

International seminar on “Nuclear Safety and
Security Challenges of 21st Century “
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Nuclear Safety and Security Synergies

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SYNERGY

Working together to the mutual advantage of both and producing an effect greater than the sum of their individual effects

CAVEAT

Nuclear security is a multi dimensional discipline, unlike nuclear safety which has a narrower focus. Nuclear security is also governed by many international legally binding instruments emanating from the U.N.

This presentation therefore focuses only on the synergies relating to nuclear power.

Providing oversight of the safeguarding of nuclear material, its accounting and control is also considered a regulatory function and is an integral part of nuclear security

CP-1 Chicago Pile 1 : 1st man-made reactor

The CP-1 was constructed in the middle of a 30 feet by 60 feet squash court under the University of Chicago's baseball stadium and consisted of graphite blocks and lumps of uranium in form of spheres and the whole thing shrouded by a gray balloon cloth to contain any unexpected radioactive release

Early beginnings of Nuclear Safety: SCRAM

2 December 1942 1st Nuclear Reactor
CP – 1 in the heart of Chicago

Dr. Norman Hilberry : the **Safety Control
Rod Axe Man (SCRAM)**

was ushered to the balcony rail, handed a well sharpened fireman's ax and told that was it, "if the safety rods fail to operate, cut that rope."

Henry Moore's memorial titled Nuclear Energy



Nuclear Security in the Early Days

- No security – as such - at the CP-1
- Canada Excluded: The U.S. Army has taken over the atomic bomb project in the person of General Leslie Groves. He regarded the Montreal group, in which so many different nationalities were represented, as a serious security risk
- The Early Atomic Spies
 - Rosenbergs
 - Klaus Fuchs

Some early nuclear security breakdowns

- Klaus Fuchs – German refugee theoretical physicist who worked with the British delegation at Los Alamos during the Manhattan Project. He was eventually discovered, confessed, and sentenced to jail in Britain. He was later released, and he emigrated to East Germany. Because of his close connection to many aspects of project activities, and his extensive technical knowledge, he is considered to have been the most valuable of the "Atomic Spies" in terms of the information he gave to the Soviet Union about the American fission bomb program.
- Ethel and Julius Rosenberg – Americans who were supposedly involved in coordinating and recruiting an espionage network which included David Greenglass – Ethel's brother working as a machinist at Los Alamos. They were convicted and executed at Sing Sing Prison in 1953.

IAEA (the Agency) Statute on Safety and Security

ARTICLE III: Functions

A. The Agency is authorized:

6. To establish or adopt

..... **standards of safety for protection of health and minimization of danger to life and property**

....., and to provide for the application of these standards to its own operations as well as to the operations making use of materials, services, equipment, facilities, and information made available by the Agency or at its request or under its control or supervision; and to provide for the application of these standards, at the request of the parties, to operations under any bilateral or multilateral arrangements, or, at the request of a State, to any of that State's activities in the field of atomic energy;

ATTRIBUTES OF NUCLEAR SAFETY: THE 4 C's

- Control the Reactivity
- Cool the fuel
- Confine the radioactivity
- Contain the radioactivity

ATTRIBUTES OF NUCLEAR SECURITY

To prevent and detect and respond to, theft, sabotage, unauthorized access , illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities

DIFFERENCE

Is there a difference between the approaches to Nuclear Safety and Nuclear Security ?

