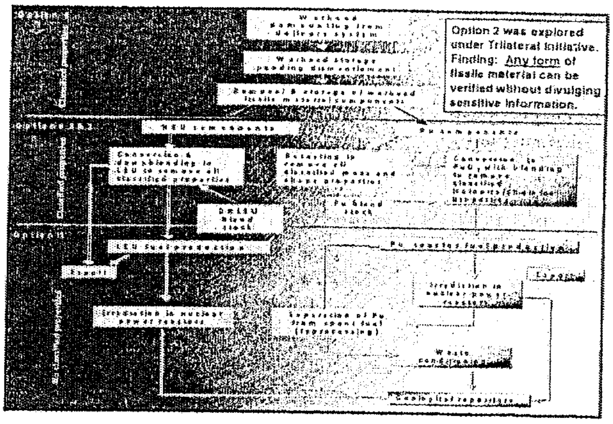
- Information reported by inspected State
- Information from Technical Cooperation
- Information provided by other States
- Open source information
- Satellite imagery
- Information collected by inspectors
- Environmental sampling (Security Concern)
- Inspector access (including managed access)



Undeclared Pu production might be accomplished by secretly inserting natural uranium in the core of a nuclear reactor subject to inspections.

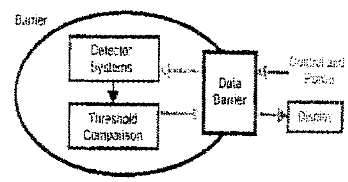
Commercial satellite imagery is used routinely in IAEA Safeguards – especially in preparation for complementary access visits.

Would excess military fissile material stocks be included in the FM(C)T? If so, when and how?



Fissile Material Released from Defence Programmes

1. Voluntary submittal of unclassified excess material blocks possible re-use
2. Verification of classified fissile material allows early submittal of much larger amounts (Trilateral Initiative)
3. Additional attributes could allow verification of weapon-heritage
4. Use of seals / perimeter monitoring could allow verification of dismantlement



Information Barriers developed under the Trilateral Initiative allow "attribute verification" measurements to be carried out on nuclear warhead components without divulging sensitive information.

Verification Challenges

(Depend on Scope of Treaty)

Verification Challenges

- Military security associated with nuclear weapon programs and naval reactor programs (whether or not excess military stocks covered)
- Dual-use Facilities
- New uranium enrichment plants, high density, zero emissions
- Work demand and ramping-up – what comes first, second, ...
- Convergence – what, when and how?

Given recent developments, could the FM(C)T contribute to preventing nuclear terrorism?

Prevention of Nuclear Terrorism under the FM(C)T:

- First line of defence: fissile material protection, control and accounting (MPC&A) – apply strict international standards
- Encourage adherence to the Convention on the Physical Protection of Nuclear Material
- Engage all FM(C)T States in common framework to enhance safety and security of fissile materials

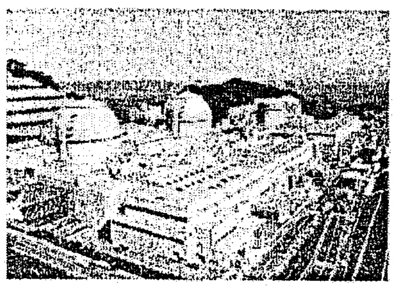
The FM(C)T and Nuclear Terrorism

- The FM(C)T could set requirements for standardized laws or regulations governing ownership, access and use of fissile materials and associated facilities.

Expanded nuclear power is foreseen by some States as a means to reduce global warming. Should the FM(C)T guide the future implementation of nuclear energy for peaceful purposes?

Guiding Future Peaceful Applications of Nuclear Energy

- Proliferation resistance and physical protection principles for nuclear energy systems
- Balancing production and use: management of accumulations of fissile material stocks
- Transparency measures, e.g., "prudent and legitimate" reviews of plans for nuclear facilities



A nuclear power plant in Japan with four reactors

IAEA "INPRO" PROGRAM

- Invites IAEA Member States to join in development of innovative reactors, including proliferation-resistance features

Future Generation IV Nuclear Energy Systems will employ plutonium recycle

- Gas-Cooled Fast Reactor
- Molten Salt Reactor
- Sodium Cooled Reactor
- Lead Alloy-Cooled Reactor System
- Supercritical Water- Cooled Reactor
- Very High Temperature Reactor

FM(C)T: Verification by a new Organization or by the IAEA?

