КОНФЕРЕНЦИЯ ПО РАЗОРУЖЕНИЮ

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ПИСЬМО ПОСТОЯННОГО ПРЕДСТАВИТЕЛЯ НИДЕРЛАНДОВ НА КОНФЕРЕНЦИИ ПО РАЗОРУЖЕНИЮ ОТ 7 ЯНВАРЯ 2003 ГОДА НА ИМЯ ГЕНЕРАЛЬНОГО СЕКРЕТАРЯ КОНФЕРЕНЦИИ, ПРЕПРОВОЖДАЮЩЕЕ РЕЗЮМЕ ВТОРОГО НЕОФИЦИАЛЬНОГО СОВЕЩАНИЯ ОТКРЫТОГО СОСТАВА В РАМКАХ НИДЕРЛАНСКИХ УЧЕНИЙ В СВЯЗИ С ДЗПРМ ПРИМЕНИТЕЛЬНО К ДОГОВОРУ О ЗАПРЕЩЕНИИ ПРОИЗВОДСТВА РАСЩЕПЛЯЮЩЕГОСЯ МАТЕРИАЛА ДЛЯ ЯДЕРНОГО ОРУЖИЯ И ДРУГИХ ЯДЕРНЫХ ВЗРЫВНЫХ УСТРОЙСТВ, ПРОХОДИВШЕГО В ЖЕНЕВЕ 25 СЕНТЯБРЯ 2002 ГОДА

Имею честь препроводить Вам резюме второго неофициального совещания открытого состава в рамках нидерландского учения в связи с ДЗПРМ по проблеме запрещения производства расщепляющегося материала для ядерного оружия и других ядерных взрывных устройств (ДЗПРМ).

Это совещание было организовано в среду, 25 сентября 2002 года, делегацией Королевства Нидерланды на Конференции по разоружению. В общей сложности это совещание насчитывало значительно более 100 участников. Совещание посетили более 50 стран, а также представители НПО, некоторых международных организаций, равно как и МАГАТЭ из Вены.

Сфера охвата ДЗПРМ: презентация Тома Ши (МАГАТЭ)

На этом совещании начальник управления по Трехсторонней инициативе Департамента гарантий венского Международного агентства по атомной энергии (МАГАТЭ) г-н Томас Ши от имени МАГАТЭ устроил презентацию по возможной структуре договора о запрещении производства расщепляющегося материала для ядерного оружия и других ядерных взрывных устройств (ДЗПРМ). Копия его презентации приобщается к настоящему документу.

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Проблемы, затронутые в презентации г-на Ши включают:

- что мог бы охватывать ДЗПРМ (сфера охвата, определения, какого рода объекты);
- как можно было бы проверять ДЗПРМ (объявления, проверка);
- какие исключения для военного применения надлежит сделать (военно-морские двигательные установки и другие невзрывные виды военного применения);
- какие другие надлежащие элементы нужно рассмотреть (организация, расходы и юридические элементы, такие как вступление в силу.

Проблемы, поднятые в рамках дискуссии, которая последовала сразу же за презентацией г-на Ши, включали рамки режима проверки по ДЗПРМ, финансирование проверочного режима ДЗПРМ, проблему запасов (включая значимость Трехсторонней инициативы для ДЗПРМ) и значимость ДЗПРМ для предотвращения ядерного терроризма.

Рамки режима проверки по ДЗПРМ

Что касается рамок режима проверки по ДЗПРМ, то дискуссия концентрировалась на вопросе о том, к кому должна применяться проверка по ДЗПРМ – ко всем государствам или же лишь к тем государствам, которым по ДНЯО не запрещено производить или иметь ядерное оружие (т.е. пятеро государств, обладающих ядерным оружием, и трое государств, не являющихся членами ДНЯО). Кроме того, должно ли это близко походить на нынешнюю систему гарантий МАГАТЭ для государств, не обладающих ядерным оружием (INFCIRC/153 и INFCIRC/540), или же следует разработать отдельные проверочные режимы соответственно для государств, обладающих ядерным оружием, и государств, не обладающих ядерным оружием.