Nuclear Safety

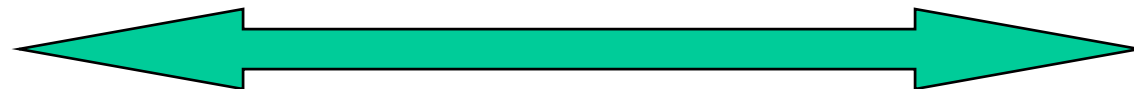
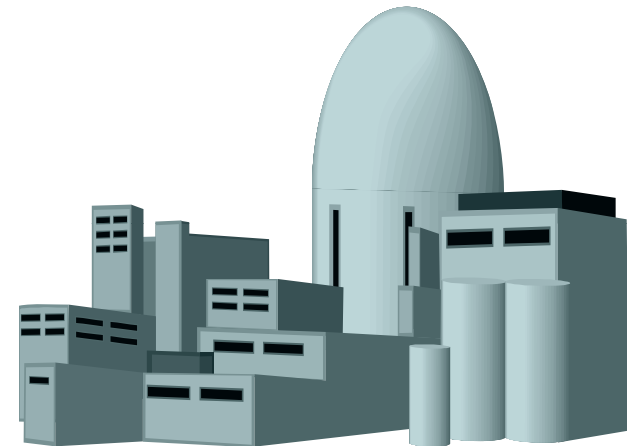


Distance

Time



Shielding

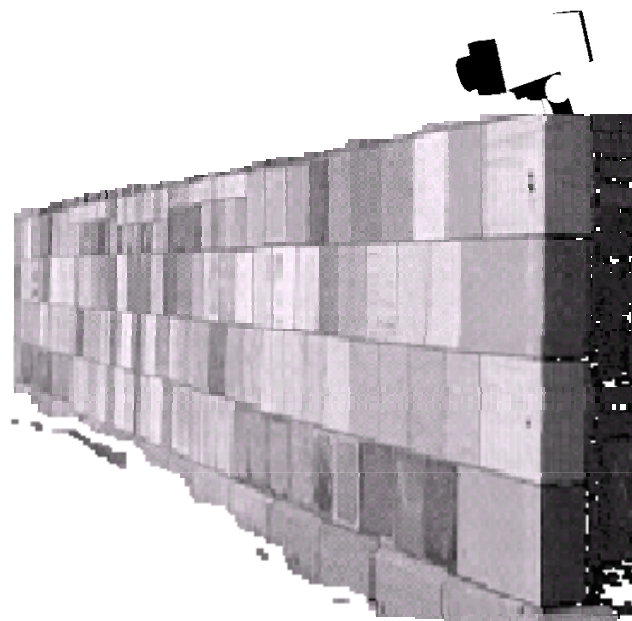


To protect man from the harmful effects of radiation

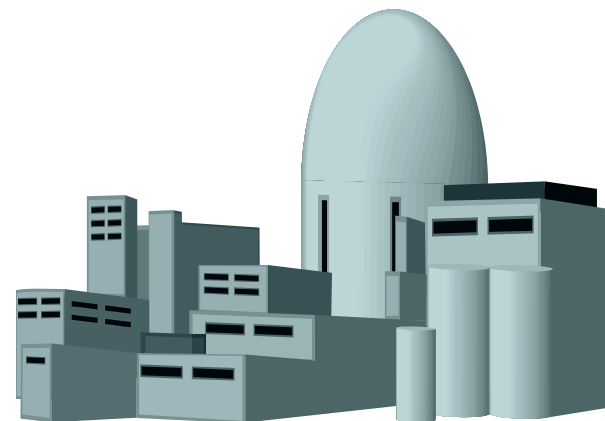
Nuclear Security



Detection



Barrier/Delay



Response

To protect the facility from the harmful actions of man

A SYNERGISTIC NUCLEAR SAFETY & SECURITY REGIME : the 3 P's

- **PROTECTS** the **PUBLIC** against accidental or malicious acts against nuclear material and facilities
- **PROTECTS** the **INVESTMENT** against risk of a major economic loss due to an incident or a malicious act by specifying stringent safety/security standards in nuclear facilities
- **PROTECTS** the **NATION** against radioactive releases (or threats thereof) caused by malicious acts etc

Malicious Act: theft , sabotage, unauthorized access, illegal transfer involving nuclear ,other radioactive substances or their facilities

A SYNERGISTIC NUCLEAR SAFETY & SECURITY REGIME II

A synergistic approach to nuclear safety and nuclear security is really a management issue: how different needs and requirements of the two disciplines are managed together along with other management issues such as efficiency , production etc. such that they can work together to the mutual advantage of both and result a safer, securer, more efficient facility

HOW CAN THIS SYNERGY BE MADE TO HAPPEN?

