Semester 1 2022/2023
Sistem Pengawasan Nuklir (RN6086)
FMIPA ITB

# Sistem Pengawasan Nuklir (RN6086)

## Konsep 3S dan konsep dasar keamanan (security)

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# Sistem Pengawasan Nuklir

1. tekait tema pengawasan, juga tema keselamatan atau safety dan juga keamanan atau security fasilitas nuklir

**2.** Sinergitas konsep 3S safety, secuarity dan safeguard proses dan implementasinya,

**3.** konsep dasar depence in depth dari safety dan safeguard,

**4.** analisa desain basis dari konsep safety dan safeguard by design

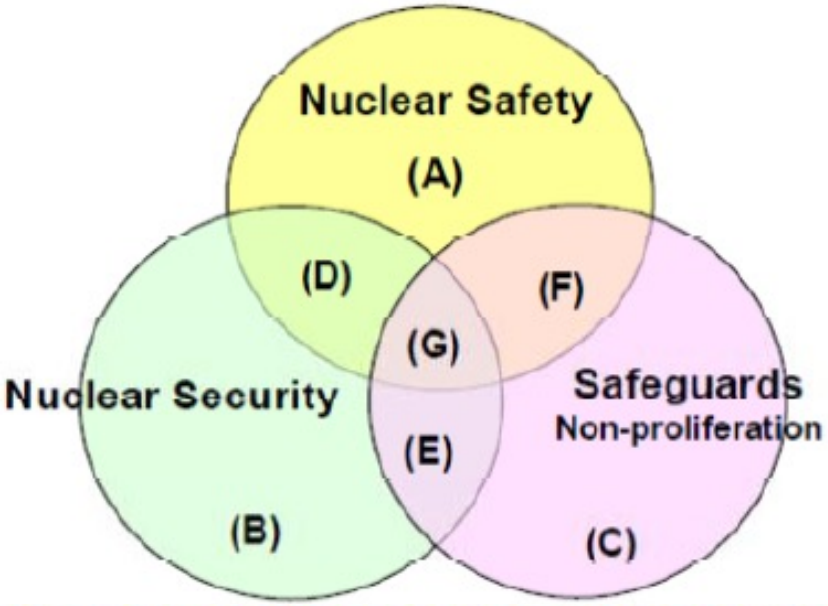
**5.** material nuklir terkait daur ulang bahan bakar, kuantitas materil nuklir terkait data

6. pelaporan khusunya material nuklir terkait uranium dan plutonium

7. konsep non proliferasi nuklir, pengetahuan mengenai protected plutonium proliferation

**8. K**onsep material attractiveness,

# Sinergisasi Konsep 3 S




(A) Emergency core cooling system for nuclear power plant, (B) Barrier at the facility entrance, (C) Authenticated apparatus
(D) Double-entry doors to keep negative pressure and prevent radioactive release
(E) Management of nuclear material using containment and surveillance and remote monitoring camera
(F) Management of nuclear material for criticality and accounting control
(G) Possible monitoring camera for multipurpose use, such as joint use of equipment

Figure 1 - A Venn diagram depiction of potential synergies among the 3Ss, with examples. (Courtesy of the IAEA, via blanket permission, from Suzuki et al., 2010)

Nuclear Security Science & Policy Institute
A Division of the Texas Engineering Experiment Station

SAFETY, SAFEGUARDS AND SECURITY IN INDIAN CIVIL NUCLEAR FACILITIES

# Konsep 3 S Nuklir

• Safety, Security, Safeguards as policy areas: forms of governance developed to manage risks connected to the use of nuclear technology.
• Action at different levels:
– Facility: Management, internal rules, practices –
National: Policies, regulatory framework
– International: treaties, cooperation agreeements, trade control regimes, IAEA


Sumber : Alberto Muti , **Nuclear Safety, Security and Safeguards, VERTIC**

# Nuclear Safety

"The achievement of proper operating conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards."

*IAEA Nuclear Safety Glossary*

## Nuclear Safety – International

Key International Agreements on Nuclear Safety:

- Convention on Nuclear Safety(1994)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997)
- Convention on Early Notification of a Nuclear Accident (1986)
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1986)
- IAEA supports the implementation of these treaties and encourages ratification
  - IAEA acts as coordination body for the implementation of these treaties
- IAEA supports improvements in Nuclear Safety in Member States
- IAEA Action Plan on Nuclear Safety (2011)
- IAEA Assistance

Sumber : Alberto Muti , **Nuclear Safety, Security and Safeguards, VERTIC**

# Nuclear Security

"The prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities."

*IAEA Nuclear Safety Glossary*

## Nuclear Security

- The youngest of the "Three S"
- Energised by changes in the international environment:
  - Disgregation of the former Soviet Union
  - 9/11 Attacks and "War on Terror"
- Since then, it has risen to prominence in international agenda – and profoundly changed as a concept
- Nuclear Security is a responsibility of the state
- "Original" nuclear security was physical protection: guards, gates and guns
  - Principles such as "Defence in Depth" and "Deter, Detect, Delay, Respond, Recover"
- Over time, the concept expanded to include the human elements of security:
  - Insider Threat
  - "Security Culture" among facility staff

Sumber : Alberto Muti , **Nuclear Safety, Security and Safeguards, VERTIC**

# Konsep Keamanan (Security)

## Nuclear Security – International

Key International initiatives on Nuclear Security:

- Cooperative Threat Reduction Programmes (1990s onwards)
- Global Partnership (G7-backed, 31 members, 2002)
- Nuclear Security Summits (2010-2016)
- US Partnership for Nuclear Security
- EU CBRN Centres of Excellence
- Convention on the Physical Protection of Nuclear Material (1980) + 2005 Amendment
- Code of Conduct on the Safety and Security of Radioactive Sources
- International Convention for the Suppression of Acts of Nuclear Terrorism (2007)
- UN Security Council Resolutions:

– 1373 (2001)
– 1540 (2004)

- Not all these instruments relate back to the IAEA – the international framework is more fragmented
- The IAEA has stepped up to provide a coordination and support role on nuclear security after 2001
- Key documents: Nuclear Security Plans, starting in 2003. Current plan is 2018-2021

