THE CENTER
FOR ARMS CONTROL
AND NON-PROLIFERATION

2012 NSS: Safety-Security & DPRK

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I. SAFETY IN 2012 NSS?

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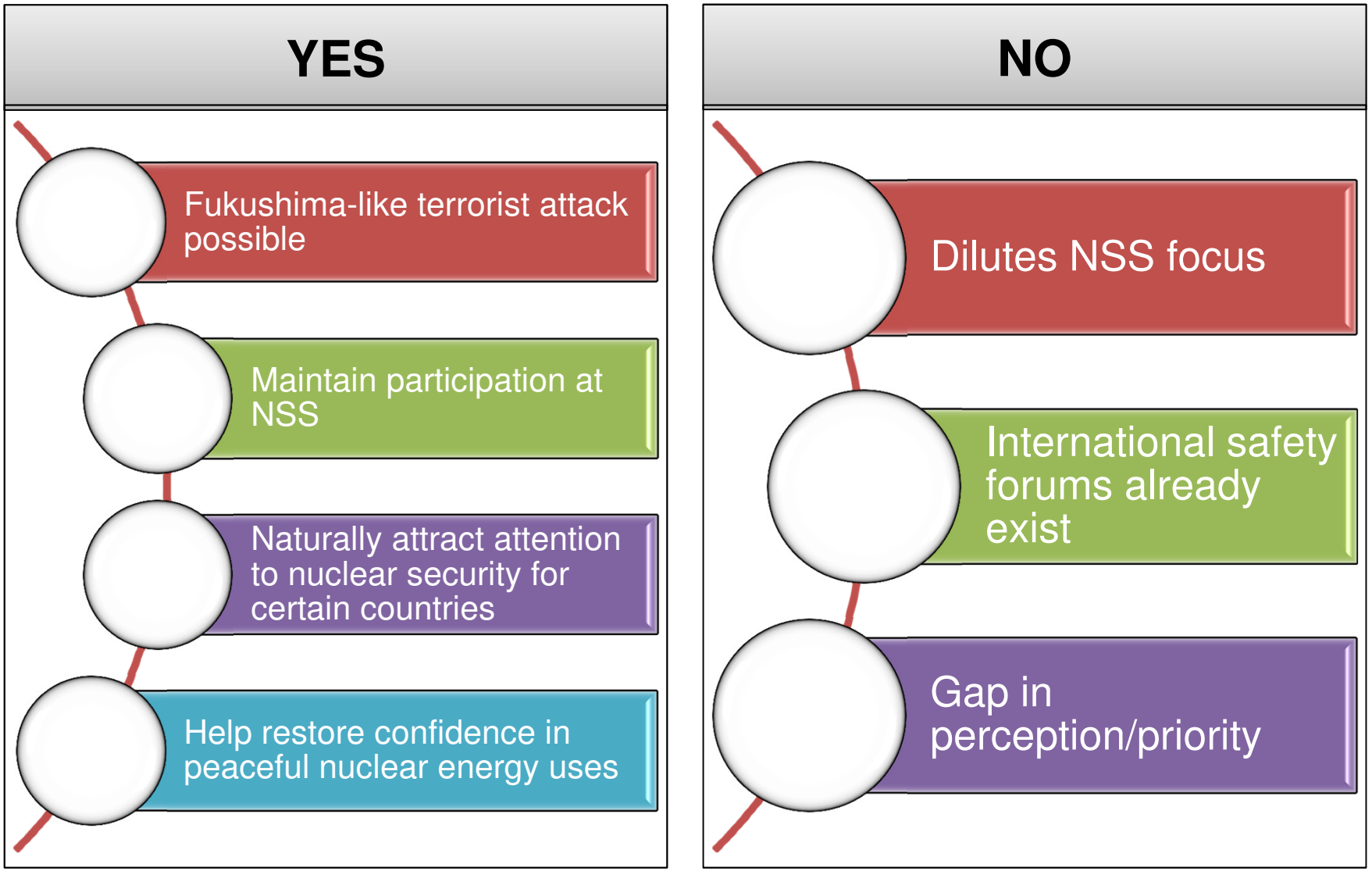

NUCLEAR SAFETY

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"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

- Concept of in reverse proportion to a degree of "risk."
- *Risk* – "summation of event consequences in which a specified consequence is a product of the probability of occurrence of an event and a measure of the consequence of that event." (IAEA)

***Severe accident*:** involves significant core degradation and destruction of safety features beyond the standard a plant was designed to withstand.

- Improper cool down → reactor melt down → radiation release (Fukushima).
- Defence in depth helps prevent severe accident and mitigate radiation release.

