

Possible Options for International Management of Plutonium Stockpile

The 3rd Panel on Peace and Security of Northeast Asia (PSNA)
Workshop

“Responsibility and Role of Nuclear Powers
in Promoting International Peace and Security”

Moscow, May 31- June 1st, 2018

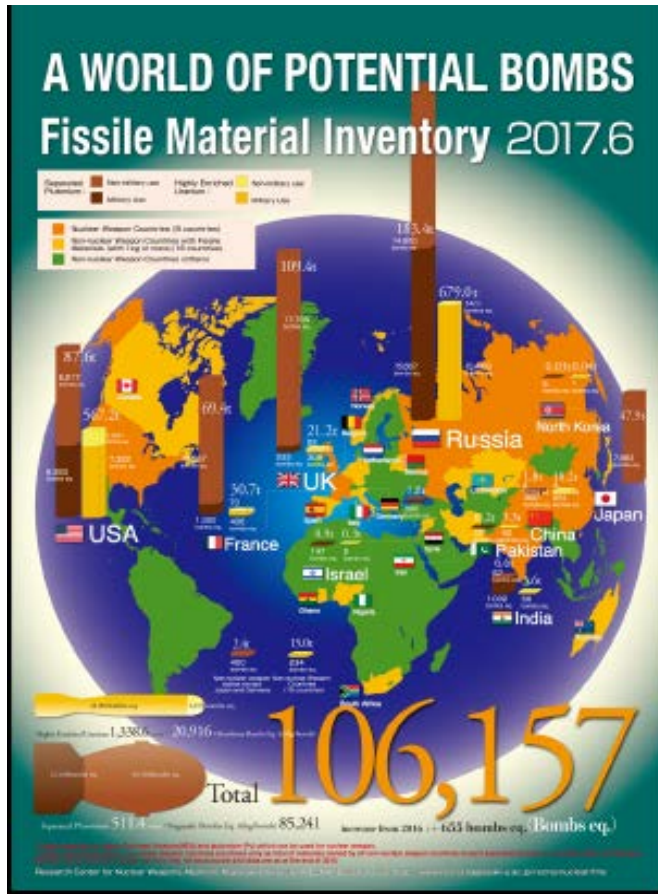
Dr. Tatsujiro Suzuki

Director, Professor

Research Center for Nuclear Weapons Abolition, Nagasaki
University(RECNA)

suzukitatsu@nagasaki-u.ac.jp

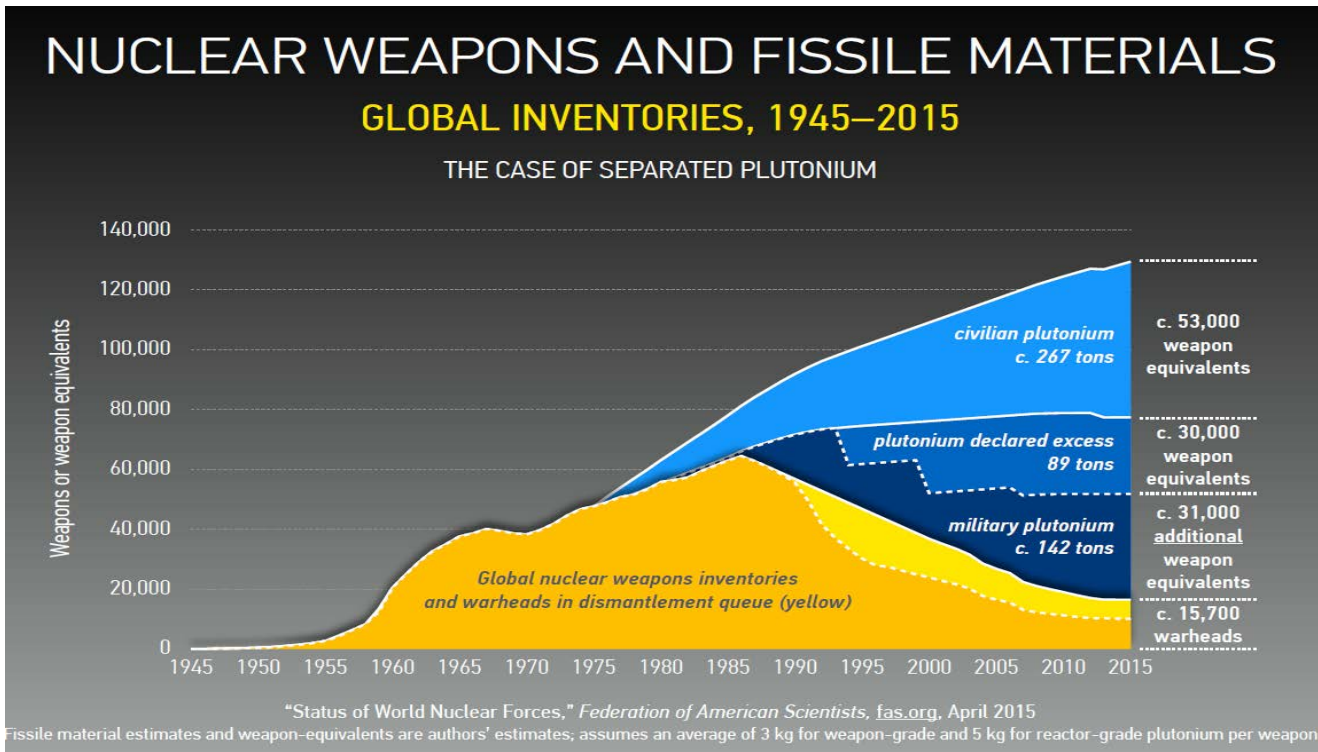
Global Fissile Materials Stockpile is increasing (2017.6)