Sumber : Alberto Muti , **Nuclear Safety, Security and Safeguards, VERTIC**

# Traditional safeguards

- Traditional safeguards use "material accountancy" and "containment and surveillance" to provide *timely detection* of diversion of *significant quantities* of nuclear material, and to *deter* such diversion by the *risk of detection*
- Significant quantities:
  - Pu or U233: 8 kg
  - HEU: 25 kg contained U-235
  - *Bombs can be made with less -- a key issue*
- Timeliness goal:
  - 1 month for unirradiated Pu or HEU (incl. MOX)
  - *Longer than estimated conversion time – another key issue*

Sumber : How IAEA Safeguards Work, Matthew Bunn IGA-232, Controlling the World's Most Dangerous Weapons, 20 September 2013, belfercenter.org/mta

# Material accountancy

***MUF*** (*M*aterial *U*naccounted *F*or) =

Beginning inventory + Additions to inventory - Ending inventory - Removals from inventory

- Because of measurement uncertainties, all bulk facilities have some MUF – but does it mean a real loss?
  - **σMUF** -- standard deviation of MUF -- is measurement precision
  - If MUF > than some threshold level -- usually 3 σMUF -- IAEA rejects the hypothesis that real MUF is zero, investigates possibility that diversion has occurred
- For item facility (e.g., LWR), MUF=0 unless something is missing

*These days MUF sometimes called "inventory difference" or ID*

Sumber : How IAEA Safeguards Work, Matthew Bunn IGA-232, Controlling the World's Most Dangerous Weapons, 20 September 2013, belfercenter.org/mta

# International accountancy standards

| Facility Type | Relative STD (%) |
|---|---|
| Uranium enrichment | 0.2 |
| Uranium fabrication | 0.3 |
| Plutonium reprocessing | 1.0 |
| Plutonium fabrication | 0.5 |
| Scrap store | 4.0 |
| Waste store | 25.0 |

*Source: IAEA Inspector Training Course*

Sumber : How IAEA Safeguards Work, Matthew Bunn IGA-232, Controlling the World's Most Dangerous Weapons, 20 September 2013, belfercenter.org/mta

# Containment and surveillance

- Containment and surveillance complements material accountancy by (a) detecting unusual activities, (b) confirming there has been no removal of material from measured, sealed containers
- Typical measures include:
  - Surveillance cameras
  - Tamper-resistant seals (which will be broken if sealed item is opened)
  - Tamper-resistant tags (uniquely identify particular measured items)
- What happens when cameras go out, seals break? Often, re-inspection required
- Clearly, containment and surveillance contribute to safeguards confidence – but no one has come up with a way to measure how much better accountancy is with containment and surveillance added

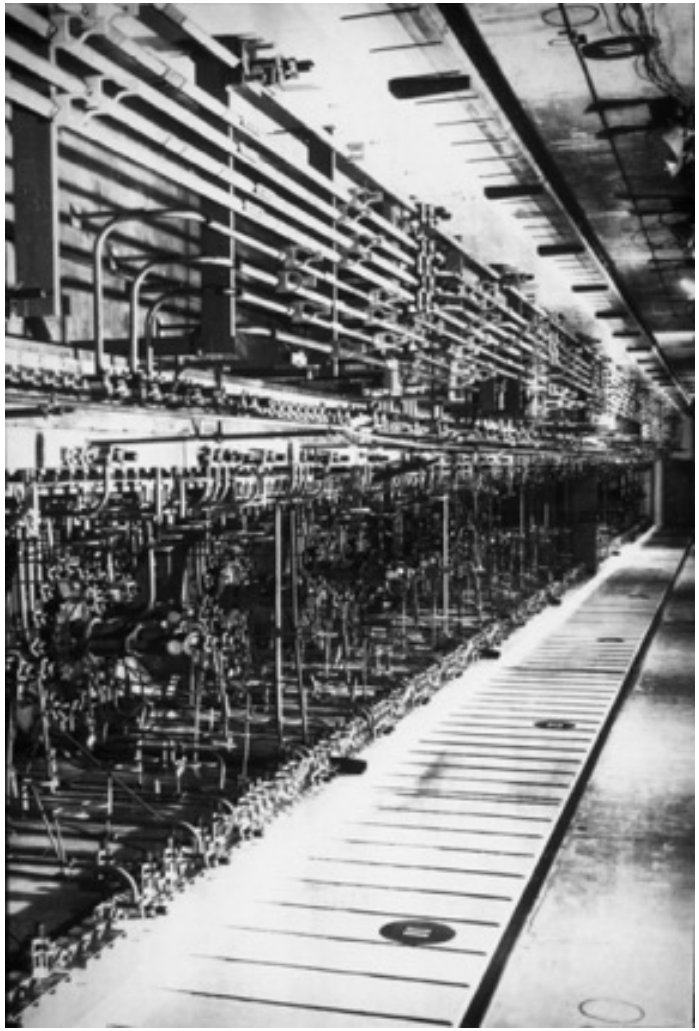
Sumber : How IAEA Safeguards Work, Matthew Bunn IGA-232, Controlling the World's Most Dangerous Weapons, 20 September 2013, belfercenter.org/mta