DEFENCE IN DEPTH (SAFETY)

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"Consists in a hierarchical deployment of different levels of equipment and procedures in order to maintain the effectiveness of physical barriers placed between radioactive materials and workers, the public or the environment, in normal operation, anticipated operational occurrences and, for some barriers, in accidents at the plant."

- Fundamental to the safety of nuclear facilities, which refers to the multiple layers of protection of both the public and workers.
- Strategy: placing priority on accident prevention, and if it fails, on consequence mitigation.
- Lack of sufficient understanding regarding the nature of accidents could be the very cause of accidents from human error.

DEFENCE IN DEPTH (SAFETY)

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1979 Three Mile Island

- Severe core meltdown.
- Helped identify and eliminate possible weaknesses in defence in depth.
- Demonstrated the importance of human factors, or the human-machine interface.

1986 Chernobyl

- Showed possible consequences of inadequate defense in depth.
- Showed need for a safety culture.
- Showed that a nuclear accident in one country transcends boundaries and sends harmful radiation to neighboring countries.

DESIGN BASIS ACCIDENT (DBA)

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"A postulated accident that a nuclear facility must be designed and built to withstand without loss to the systems, structures and components necessary to ensure public health and safety." (U.S. NRC)

- Stipulates minimum functional and performance-based considerations that go into nuclear facilities and equipment construction.
- Guide for safety standards of nuclear facilities.

Beyond DBA - Likelihood of the accident may be low but accident sequences in this case can lead to a severe accident, which could result in severe damage to a reactor's core, and eventually contaminate the areas around it with harmful radiation.

- Ex) Three Mile Island, Chernobyl, Fukushima.
- Fukushima: quake-tsunami started it; sever core meltdown caused by station black out (SBO).

NUCLEAR SECURITY

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"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

DEFENCE IN DEPTH (SECURITY)

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Physical protection that reflects “a concept of several layers and methods of protection (structural, other technical, personnel and organizational) that have to be overcome or circumvented by an adversary in order to achieve his objectives.” (IAEA INFCIRC/225/Rev5)

- Hardware (security devices) + procedures (including the organization of guards and their performance) + facility design (including layout).
- Physical protection system: detection; delay and response; nuclear material accountancy and control.

DESIGN BASIS THREAT (DBT)

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"The attributes and characteristics, who might attempt unauthorized removal of nuclear material or sabotage, against which a physical protection system is designed and evaluated." (INFCIRC/225/Rev.4 Corrected)

- Primary guideline for nuclear facility security.
- Way to define & asses threat recommended by IAEA.
- DBT varies by State & remains confidential.
- Limitations: does not take into consideration aerial attacks.

Beyond DBT – Multiple damages to a reactor system or cooling system resulting in radiation emissions caused by the penetration of the physical protection system from sabotage.

- Since DBT is considered as the maximum credible threat, the scope of DBT should cover a whole spectrum off possible terror attacks, like the severe accident scenarios in the DBA.

SAFETY vs. SECURITY

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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)

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)

SAFETY vs. SECURITY

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SAFETY	SECURITY
Regime: Older, more elaborated over years, more matured and established	**Regime:** Newer, younger, less elaborated
Cause: Unintended events (natural, hardware failures, internal events, human error)	**Cause:** Malicious acts to steal or cause damage
Approach: Transparent; Probabilistic safety analysis used	**Approach:** Confidential (measures and info); Deterrence; Threat-based judgment used
Attitude: Transparent; Open review encouraged	**Attitude:** Sovereignty; Confidentiality; State secrets; Transparency will harm security rather than enhance it
Objective: Protect humans & environment against radiological risks	**Objective:** Prevent theft, hijacking, sabotage of facilities & materials in storage or transit
Tools: Human training; Multiple, redundant safety features (defence in depth)	**Tools:** Guards; Weapons (guns); Gates; Limited access to vital areas

SAFETY vs. SECURITY

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SAFETY	SECURITY
Personnel: Operators; Technicians; Engineers	**Personnel:** Police; Military; SWAT team; Guards
Parameters: Within the facility; Nearby areas during transport	**Parameters:** Nuclear facilities; Border control; Forensics; Smuggling; Law enforcement; Intelligence operations
Regime's origin: IAEA	Regime's origin: IAEA; UNGA; UNSC
Stakeholders: Regulators; Industry; World Association of Nuclear Operators	**Stakeholders:** Beginning to see INTERPOL; Police forces; Security forces; Guard forces
Legal Instruments: 1) Safety conventions 2) Accident conventions 3) Nuclear liability conventions and protocols	**Legal Instruments:** 1) Physical protection convention 2) Terrorism suppression convention 3) UNSC Resolutions