Potential conflicts / overlaps with IAEA safeguards would need to be identified and managed

- Responsibilities of FM(C)T Parties to IAEA under existing obligations
- Duplicate inspections with different methods and criteria
- Financing

The resulting regime could have a "Hybrid" character

FM(C)T: Verification by IAEA

- If IAEA asked to develop verification system, Treaty itself could be short: a few pages of basic principles
- Verification could follow an IAEA model agreement, which could be approved by CD before the FM(C)T is concluded
- Extensive use of existing IAEA provisions would facilitate negotiation, minimize discriminatory status
- Implementation sooner, less expensive

FM(C)T / IAEA Agreements for full-scope safeguards States

- Require INFCIRC/153 comprehensive safeguards + full INFCIRC/540 protocol
- Additional requirements? FM(C)T Protocol ?
  - Challenge Inspections (If for the other States?)
  - ✓Other fissile materials
  - ✓Proliferation resistance / physical protection
  - ✓Conference of States Parties

Option 1: FM(C)T / IAEA Agreements for the (8) States having fissile material not subject to IAEA safeguards

- Full provisions of INFCIRC/153 + 540, plus
- FM(C)T Protocol requirements: As for full-scope safeguards States, plus
- provisions for suspended implementation of some of the 153/540 provisions on materials / facilities subject to national security;
- provisions for phasing out suspensions

Option 2: FM(C)T / IAEA Agreements for the (8) States having fissile material not subject to IAEA safeguards

- New verification agreement adopting relevant provisions of INFCIRC/153 + 540, plus
- FM(C)T Protocol requirements: As for full-scope safeguards States

FM(C)T: Option 1: Verification by New Organization (Not IAEA)

- A discriminatory regime could be created vis à vis NNWS
- Arrangement could undermine NPT safeguards system
- Could lead to duplicate inspections in facilities subject to IAEA safeguards in eight States (also in NNWS?)
- Expensive: new organization requires infrastructure, support
- Extended, complex CD negotiation

Verification Costs

Costs: Depend on:

- decisions to be made by CD and
- information to be provided by States on facilities that would be subject to inspection
- future status of facilities and ramping up priorities

Figure about the same as for IAEA safeguards in non-nuclear weapon States – on the order of $100M per year

The idea of an FM(C)T is old. Could negotiations begin now?

Could contemporary events make it possible to complete the FM(C)T?

- Most of the eight States have apparently stopped and the others might soon be ready to stop production of fissile materials
- Russia and the United States already have a bilateral "Plutonium Production Reactor Agreement" which stops Pu production in the two States and includes reciprocal inspections

Contemporary events ...

- G8 Global Partnership against the spread of weapons and materials of mass destruction
- Cuba announced it will sign NPT and ratify Tlatelolco. It will accept a comprehensive IAEA safeguards agreement, leaving only China, France, India, Israel, Pakistan, Russia, the United Kingdom and the United States with unsafeguarded fissile material
- Progress towards G8 financing of Russian disposition of nuclear weapon plutonium

Contemporary events ...

- The Trilateral Initiative conclusion: concepts and technologies developed could allow for IAEA verification of any form of weapon-origin fissile material without divulging sensitive information
- Progress to strengthen and extend the Convention on the Physical Protection of Nuclear Material

Contemporary events ...

- Global warming and increasing reliance on nuclear power, including "proliferation-resistance and physical protection" features comprising technical, institutional and verification measures
- Generation IV International R&D on six advanced nuclear energy systems, with Pu

The FM(C)T could:

- Be a significant step towards nuclear disarmament, facilitating further steps
- Prevent future nuclear arms race and encourage progress towards disarmament
- Reinforce NNWS commitments, preserve integrity/durability of non-proliferation regime
- Rationalize nuclear commerce
- Reduce risks of proliferation & nuclear terrorism

Biographical Information
Thomas E. Shea, PhD

Thomas E. Shea is Head of the Trilateral Initiative Office in the Department of Safeguards at the International Atomic Energy Agency, responsible for program development and implementation activities associated with a possible new verification role for the IAEA: weapon-origin and other fissile material released from military applications.

Tom Shea is an American. He was awarded a Special Fellowship from the United States Atomic Energy Commission, and received his Master of Science in Nuclear Engineering and his Doctor of Philosophy in Nuclear Science from Rensselaer Polytechnic Institute.

During his 22 years at the International Atomic Energy Agency, he helped to establish the basic safeguards implementation parameters and defined safeguards approaches for many complex nuclear facilities. He headed a section of inspectors for 11 years, and was responsible for safeguards implementation in Japan, India, Taiwan, Australia, and Indonesia. He established the Project Office for the JNFL Rokkasho Reprocessing Facility, and successfully headed a Tripartite Project with the Russian Federation and the People's Republic of China, regarding safeguards at centrifuge enrichment plants equipped with Russian centrifuges.

For over 20 years, Shea has held a deep interest in establishing international verification measures related to nuclear disarmament. He was named to a UN Security Council Panel on disarmament in Iraq, carried out an IAEA investigation of the technical requirements for the verification of the Comprehensive Nuclear Test Ban Treaty, and headed the IAEA Secretariat Working Group on the verification of a fissile material production cut-off treaty.

Shea has taken an active role in IAEA activities related to proliferation-resistant reactors, in both the U.S. Generation IV program, and the IAEA International Innovative Reactors Project.

Shea is a Fellow of the Institute of Nuclear Materials Management.

He retired from the IAEA at the end of January 2002, and since then has been a consultant to the US Department of Energy Pacific Northwest National Laboratory, working as an expert in the IAEA, continuing his earlier duties.