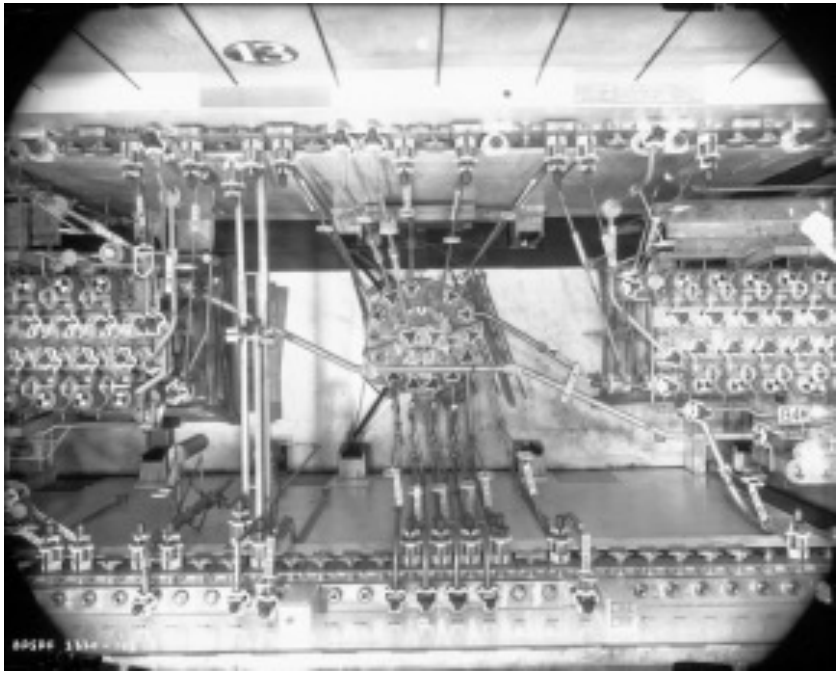
# Safeguarding a reprocessing plant

- Large commercial plant: 800 MTHM/yr, ~8 tPu/yr
- 1 close-out for measured inventory/yr
- 1% uncertainty ≈ 80 kg Pu
- If only challenge if MUF>3 σMUF □ 240 kg Pu
- Also, can't meet timeliness goal with 1 inventory/yr
- Partial solutions:
  - Comprehensive transparency and containment and surveillance throughout plant – monitor all flows, detect all unusual activity
  - Near-real-time accountancy – much more frequent partial measurements of material in process, with statistical models designed to detect both abrupt and protracted diversions

Sumber : How IAEA Safeguards Work, Matthew Bunn IGA-232, Controlling the World's Most Dangerous Weapons, 20 September 2013, belfercenter.org/mta

# Reprocessing plant piping





*Sources: DOE*

Sumber : How IAEA Safeguards Work, Matthew Bunn IGA-232, Controlling the World's Most Dangerous Weapons, 20 September 2013, belfercenter.org/mta

# Example: some failures in Iran

- 18-year centrifuge program undeclared, undetected by traditional safeguards
- Iran imported 100s of kgs of U from China without reporting it – no detection for > a decade
- Iran converted 100s of kgs of U to metal – no reporting, no detection, for years
- Iran conducted centrifuge tests with UF6, lied to the IAEA in saying it had not done so, was detected years later
- Traditional safeguards only designed to monitor *declared* activities – little capability to address *secret* activities
- *However,* once *other* sources informed IAEA of what was happening, IAEA has done a very professional job at peeling back successive layers of Iranian lies

Sumber : **Capacity Building For Safeguards : Some Perspectives,** MANAGING THE DEVELOPMENT OF NATIONAL INFRASTRUCTURE FOR NUCLEAR POWER Vienna 9 - 12 February 2010

# Safeguards technologies: A wide range

TABLE 7: VERIFICATION MEASUREMENT METHODS FOR ON-SITE IAEA ANALYTICAL LABORATORIES

| PROCESS AREA | SAMPLING POINT | INSTRUMENT OR METHOD | CONCENTRATION MEASUREMENT | SAMPLE FRACTION | GOAL ACCURACY |
|---|---|---|---|---|---|
| HEAD END | INPUT TANK | HYBRID K-EDGE DENSITOMETER (HKEDG) | Pu<br>U | 100 %<br>50 % | ≤ 1 %<br>≤ 0.5 % |
| SEPARATION | BUFFER/FEED TANKS | ISOTOPE DILUTION MASS SPECTRO-METRY (IDMS) | Pu<br>U | 25 %<br>2 % | ≤ 0.2 %<br>0.2 % |
| SEPARATION | SCRUB AND WASTE TANKS | Pu(VI) SPECTRO-PHOTOMETRY | Pu | < 20 % | ≤ 25 % |
| Pu PURIFICATION | COLLECTION AND FEED TANKS | HKEDG<br>IDMS | Pu<br>Pu | 50 %<br>≤ 10 % | 1 %<br>≤ 0.2 % |
| | PuN TANKS | KEDG<br>IDMS | Pu<br>Pu | 25 - 100 %<br>10 - 90 % | 0.2 %<br>0.1 % |
| | WASTE TANKS | Pu(VI) SPECTRO-PHOTOMETRY | Pu | < 10 % | ≤ 25 % |
| U PURIFICATION | UN TANKS | K-EDGE DENSITOM-ETER (KEDGG) | U | ≤ 10 % | 0.2 % |
| | $UO_3$ CANS<br>$UO_3$ CANNING | NDA (MEASURE-MENTS MADE IN PLANT)<br>KEDG | U<br>U | ≤ 10 %<br>1 % | < 5 %<br>0.2 % |
| MOX CONVERSION | U, Pu N TANKS | KEDG | U<br>Pu | < 10 %<br>50 % | 0.2 %<br>0.2 % |
| | | IDMS | Pu | 20 % | ≤ 0.2 % |
| | MOX CANISTERS | NDA (MEASURE-MENTS MADE IN PLANT) | Pu | 100 % | 1 % |
| | MOX CANNING | KEDG | Pu | 25 % | ≤ 0.2 % |

*Source: Shea et al., "Safeguarding Reprocessing Plants,"* JNMM, 1993

Sumber : **Capacity Building For Safeguards : Some Perspectives,** MANAGING THE DEVELOPMENT OF NATIONAL INFRASTRUCTURE FOR NUCLEAR POWER Vienna 9 - 12 February 2010