SAFETY-SECURITY

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Nuclear Safety	Safety-Security	Nuclear Security
• "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	• The overlapping areas in nuclear safety and nuclear security measures that strengthen each other and improve the safety and security of nuclear and radiological facilities and materials.	• "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

SAFETY-SECURITY INTERFACE

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Interaction

- Depends on context

Found in

- Sabotage
  - Knowledge needed: NPPs safety systems (power supply; cooling systems for reactor core & spent nuclear fuel ponds)
- Emergency response
  - Natural accident or malicious incident

INTERNATIONAL INSTRUMENTS

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SAFETY	SAFETY-SECURITY	SECURITY
Convention on Nuclear Safety Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management Code of Conduct on the Safety of Research Reactors	Convention on Early Notification of a Nuclear Accident Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency Code of Conduct on the Safety and Security of Radioactive Sources	Convention on the Physical Protection of Nuclear Material (CPPNM) CPPNM 2005 Amendment International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225) UNSCR 1540/1373

2S INTERFACE

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SAFETY-SECURITY SYNERGIES

- Regulatory infrastructure
- Design & construction of nuclear installations and facilities
- Access controls to nuclear installations/other facilities
- Categorization of radioactive sources
- Source design
- Security of radioactive sources/radioactive materials security
- Recovery of orphan sources
- Emergency response plans
- Radioactive waste management

2S SYNERGIES

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Simultaneously strengthening nuclear safety and security is tied to improvements in the vital areas

- Including: main control room, cooling system in reactors and spent fuel ponds, on-site and outside power supplies, and the containment structure in nuclear power plants.
- Security and safety functions serve to prevent occurrence of malevolent events and, if occurred, to mitigate a significant release of radioactive material to the environment in the event of an accident.

Example: Reactor containment structure

- Safety – prevents significant release of radioactive material.
- Security – provides protective structure for reactor from terrorist attack or sabotage.

2S CONFLICTS

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Challenge: Elements or actions in one area could be antagonistic to other area.

- Security systems can interfere with emergency response or effective safety practices.
- Ex) Delay barriers – security function could limit rapid access response or limit emergency exit of plant personnel.

Emergency evacuation process for both malicious incident and natural accident.

- Safety functions help accelerate speedy evacuation of personnel, but top priority for security is identifying insider threat or intruder.

RECOMMENDATIONS

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1 Raise awareness of nuclear safety-security interface

- Regular high-level meetings on safety-security.
- IAEA & Nuclear Security Summits.

2 Strengthen nuclear safety-security interface & integrate into service life

- Strengthen nuclear safety-security interface.
- Safety-security measures built into all phases of nuclear facilities' service life (siting, design, construction, operation, decommissioning).
- Incorporate considerations for cyber and aircraft attacks that cannot be guarded against by traditional security methods.

RECOMMENDATIONS

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3 Establish international standard for DBA and/or DBT

- Consider all possible accidents and incidents occurred by internal events (malfunctioned safety systems, human error) & external events (earthquakes, fires, floods, tornadoes, wind, possible terrorist activities).
- International standard that does not infringe upon sovereignty and confidentiality would be to create a model applicable to respective countries' nuclear plants.

4 Strengthen the IAEA's role and governance in nuclear safety-security

- IAEA: sole guider & advisor of nuclear safety-security measures.
- Seek a solution to confidentiality to improve the interface.
- Encourage Physical Protection Advisory Service (IPASS) missions.
- Leadership and management must be at the highest levels to ensure effective coordination and balance between safety and security

CHALLENGES

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- Cost/Benefit Analysis
- National Interest
- Safety-Security & NPT
- “Outlier” States

II. NORTH KOREA

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Not a direct NSS topic

- Concern of legitimizing NK's nuclear programs.

DPRK discussion still needed and important

- DPRK = ROK's #1 security threat.
- Failure to mention DPRK = political loss for ROK.

President Lee's verbal invitation to Kim Jong-il: Conditional

Explicitly naming DPRK in Communique: Unrealistic

NORTH KOREA

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Possible language for Seoul Communiqué

- "Call on all states, regimes, and non-state actors with aspirations to acquire or develop nuclear weapons or nuclear parts, as well as those in violation of the Nuclear Non-Proliferation Treaty, to surrender their weapons ambitions, roll back existing nuclear programs, and enjoy greater benefits as responsible international players and users of peaceful nuclear energy while cooperating multilaterally to secure all vulnerable nuclear and radioactive materials."
- "Call on nuclear-armed states and aspirants currently in violation of the NPT to refrain from transferring nuclear materials, parts, technology, and know-how."

Sideline conversations on North Korea can and should be held

- Speeches by President Lee and senior ROK officials; Members of the six-party talks; Like-minded states

THANK YOU

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