Финансирование проверочного режима ДЗПРМ

Механизмы финансирования проверочного режима тесно взаимосвязаны со сферой охвата такого режима, и в особенности с категориями объектов, которые должны быть охвачены режимом проверки. К числу вариантов финансирования, которые упоминались в ходе дискуссии, относится финансирование теми государствами, которые занимаются производством расщепляющегося материала для ядерного оружия и других ядерных взрывных устройств, или же всеми государствами - участниками ДЗПРМ за счет применения ооновской шкалы взносов или сопоставимой модели.

В основу альтернативной модели финансирования проверочного режима будущей организации, упоминавшейся в ходе дискуссии, был положен добавочный сбор с килотонны производимой ядерной энергии.

Проблема запасов (включая значимость Трехсторонней инициативы)

Что касается проблемы запасов избыточного расщепляющегося материала, то было признано, что мандат на переговоры по ДЗПРМ (мандат Шеннона, содержащийся в документе CD/1299), сформулирован двусмысленно. В ходе дискуссии были подняты три варианта: что целесообразнее – a) проблему запасов уместнее урегулировать в рамках сферы охвата договора, b) за счет отдельных, но подкрепляющих механизмов или же c) ее вообще не следует разбирать в рамках структуры ДЗПРМ. Что касается отдельных подкрепляющих механизмов, то состоялась дискуссия насчет того, нельзя ли использовать для урегулирования этой проблемы, например, уже существующие механизмы типа Трехсторонней инициативы (структура между МАГАТЭ, Российской Федерацией и Соединенными Штатами в отношении коллективного мониторинга соответствующих избыточных запасов).

В этом отношении в ходе дискуссии упоминался и рабочий документ Южной Африки относительно так называемой базовой модели по запасам избыточного материала (документ CD/1671). В этом рабочем документе Южной Африки постулируется, что было бы весьма трудно включить в переговоры запасы расщепляющегося материала, и не только с политической, но и с практической точки зрения. Кроме того, судя по их собственному опыту, существует, пожалуй, значительный разрыв между фактическими размерами запасов и количеством расщепляющегося материала, которым предположительно могли бы располагать государства, обладающие ядерным оружием, исходя из их прежних производственных учетных данных.

Значимость ДЗПРМ для предотвращения ядерного терроризма

Последняя проблема, поднятая в ходе дискуссии, которая последовала за презентацией д-ра Ши, касалась значимости (или нет) ДЗПРМ для предотвращения ядерного терроризма. Широко считалось, что ДЗПРМ внес бы ограниченный вклад в этом отношении. Хотя ДЗПРМ обеспечил бы дополнительные возможности в плане проверки, в этом отношении, по общему мнению, более актуальна Конвенция о физической защите ядерного материала.

Я был бы признателен Вам за выпуск этого письма, равно как и добавления к этому письму, в качестве официального документа Конференции по разоружению и за его распространение среди всех государств - членов Конференции и участвующих в ее работе государств-нечленов.

Искренне Ваш,

(подпись): Крис К. Сандерс
Посол
Постоянный представитель
Нидерландов на Конференции
по разоружению

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

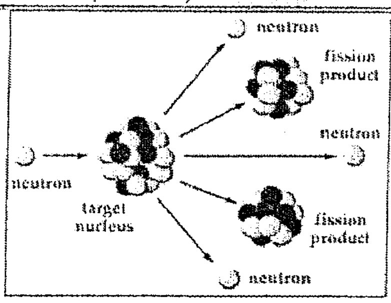
- Agreed by the CD on the basis of 1993 UNGA resolution
- An Ad Hoc Committee to be established to negotiate a fissile material cut-off treaty.
- No delegation precluded from raising the issues of the treaty's scope and verification in the Ad Hoc Committee

Scope Options

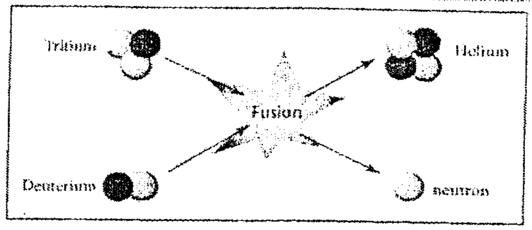
The term "FM(C)T" is used in this presentation as a range of views exists on whether the treaty might be limited to a "production cut-off", a broader "acquisition control" or a general purpose "fissile material" treaty

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)

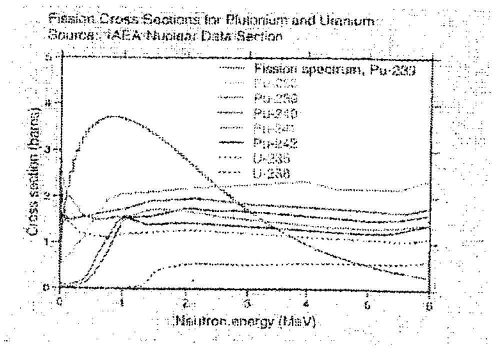


Fusion reactions do not release as much energy per reaction as fission, but because the materials are very light, fusing 1 kg of D+T yields almost five times the yield from fissioning 1 kg of plutonium or ^{235}U.