- **Highly Enriched Uranium (HEU): 1,338.6 ton: ~ 20,916 Hiroshima bombs eq. (64kg/bomb)**
- **Plutonium (Pu): 511.4 ton: ~85,241 Nagasaki bombs eq.(6kg/bomb)**
- **TOTAL of 106,157 bombs eq. (+655 bombs eq. increase from 2016)**
- **Most of HEU stockpile is for military use and its total amount is decreasing.**
- **70% of Pu stockpile is for non-military use, and its stockpile is increasing due to reprocessing activities**
 - Especially, Japan's stockpile (48 tons) is outstanding among non-nuclear weapon states.

Source: RECNA, http://www.recna.nagasaki-u.ac.jp/recna/bd/files/fissile_material2017ENG.pdf

Global Stockpile of Separated Plutonium is increasing

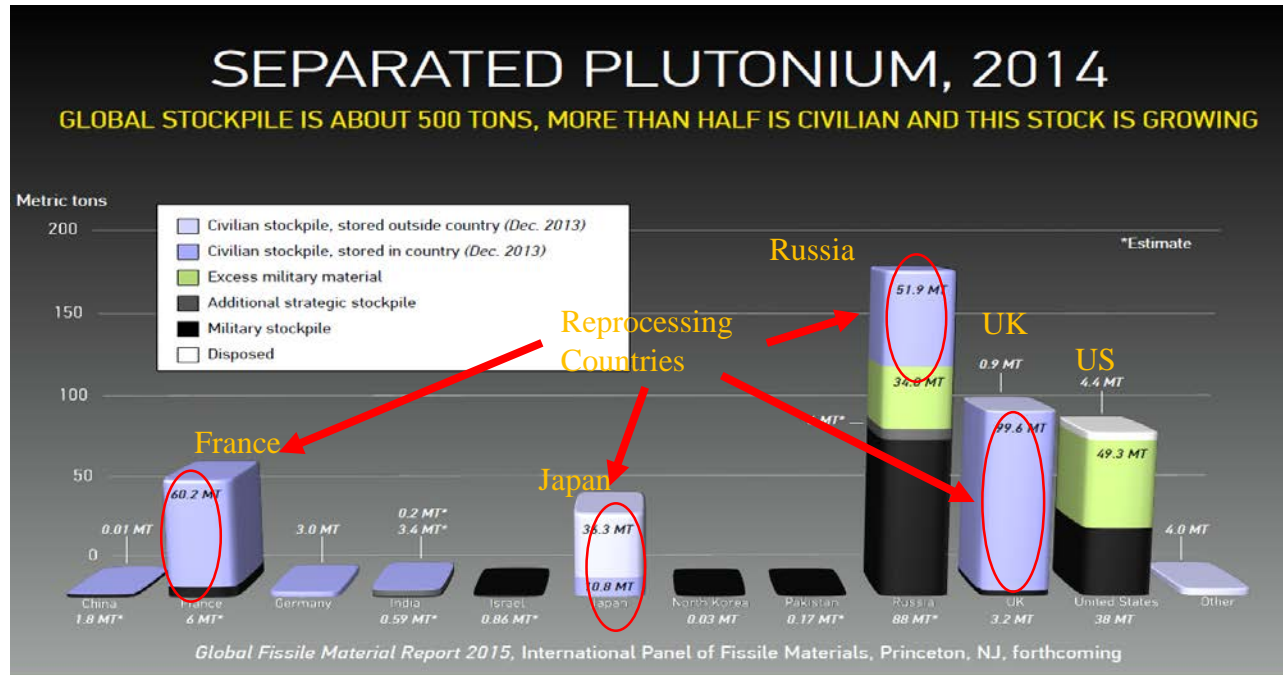


Source; Zia Mian, Alex Glazer, “Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Production,” presented at NPT Review Conference, May 8, 2015.

<http://fissilematerials.org/library/ipfm15.pdf>

*“We encourage States to **keep their stockpile of separated plutonium to the minimum level**, both as consistent with national requirements.” – 2014 the Hague Nuclear Security*

Four reprocessing countries have largest civilian plutonium stockpile



Source; Zia Mian, Alex Glazer, “Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Production,” presented at NPT Review Conference, May 8, 2015.

<http://fissilematerials.org/library/ipfm15.pdf>

“Mitigating Security Risks from Separated Plutonium: Some near term steps” by John Carlson(1)

Minimizing Stocks

- Committing to **keep separation (reprocessing) in balance with consumption**. Ensuring the rate of reprocessing output is consistent with the capacity to consume such output
- Considering mechanism and incentives to encourage states to declare surplus or “excess plutonium” (ex. If there is no plan to use plutonium within a defined period)
- **Such “excess plutonium” could be placed under IAEA control or could be made available for consumption elsewhere**
- Consider development of regional or multinational plutonium storage schemes