# Different steps, different safeguards

| Fuel cycle step | Current safeguards | Future safeguards? |
|---|---|---|
| U mining and milling | Essentially none | Declarations + |
| U conversion | Covered; limited accountancy | Full accountancy |
| Enrichment | In-depth safeguards | Flow monitoring |
| LEU fuel fabrication | Covered; limited effort | Covered; limited effort |
| Power reactor operation | Covered; limited effort | Neutrino detection |
| Research reactors | Covered; limited effort | Increased effort |
| Spent fuel storage -- pool | Covered; limited effort | Remote monitoring |
| Spent fuel storage -- cask | Covered; v. limited effort | Remote monitoring |
| Reprocessing | In-depth safeguards--challenge | Still a challenge |
| Pu storage | In-depth safeguards | Remote monitoring |
| MOX fuel fabrication | In-depth safeguards--chalenge | Still a challenge |
| Spent fuel disposal | Not operational | Unmanned monitors |
| HLW disposal | Termination of safeguards | Termination of safeguards |

Sumber : **Capacity Building For Safeguards : Some Perspectives,** MANAGING THE DEVELOPMENT OF NATIONAL INFRASTRUCTURE FOR NUCLEAR POWER Vienna 9 - 12 February 2010

# The Threat Is Real

- Terrorists have stated their desire to use nuclear weapons.
- Acquiring weapons-useable nuclear material is the key step in constructing a nuclear weapon.
- Weapons-usable nuclear material exists at hundreds of sites in 25 countries.
- Not all sites are well secured against terrorists or criminals and nuclear security is only as strong as the weakest link.
- Once a terrorist has acquired weapons-useable nuclear materials, countermeasures have limited effectiveness

Sumber : Introduction to Nuclear Security https://www.nti.org

# Konsep Keamanan (Security)

## Security Lapses Continue

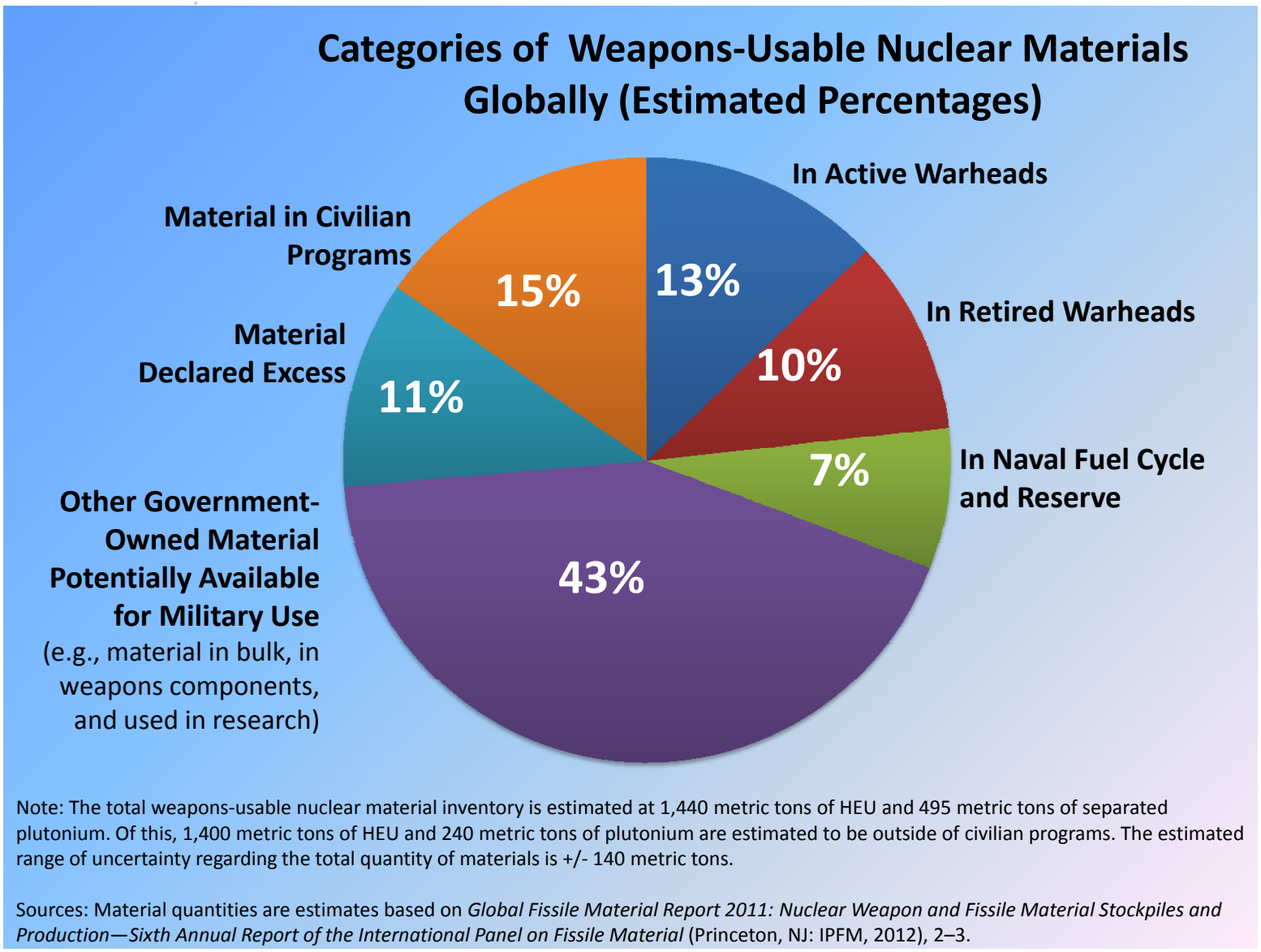
• Overthelast20years,therehavebeen1000sof nuclear smuggling incidents, of which ~ 20 involved highly enriched uranium or plutonium.
• It'slikelythatmanymorecaseswereundetected.
• Therehavebeennumerouslapsesinsecurity that, under different circumstances, could have been catastrophic:
– Y-12 (U.S.) security breach (2012)
– Pelindaba (South Africa) break-in (2007)
– Kurchatov Institute (Russia) accounting problem (2001)

## Global Nuclear Security System

• Nuclear security is historically viewed as the sovereign responsibility of individual states.
• Each country's regulatory systems were often developed independently.
– Often variable
• There is no comprehensive global system for tracking, protecting, and managing nuclear materials in a way that builds confidence.
– The existing international system is a patchwork of agreements, guidelines, and multilateral engagement mechanisms.
– It encompasses only civilian materials (15% of total weapons- useable nuclear materials).