Some suggestions - I

- One regulatory authority overseeing safety and security
- Government to ensure independence of regulatory authority in all matters : technical ,administrative, financial and international liaison
- Develop in-house safety and security resource centers for analysis, information dissemination and education &training
- Constant exercises: in the field, table-top, simulations of all possible scenarios
- Complacency kills

HOW CAN THIS SYNERGY BE MADE TO HAPPEN?

Some suggestions - II

- A Recognition that Safety and Security are entirely different disciplines requiring their own expertise and methodology
 - Not just a case of different perceptions, but of different realities
 - Nuclear Security must perforce deal with would-be criminals, thieves, saboteurs, law-breakers, smugglers and illicit traffickers and other unsavory persons or groups with serious malicious intent to harm the nation – not so for nuclear safety
- An understanding of each others disciplines, requirements and even perceptions must be shared
 - a constant interaction between safety and security — during design, construction, installation, manufacturing and operation and even final disposal
- Nuclear security has multiple dimensions. Confidentiality is one such dimension which can conflict with the demand for transparency in safety matters

HOW CAN THIS SYNERGY BE MADE TO HAPPEN? Some suggestions - III

- Interfaces during:
 - Design – international security guidance (standards !?)
 - Construction - U.S. Embassy in Moscow
 - Manufacturing
 - Commissioning
 - Operation
 - Decommissioning

Security during Construction – U.S. Embassy in Moscow

- Soviet construction workers, handpicked by the KGB, built an eight-story embassy that was so full of electronic sensors and other bugging devices that it could not be utilized. There were congressional demands that the tower be demolished and built anew. After years of reviews costing tens of millions of dollars, the State Department decided to use the building after all. But before that can be done, its top two floors will be dismantled and replaced with a four-story "top hat" that should be impenetrable to Russian eavesdroppers.

Security During Operation

- **In 1946, Soviet school children presented a two foot wooden replica of the Great Seal of the United States to Ambassador Averell Harriman.**

The Ambassador hung the seal in his office in Spaso House (Ambassador's residence). During George F. Kennan's ambassadorship in 1952, a secret technical surveillance countermeasures (TSCM) inspection discovered that the seal contained a microphone and a resonant cavity which could be stimulated from an outside radio signal.

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Security During Operation

On May 26, 1960, U.S. Ambassador to the United Nations Henry Cabot Lodge, Jr. unveiled the Great Seal Bug before the UN Security Council to counter Soviet denunciations of American U-2 espionage. The Soviets had presented a replica of the Great Seal of the United States as a gift to Ambassador Averell Harriman in 1946. The gift hung in the U.S. Embassy for many years, until in 1952, during George F. Kennan's ambassadorship, U.S. security personnel discovered the listening device embedded inside the Great Seal. Lodge's unveiling of this Great Seal before the Security Council in 1960 provided proof that the Soviets also spied on the Americans, and undercut a Soviet resolution before the Security Council denouncing the United States for its U-2 espionage missions. – U.S. Department of State