- Take appropriate actions for management and disposition of excess civilian and military plutonium

www.nti.org/media/documents/NTI_Paper_Mitigating_Security_Risks_FIN_AL-April2018.pdf

“Mitigating Security Risks from Separated Plutonium: Some near term steps” by John Carlson(2)

Mitigating Risks

- Thorough **review of technical, economic rationale for reprocessing**
- Commit to convert Pu into less sensitive forms
- Minimizing the number of sites
- Regularly review adequacy of security
- Avoid production of weapon-grade plutonium
- **Identify non-essential holdings of plutonium and undertake appropriate actions to deal with these** (as those for HEU)
- Encourage facilities already using plutonium (MOX) to use excess plutonium
- Place all civilian and excess military plutonium under IAEA safeguards
- **Discourage reprocessing and encourage direct disposal or interim storage under bilateral cooperation agreement**

www.nti.org/media/documents/NTI_Paper_Mitigating_Security_Risks_FINAL-April2018.pdf

Need a new “norm”: Possible Four Options

1. Enhanced transparency by strengthening International Plutonium Management Guideline (INFCIRC/549)
2. International Plutonium Storage (under the custody of IAEA) of “excess” plutonium
3. International cooperation on plutonium disposition
4. Moratorium and possible phase out of reprocessing.

1. Enhancing International Plutonium Management Guideline (INFCIRC/539)

- National Statement should include:
 - Specify “Demand” (consumption/disposition) for the next 3 years
 - Restrain “Supply” (reprocessing) up to the amount specified by the demand, including current stockpile
 - Define “excess” stockpile (beyond the quantity defined above)
 - Numbers should be in kg rather than tons (follow Japan)
 - Specify sites where separated plutonium is stored (follow Japan)
 - Include HEU stockpile if any
 - Review of national nuclear fuel cycle policy (cost, rationale, environmental impacts, safety etc.)