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

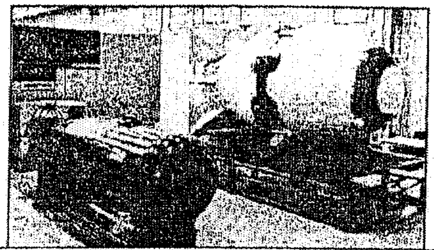
- ✓ Plutonium (less than 80% ^{238}Pu)
- ✓ Uranium (enriched to at least 20% ^{235}U)
- ✓ ^{233}U (intense high energy gamma rays)
- ✓ Neptunium (^{237}Np is fissionable, not fissile)
- Americium (Heat, gamma rays)
- Protactinium (amount)
- Curium & Californium (intense spontaneous fission neutrons)

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

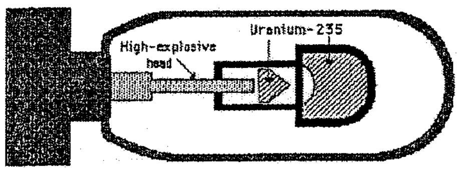
⇒When negotiating the Treaty, specific fissile materials could be defined as subject to the Treaty, with straightforward provisions for change, as may arise

Use of Fissile Material in Nuclear Weapons

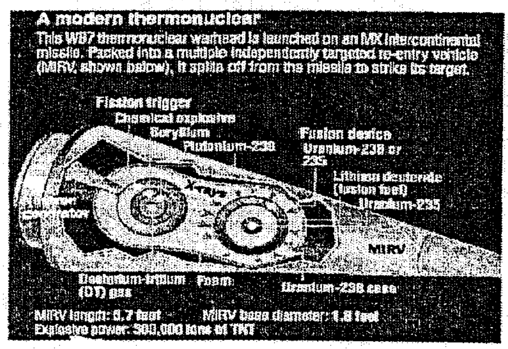


The first nuclear weapons. "Little Boy" on the left, is a gun-type weapon using 235U. It was dropped on Hiroshima, with no testing before hand. "Fat Man" on the right, is a plutonium implosion weapon. The explosive yield of each was on the order of 15 kT.

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



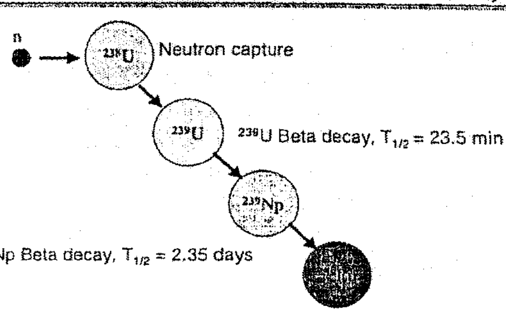
Gun-type weapons require more fissile material and are larger than implosion-type weapons.



Plutonium Production

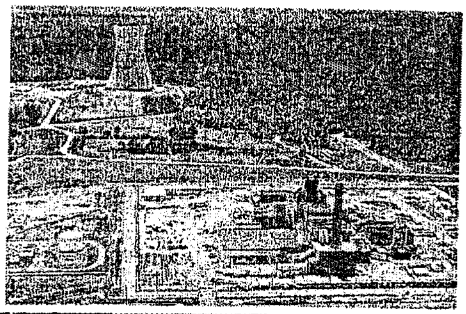
Pu does not exist in nature; it is produced through nuclear transmutation.