Sumber : Introduction to Nuclear Security https://www.nti.org

# Konsep Keamanan (Security)




Note: The total weapons-usable nuclear material inventory is estimated at 1,440 metric tons of HEU and 495 metric tons of separated plutonium. Of this, 1,400 metric tons of HEU and 240 metric tons of plutonium are estimated to be outside of civilian programs. The estimated range of uncertainty regarding the total quantity of materials is +/- 140 metric tons.

Sources: Material quantities are estimates based on *Global Fissile Material Report 2011: Nuclear Weapon and Fissile Material Stockpiles and Production—Sixth Annual Report of the International Panel on Fissile Material* (Princeton, NJ: IPFM, 2012), 2–3.

Sumber : Introduction to Nuclear Security https://www.nti.org

# IAEA's Security Role

- The principle objective is to"accelerate and enlarge the contribution of atomic energy..."
- It administers a *safeguards* system to detect diversion for military purposes.
- Nuclear *security* is a relatively new mission.
- IAEA develops nuclear security guidelines and provides numerous nuclear security advisory services.
- The scope of responsibility is *civilian* materials, largely outside the five nuclear weapons states

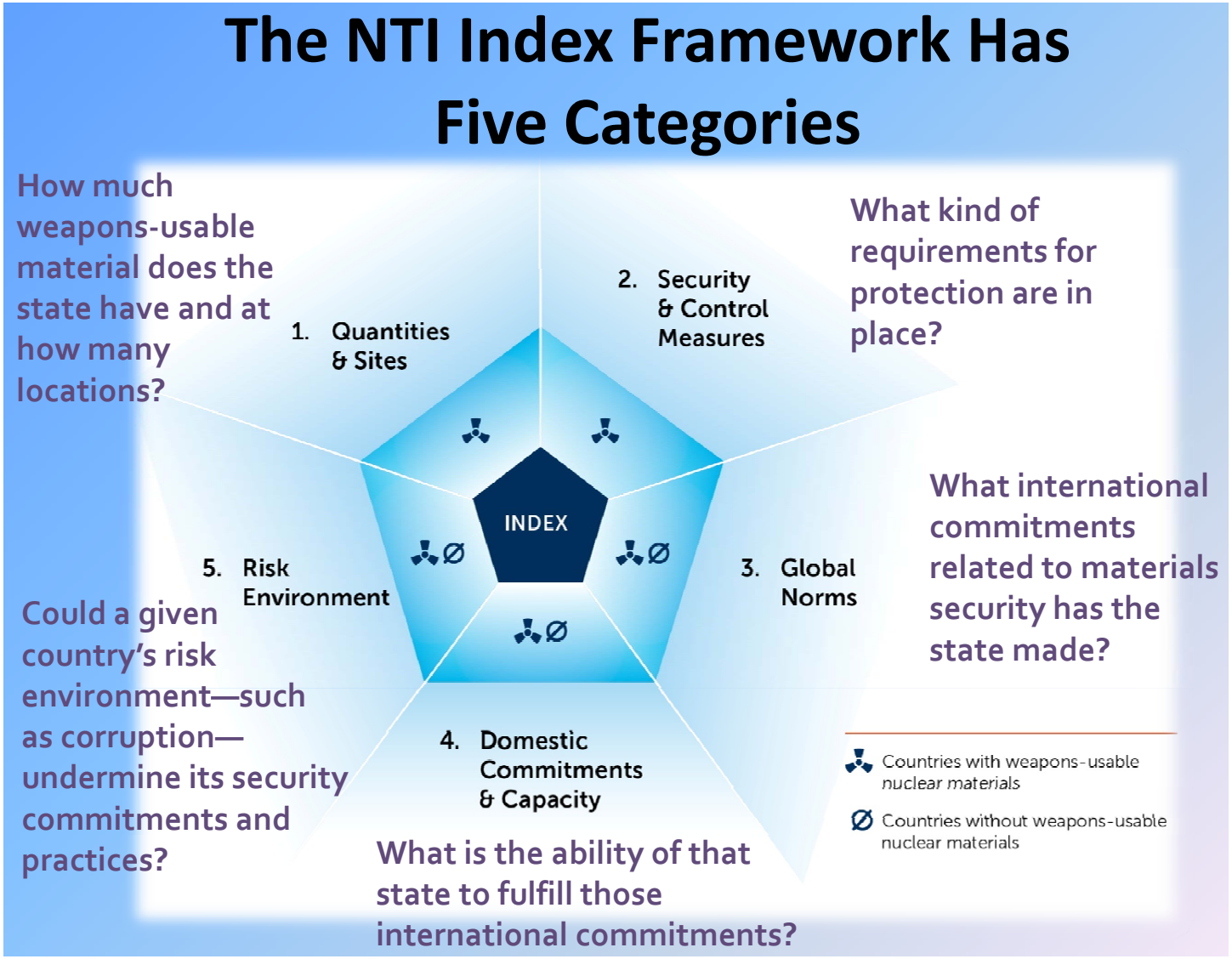
## Summary and Discussion

- Nuclear security is a cornerstone of preventing nuclear terrorism.
- An attack anywhere would be an attack everywhere.
- Currently, nuclear materials security largely depends on actions by individual states.
- A comprehensive global system is needed to provide confidence in each state's materials security.