Plutonium Stockpile in Japan (as of the end of 2016)

	2016 (kg)	2015 (kg)
Stock in Japan (Pu total)		
Reprocessing Plants	4,359	4,359
MOX Fuel Plant	3,364	3,364
Stored at Reactors	3,109	3,109
Sub-total (Pu fissile)	9,844 (6,605)	10,832 (7,307)
Stocks in Europe (Pu total)		
UK	20,839	20,888
France	16,217	16,248
Sub-total :Pu total(Pu fissile)	37,056 (24,516)	37,115(24,574)
Total (Pu fissile)	46,900(31,121)	47,947(31,881)

Source: Japan Atomic Energy Commission (2017)
http://www.aec.go.jp/jicst/NC/about/kettei/170801_e.pdf

2. International Plutonium Storage

- Put plutonium under IAEA custody. Withdrawal of plutonium can be implemented only when its owner country can demonstrate such “demand”
- OPTION A: Storage of only “excess” civilian plutonium stockpile
- OPTION B: Storage of only ALL civilian plutonium stockpile
- OPTION C: Storage of ALL civilian and “excess” military stockpile

- Storage site:
 - In order to minimize transportation, it is better to keep plutonium in existing storage sites
 - Transfer such plutonium to final disposition place only when such plan is confirmed
 - Encourage nuclear weapon states to accept “excess” plutonium from non-nuclear weapon states

3. International Cooperation in plutonium disposition

Taking over (accepting) foreign-owned plutonium stockpile

- UK: Proposed to take ownership of foreign owned plutonium stored in UK in 2011.
 - *“the UK would be open to consider the merits of taking over ownership of that foreign plutonium and to manage with existing UK plutonium; any such change in ownership would need to be in compliance with inter-governmental agreements and subject to conclusion of acceptable commercial arrangements”* – “Management of the UK’s plutonium stocks: a consultation on the long-term management of UK owned separated civil plutonium”, February 2011.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/42766/1243-uk-plutonium-stocks.pdf
- France once agreed to take separated plutonium from commercial reprocessing contract with Taiwan (it was denied later by Taiwan government) in 2015. (“Taiwan tenders spent fuel reprocessing contract”, Shaun Burnie, with Mycle Schneider, March 18, 2015, http://fissilematerials.org/blog/2015/03/taiwan_tenders_spent_fuel.html)
- US accepted returning of Japan-owned plutonium from Fuel Critical Assembly (FCA) in 2014.
- International Cooperation on R&D of disposition of plutonium (non-MOX option).

4. Moratorium and possible phase-out of reprocessing

- Pugwash Council Statement (2015/11)
 - **Reprocessing to separate plutonium should end in all countries, including all nuclear weapon countries, whether for energy or weapon purposes.**
- Moratorium of reprocessing for civilian purposes
 - Only four countries (Russia, France, UK and Japan) are conducting civilian reprocessing— They could agree not to commit to further reprocessing until existing stocks will be reduced below “excess” amount
 - Negotiate to establish a new norm: Commitment to NO new reprocessing plants unless the demand for plutonium is proven by nuclear power plant owners.

REFERENCE

International plutonium management guideline (INFCIRC/549)

<https://www.iaea.org/sites/default/files/infcirc549.pdf>

- 9 States (Belgium, China, France, Germany, Japan, Russia, Switzerland, UK, US) established the Guidelines for management of plutonium.
- Policies for the Management of Plutonium
 - Consistent with its national decisions on nuclear fuel cycle which will ensure the peaceful use of the safe and permanent disposal of plutonium.
 - Strategy will take into account:
 - the need to avoid contributing to the risks of nuclear proliferation, especially during any period of storage before the plutonium is either irradiated as fuel in a reactor or permanently disposed of;
 - the need to protect the environment, workers and the public;
 - the resource value of the material, the costs and benefits involved and budgetary requirements
 - the importance of balancing supply and demand, including demand for reasonable working stocks for nuclear operations, as soon as practical.

International plutonium management guideline (INFCIRC/549)

<https://www.iaea.org/sites/default/files/infcirc549.pdf>

1. Occasional brief statements explaining its national strategy for nuclear power and the nuclear fuel cycle
 2. An annual statement, in the format set out at Annex B, of its holdings of all plutonium subject to these guidelines; and
 3. An annual statement, in the format set out in Annex C, of its estimate of the plutonium contained in its holdings of spent civil reactor fuel.
- It will be ready to join with them in reviewing these guidelines in the light of experience with their application and changing circumstances at an agreed time not less than five years after the date on which these guidelines are notified to the Director General of the Agency.