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



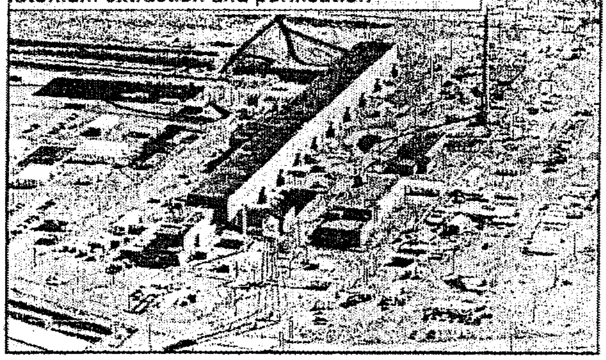
Plutonium Production

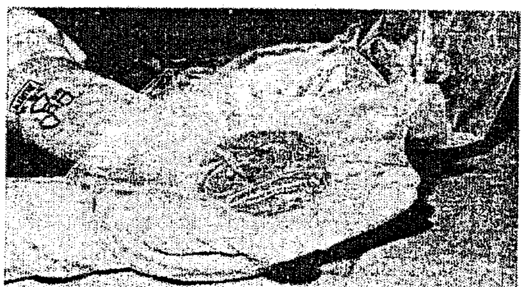
- Obtain uranium ore and process to fuel form
- Produce fuel
- Irradiate in nuclear reactor
- Transport to reprocessing plant
- Chop/dissolve fuel cladding
- Separate fission products
- Separate and purify plutonium
- Convert to metal



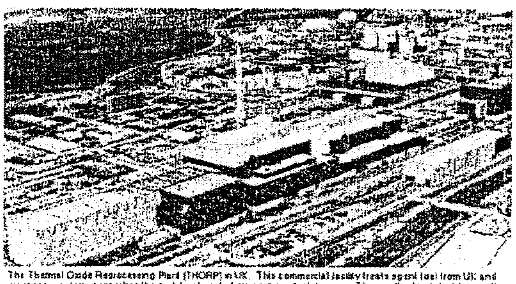
A Plutonium Production Reactor

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)

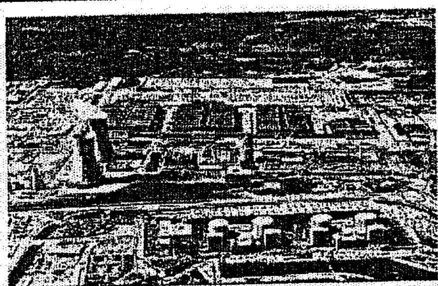
Uranium is found in mineral ores and in water. As found in nature, the percentage of the 235U isotope is 0.71%. The ^{235}U content of uranium is "enriched" to high levels for use in nuclear weapons.

HEU for Nuclear Weapons

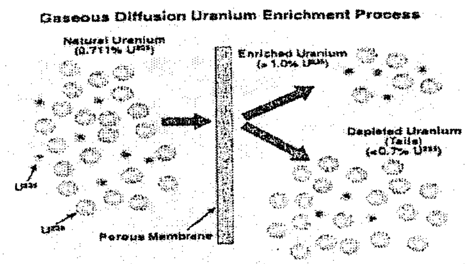
- Obtain uranium ore
- Process to enrichment feed form (UF_6 in most cases)
- Enrich ^{235}U to desired level (up to 93% used in nuclear weapons)
- Convert HEU to metal

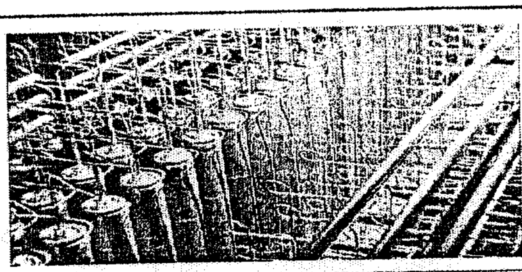
Uranium Enrichment Technologies

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

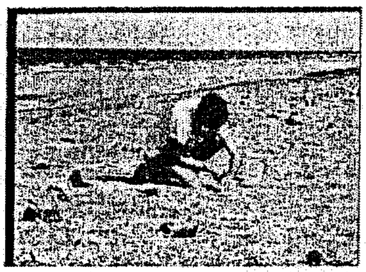
IAEA Safeguards Implementation

TABLE I. VERIFICATION ACTIVITIES

	1998	1999	2000
Inspections conducted	2507	2495	2467
Person-days of inspection	10 074	10 130	10 264
Seals applied to nuclear material or safeguards equipment, detached and subsequently verified (including seals applied jointly with EURATOM)	26 853	26 648	25 494
Optical surveillance films reviewed	932	1271	878
Video tapes reviewed	4084	6113	5290
Nuclear material samples analysed	649	653	620
Nuclear material analytical results reported	1610	1387	1401
Environmental samples analysed	497	541	286
Nuclear material under safeguards (tonnes)			
Plutonium contained in irradiated fuel	591	628	642.8
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	21.7	21.8
Low enriched uranium	40 460	51 357	48 974
Source material	90 839	85 150	91 677

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:

- <u>All</u> 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

- Civil Reprocessing Plants
- Existing Pu Stocks (?)
- Enrichment Plants
- 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?