Sumber : Introduction to Nuclear Security https://www.nti.org

# Konsep Keamanan (Security)

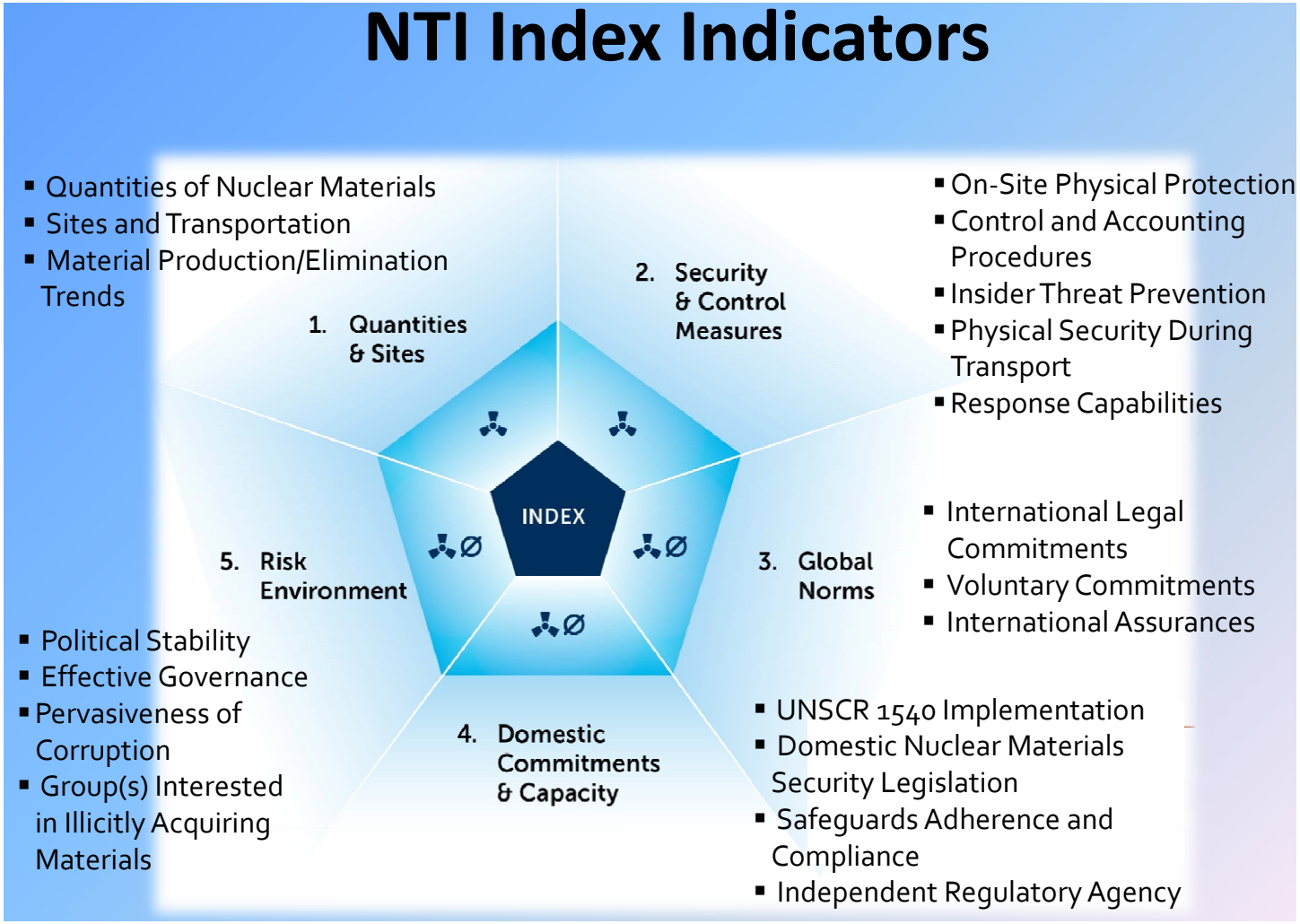
## NTI Nuclear Materials Security Index (NTI Index)




Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

# Konsep Keamanan (Security)

## NTI Nuclear Materials Security Index (NTI Index)




Sumber : Alberto Muti , **Nuclear Safety, Security and Safeguards, VERTIC**

## NTI Nuclear Materials Security Index (NTI Index)

# Country Scores and Rankings (2014)

| OVERALL SCORE | | | | 1) QUANTITIES AND SITES | | | | 2) SECURITY AND CONTROL MEASURES | | | | 3) GLOBAL NORMS | | | | 4) DOMESTIC COMMITMENTS AND CAPACITY | | | | 5) RISK ENVIRONMENT | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rank / 25 | | Score / 100 | Δ | Rank / 25 | | Score / 100 | Δ | Rank / 25 | | Score / 100 | Δ | Rank / 25 | | Score / 100 | Δ | Rank / 25 | | Score / 100 | Δ | Rank / 25 | | Score / 100 | Δ |
| 1 | Australia | 92 | +2 | =1 | Argentina | 100 | +5 | 1 | United States | 98 | – | =1 | Australia | 100 | +8 | =1 | Australia | 100 | – | 1 | Norway | 100 | +13 |
| 2 | Canada | 88 | +6 | =1 | Australia | 100 | +5 | =2 | Canada | 93 | +10 | =1 | France | 100 | +17 | =1 | Belgium | 100 | – | 2 | Japan | 86 | -1 |
| 3 | Switzerland | 87 | – | 3 | Uzbekistan | 95 | +5 | =2 | United Kingdom | 93 | – | =1 | Russia | 100 | – | =1 | Germany | 100 | – | 3 | Canada | 83 | – |
| 4 | Germany | 85 | +3 | 4 | Iran | 89 | – | =4 | Belarus | 90 | +12 | =1 | United Kingdom | 100 | – | =1 | Italy | 100 | – | 4 | Switzerland | 82 | +1 |
| 5 | Norway | 83 | +1 | =5 | Belarus | 84 | – | =4 | France | 90 | – | =5 | Canada | 94 | +17 | =1 | Japan | 100 | +27 | 5 | Australia | 79 | – |
| 6 | Poland | 82 | +1 | =5 | Poland | 84 | +6 | =6 | Germany | 88 | +10 | =5 | Germany | 94 | – | =1 | Netherlands | 100 | – | 6 | Netherlands | 78 | – |
| =7 | France | 81 | +2 | 7 | Norway | 83 | -5 | =6 | Switzerland | 88 | – | =7 | Belgium | 88 | +9 | =1 | Norway | 100 | – | 7 | Germany | 77 | +1 |
| =7 | Netherlands | 81 | – | 8 | South Africa | 79 | +6 | 8 | Australia | 86 | – | =7 | China | 88 | +5 | =1 | Poland | 100 | – | =8 | Belgium | 75 | – |
| 9 | Belarus | 80 | +5 | 9 | Italy | 73 | – | =9 | Kazakhstan | 80 | – | =7 | Kazakhstan | 88 | +6 | =1 | South Africa | 100 | – | =8 | France | 75 | -1 |
| 10 | Belgium | 79 | +7 | 10 | Switzerland | 72 | – | =9 | Russia | 80 | – | =7 | Netherlands | 88 | – | =1 | Switzerland | 100 | – | =10 | Poland | 74 | – |
| =11 | United Kingdom | 77 | -1 | 11 | Canada | 67 | – | 11 | Japan | 79 | +3 | =7 | Switzerland | 88 | – | =11 | Canada | 96 | – | =10 | United States | 74 | – |
| =11 | United States | 77 | -1 | =12 | Belgium | 62 | +6 | 12 | Netherlands | 78 | +5 | 12 | Japan | 85 | – | =11 | France | 96 | – | 12 | United Kingdom | 69 | -2 |
| =13 | Argentina | 76 | +4 | =12 | Germany | 62 | – | 13 | Poland | 74 | – | 13 | United States | 83 | – | =11 | Kazakhstan | 96 | – | 13 | Argentina | 61 | – |
| =13 | Japan | 76 | +6 | =12 | Netherlands | 62 | -5 | 14 | Belgium | 73 | +17 | =14 | Poland | 82 | – | =11 | United Kingdom | 96 | – | =14 | Belarus | 58 | +6 |
| 15 | Kazakhstan | 73 | – | 15 | North Korea | 60 | – | 15 | China | 72 | – | =14 | Uzbekistan | 82 | +14 | =15 | Argentina | 92 | – | =14 | South Africa | 58 | -2 |
| 16 | South Africa | 71 | -1 | 16 | Kazakhstan | 57 | -6 | 16 | Italy | 68 | – | 16 | Argentina | 80 | +22 | =15 | Belarus | 92 | – | 16 | Israel | 55 | – |
| 17 | Italy | 70 | -1 | 17 | Israel | 44 | – | 17 | Norway | 67 | – | 17 | Norway | 73 | – | =17 | Russia | 89 | – | 17 | Italy | 51 | -1 |
| =18 | Russia | 66 | – | =18 | China | 34 | – | 18 | South Africa | 64 | – | 18 | India | 71 | +6 | =17 | United States | 89 | -3 | 18 | North Korea | 42 | – |
| =18 | Uzbekistan | 66 | +5 | =18 | France | 34 | – | =19 | Argentina | 59 | – | 19 | Belarus | 68 | – | 19 | Uzbekistan | 88 | – | 19 | China | 38 | +2 |
| 20 | China | 64 | +1 | =20 | Russia | 23 | – | =19 | Israel | 59 | – | 20 | Pakistan | 63 | – | 20 | Pakistan | 85 | – | 20 | Kazakhstan | 37 | – |
| 21 | Israel | 57 | +2 | =20 | United States | 23 | – | 21 | Uzbekistan | 51 | +4 | 21 | Italy | 58 | – | 21 | China | 81 | – | 21 | Iran | 35 | +1 |
| 22 | Pakistan | 46 | +3 | =22 | India | 22 | – | 22 | North Korea | 43 | – | 22 | South Africa | 57 | -5 | 22 | Israel | 66 | – | 22 | India | 32 | – |
| 23 | India | 41 | +1 | =22 | Japan | 22 | – | =23 | Iran | 40 | – | 23 | Israel | 55 | +8 | 23 | India | 47 | – | 23 | Uzbekistan | 24 | – |
| 24 | Iran | 39 | – | =22 | Pakistan | 22 | – | =23 | Pakistan | 40 | +9 | 24 | Iran | 18 | – | 24 | Iran | 19 | – | 24 | Russia | 21 | – |
| 25 | North Korea | 30 | – | 25 | United Kingdom | 11 | – | 25 | India | 37 | – | 25 | North Korea | 0 | – | 25 | North Korea | 4 | – | 25 | Pakistan | 19 | +6 |

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

# Konsep Keamanan (Security)

## NTI Nuclear Materials Security Index (NTI Index)

### Example Country Profile: Netherlands

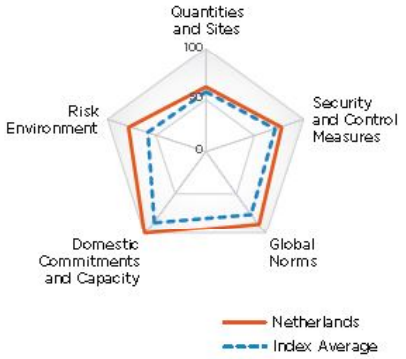
NETHERLANDS

| | Score / 100 | Δ Score | Rank / 25 |
|---|---|---|---|
| OVERALL SCORE | 81 | - | =7 |
| Quantities and Sites | 62 | 5 | –12 |
| Security and Control Measures | 78 | +5 | 12 |
| Global Norms | 88 | | –7 |
| Domestic Commitments and Capacity | 100 | | –1 |
| Risk Environment | 78 | | 6 |

=denotes tie in rank

Δ denotes change in score between 2012 and 2014

Scores are normalized (0-100, where 100=most favorable nuclear materials security conditions)




**ABOVE AVERAGE (Indicator scores greater than 66)**

Quantities and Sites
- Sites and Transportation
- Material Production / Elimination Trends

Security and Control Measures
- On site Physical Protection
- Control and Accounting Procedures
- Response Capabilities

Global Norms
- International Legal Commitments
- Voluntary Commitments

Domestic Commitments and Capacity
- UNSCR 1540 Implementation
- Domestic Nuclear Materials Security Legislation
- Safeguards Adherence and Compliance
- Independent Regulatory Agency

Risk Environment
- Political Stability
- Effective Governance
- Pervasiveness of Corruption

**AVERAGE (Indicator scores between 34 and 66)**

Quantities and Sites
- Quantities of Nuclear Materials

Security and Control Measures
- Insider Threat Prevention
- Physical Security During Transport

Global Norms
- International Assurances

Risk Environment
- Group(s) Interested in Illicitly Acquiring Materials

**BELOW AVERAGE (Indicator scores less than 34)**

**Synopsis**:

Overall excellence—biggest challenges is materials quantities.