- **Trojan Horse: Beware of Greeks bearing Gifts**

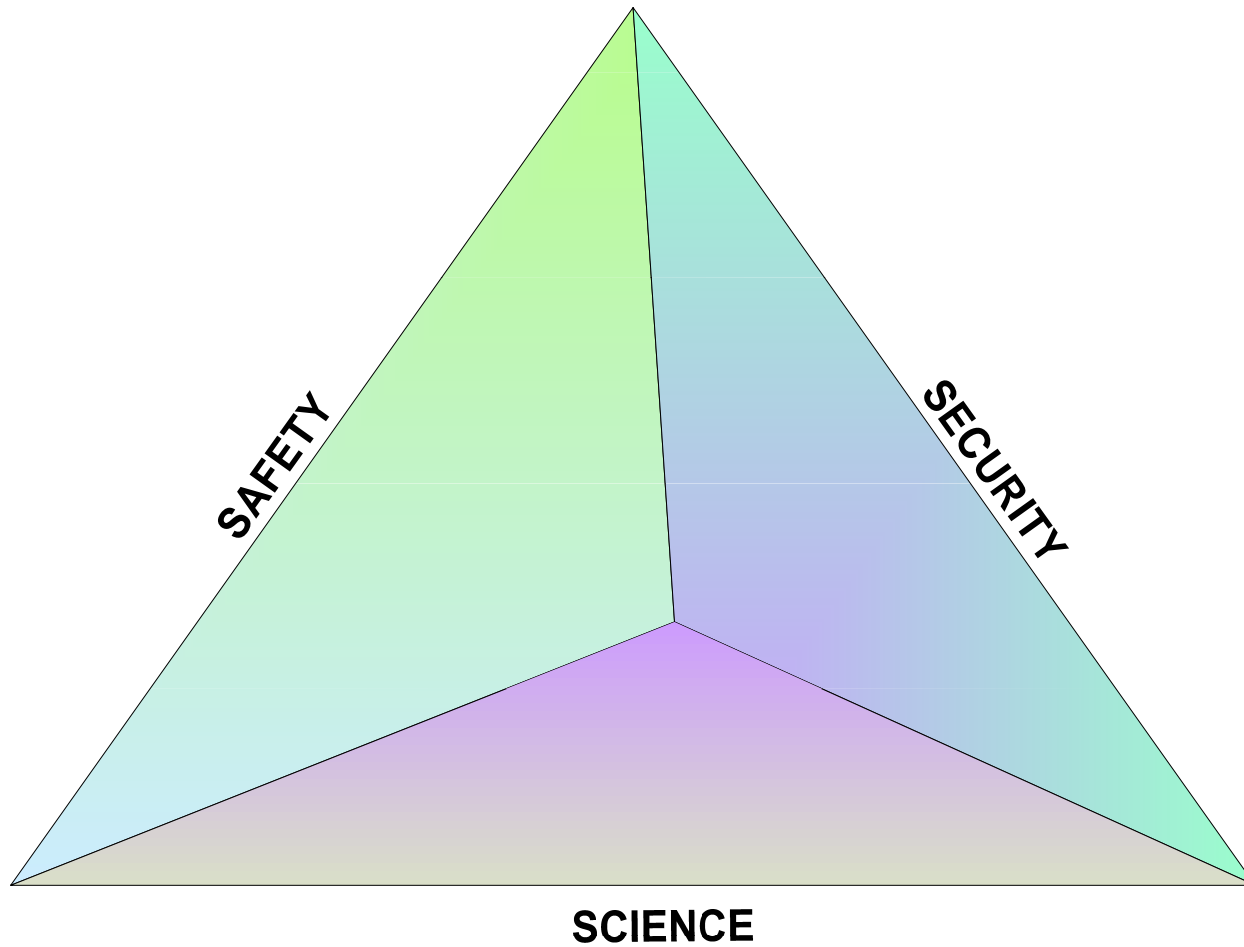
Some Nuclear Safety and Security Challenges of the 21st Century

- Global climate change driver for more nuclear power but safer and securer
- Coping with Terrorism : enemy within and without
- Coping with Extreme events: for example a beyond design basis safety event with a simultaneous security event
- These challenges must be met at the appropriate level of competency i.e. at the level of the two organizations charged with the peaceful development of atomic energy; and for its oversight namely the PAEC and PNRA.

Solutions?

How can these challenges be overcome ?

Peace Triangle



The Pyramid of Harmony