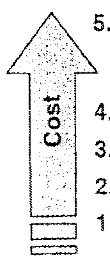
- Routine, ad hoc inspections (declared activities)
- Complementary and managed access (unreported operations or clandestine facilities)
- Special inspections (suspicions arising from inspections or access)
- As in CTBT & CWC: challenge-type inspections?

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



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

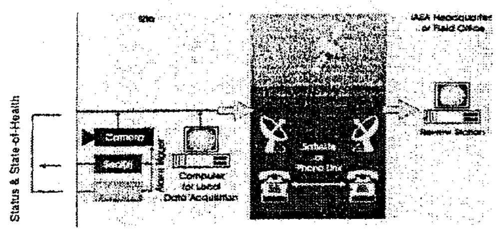
Plant Category	Number of Plants	Equipment Costs: All Plants/Cat.	Total Inspection Days/Year	Inspection Cost Per Year
1	8	0	8	$60,000
2	12	$280,000	54	380,000
3	2	$2,400,000	40	290,000
4	12	$3,000,000	360	2,600,000
5	13	19,000,000	6560	47,200,000
TOTALS	47	25,000,000	7022	50,000,000

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

Questions for Verification of Reprocessing Plants

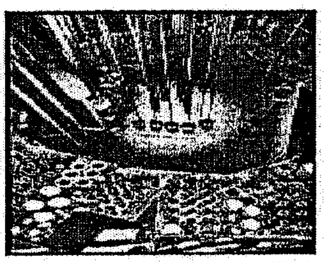
- Where would inspections begin? At the spent fuel storage pond? The Head-End? The Pu separation process?
- Would inspections follow the uranium stream?
- Would wastes be subject to inspection?
- The analytical laboratory?

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



Detecting Unreported / Clandestine Fissile Material Production

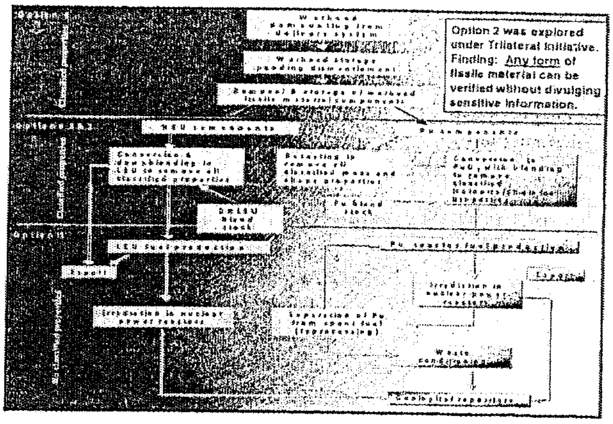
- Information reported by inspected State
- Information from Technical Cooperation
- Information provided by other States
- Open source information
- Satellite imagery
- Information collected by inspectors
- Environmental sampling (Security Concern)
- Inspector access (including managed access)



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

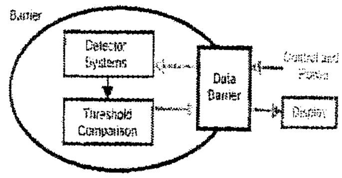
Commercial satellite imagery is used routinely in IAEA Safeguards – especially in preparation for complementary access visits.

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

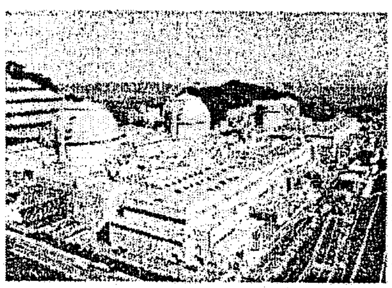
The FM(C)T and Nuclear Terrorism

- 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.