Opportunities to improve in:

- Security during transport
- Insider threat prevention
- International assurances
- Reducing materials quantities

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

**NTI Nuclear Materials Security Index (NTI Index)**

# Key Index Findings

- Governments are more aware of the threat and are engaged.
- The consensus on priorities is lacking.
- The lack of openness impedes confidence and accountability.
- Several states are more vulnerable to insider threats.
- Stocks of weapons-usable nuclear materials continue to increase.
- More states could eliminate their stocks.
- Many states lag on joining international agreements

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

# Recommendations

– Reach consensus on the key principles of a global system
•Cover all weapons-usable materials, military and civilian
•Apply international standards and best practices
•Build confidence and accountability
– Become parties to nuclear security treaties
– Strengthen voluntary mechanisms
– Secure military and other non-civilian materials to same or higher standards as civilian materials

• **Each country**:
•– Decrease stocks of weapons-usable nuclear materials
•– Improve measures to protect weapons-usable nuclear materials from theft
•– Establish and strengthen independent regulatory agencies
•– Deliver on Nuclear Security Summit commitments

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

# Konsep Keamanan (Security)

## Convention for the Physical Protection of Nuclear Material (CPPNM)

Binding treaty requiring states to apply **physical protection measures** to nuclear material, primarily during **international transportation**.

**2005 Amendment** expanded the CPPNM's scope to require protection of nuclear materials in **use, storage, and domestic transit, and protection of nuclear facilities from sabotage**

## IAEA Fundamental Principles

A set of principles adopted by the IAEA Board of Governors and meant as a step toward **strengthening the physical security regime** and **promoting the effective implementation and improvement** of physical protection worldwide. They have been incorporated into the 2005 Amendment to the CPPNM

## Safeguards and Nuclear Material Accounting

IAEA safeguards agreements require states to apply **standard nuclear material accounting systems**. All states with nuclear material (except NK) have safeguards agreements in place, though **coverage depends on whether a state is a NWS, a NNWS, or non-NPT state**

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

# Konsep Keamanan (Security)

## Nuclear Suppliers Group (NSG)

The NSG was established to ensure that suppliers apply a **uniform approach to nuclear and nuclear-related exports and dual-use items**. NSG guidelines aim to ensure that peaceful nuclear trade does not contribute to proliferation of nuclear weapons. **Suppliers should authorize transfers of trigger list items only where those items will be subject to safeguards**. Guidelines also state that recipients should have physical security measures in place

## Nuclear Security Summits

Brings together government leaders from states around the world to **focus high-level attention on the threat of nuclear terrorism**. The summit produces a communiqué identifying priority areas. At the close of the 2010 Summit, more than 60 national commitments were made, over 80% of which were achieved by the 2012 Summit. At the 2012 Summit, over 100 commitments were made. The next summit will be held in 2014

## G8 Global Partnership

A 2002 G8 initiative committed to **preventing terrorists from acquiring or developing WMD**. G8 countries pledged $20 billion over the first 10 years to fund projects to **secure and dismantle WMD stockpiles** in Russia. Since then the Global Partnership has successfully implemented numerous projects, including outside Russia. The G8 extended the GP for another ten years. Its informal nature allows countries to **match resources to specific projects**

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

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**Global Initiative to Combat Nuclear Terrorism (GICNT)**

The GICNT provides another **informal mechanism for state cooperation**. Its mission is to **strengthen global capacity** to prevent, detect, and respond to nuclear terrorism. Partner nations conduct **multilateral activities, workshops, table-top exercises, and field exercises**

**Proliferation Security Initiative (PSI)**

An informal grouping of states that have joined together to **prevent trafficking by detecting and intercepting WMD and WMD-related materials**. Countries commit to strengthen national legal authorities to facilitate interdiction, develop procedures to facilitate exchange of information, and take specific actions in support of interdiction efforts. **Shipboarding agreements** give parties permission to board vessels sailing under the other parties' national flag. Several high-profile successes in interdicting or turning back WMD-related shipments have been attributed to PSI.

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

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**IAEA Nuclear Security Advisory Services**

Although the IAEA's mandate is limited to safeguards, recognizing that it has the **technical knowledge and experience** to provide advice and assistance in the security area, the **IAEA provides advisory services**. These services include missions, evaluations, and technical services to **help requesting states assess their nuclear security needs** and **improve their capabilities** for securing nuclear material

**World Institute for Nuclear Security (WINS)**

An organization whose purpose is to provide a **forum for nuclear security professionals to share and promote best security practices**. Best practice exchanges can be a valuable tool to enable rapid and dynamic improvements for facilities' security implementation. WINS produces **best practices guides**, including **self-assessment tools**, and is **developing accreditation and training** for nuclear security professionals. WINS is also **developing peer review** offerings.

Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

# Konsep Keamanan (Security)

**Existing Nuclear Security System**

| AGREEMENTS AND GUIDELINES | MULTILATERAL ENGAGEMENT MECHANISMS | IMPLEMENTATION SERVICES |
|---|---|---|
| • CPPNM<br>• 2005 Amendment<br>• ICSANT<br>• UNSCR 1540<br>• INFCIRC/225/Rev. 5<br>• IAEA Fundamental Principles<br>• Safeguards and accounting<br>• Nuclear Suppliers Group (NSG) guidelines | • Nuclear Security Summit<br>• G8 Global Partnership<br>• GICNT<br>• Proliferation Security Initiative (PSI) | • IAEA Advisory Services<br>— IPPAS<br>— INSServ<br>— Others<br>• World Institute for Nuclear Security (WINS) |



Sumber : Introduction to Nuclear Security, Nuclear Threat Initiative, www.nti.org

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# $^{232}$Thank YoU$^{238}$

# TeriMA Kasih

# Merci

**Sidik Permana**

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