

IDENTIFYING and ADDRESSING SUPPORT NEEDS for ENSURING NUCLEAR SECURITY in LICENSED FACILITIES and ACTIVITIES

G.P. SRIVASTAVA
Bhabha Atomic Research Centre
INDIA

Regulatory Effectiveness in Safety/Security

- ❖ Public perception and acceptance of Nuclear Industry depend greatly on Regulatory Effectiveness.
- ❖ Global fall out of any Safety or Security related incident has an impact on the entire Nuclear Industry.
- ❖ Regulatory process for Safety and Security has become more stringent over last one decade or so, - in particular for Nuclear Security.

Fundamental Requisite

- High level of Nuclear and Radiation Safety
- Effective and efficient Regulatory measures
- Applicability, maintainability and upgradability
- Consistent with National/ International standards
- Incorporation of CPPNM, Code of Conduct, and UN resolution

Global Safety and Security Regime -Linkages and Standards- (India)

With information/ guidance from IAEA and as fit for the State, the Regulatory body has developed guides for Nuclear Safety comprehensively ; and for Security including

- ❑ Manual on Security of Nuclear Installations
- ❑ Guide on Security of Radioactive Sources in Radiation Facilities
- ❑ Guide on Security of Radioactive Material during Transport

Roles, Functions and Value of TSOs

- ❖ Translate the conventions/ guidelines from International Agencies like IAEA and legal frameworks into Nuclear Security Regime thru' **Implementable solutions**.
- ❖ Set up the **Technical and Operational Infrastructure** for Nuclear Security.
- ❖ Support the **Training, Maintenance, Update and Life Cycle Management** Programs.

Advise to Regulatory Body on Good Practices

- ❑ Clear and acceptable Requirement Definitions.
- ❑ Adding value to enhance the security effectiveness by sustainable state of art gadgets.
- ❑ Linkages with various organs of nuclear security – Prevention, Detection and Response
- ❑ Linking with local agencies with Emergency preparedness

Technical Support in Design, Deployment and Maintenance

- ❑ **Technical Support Organizations (TSO)** are also engaged other **Scientific/Engineering activities** of such facilities. TSO play a vital role in all stages viz. Design, Construction, Operation and Maintenance of any Nuclear Fuel Cycle Facilities.
- ❑ Multi disciplinary Bhabha Atomic Research Centre for the last 50 years has been responsible for Technical support on Analysis and design of Nuclear Safety and Security Systems – bridging the requirement gap between Nuclear Power Corporation and Regulatory Body

Support for Safety and Security

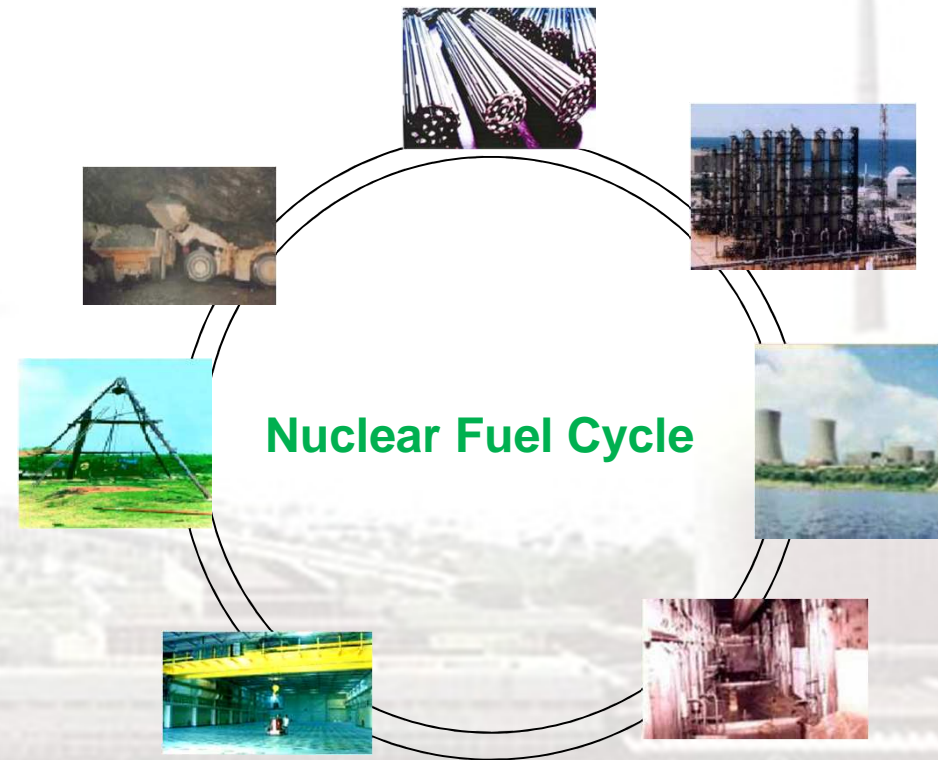
Bhabha Atomic Research Centre (TSO) helps in:

- ❖ Nuclear Physics ,Chemistry and Nuclear Engineering
- ❖ Metallurgy and Materials Science
- ❖ Risk Assessment/ Computational Techniques
- ❖ Modeling and Simulation
- ❖ Process Development for Demonstration
- ❖ Industry to back the supply

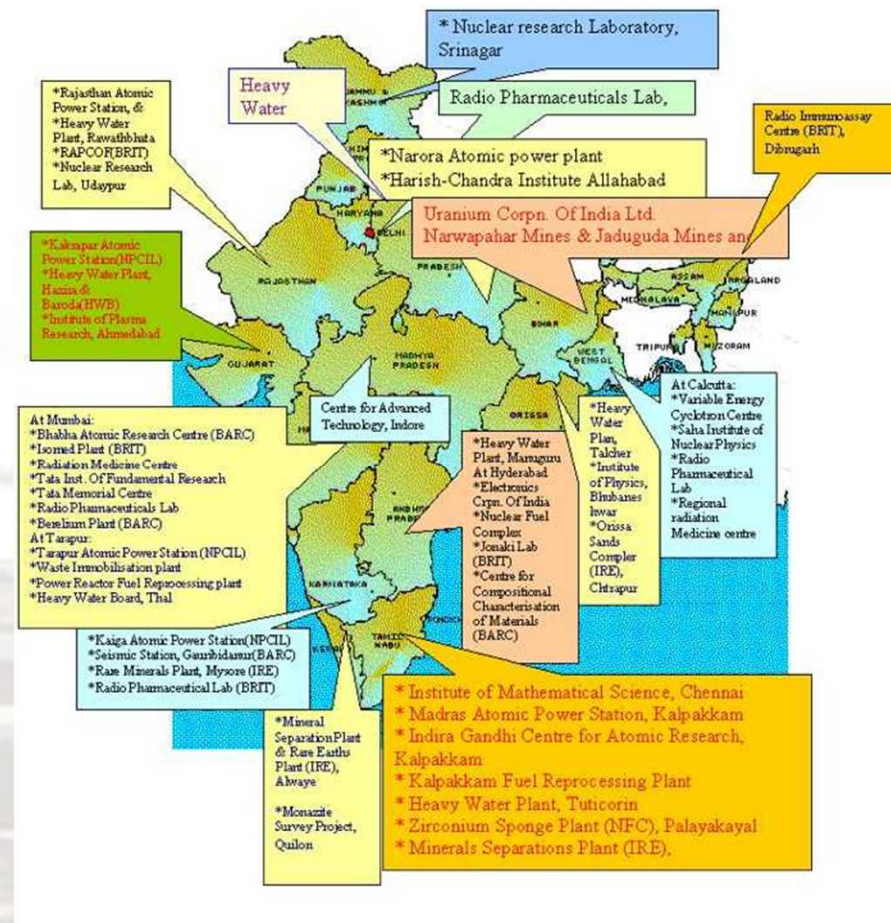
Nuclear Fuel Cycle Activities

India has activities encompassing all stages of Nuclear Fuel Cycle:

- Exploration & Mining
- Nuclear Fuel Fabrication
- Power Generation
- Spent Fuel Reprocessing
- Waste Management

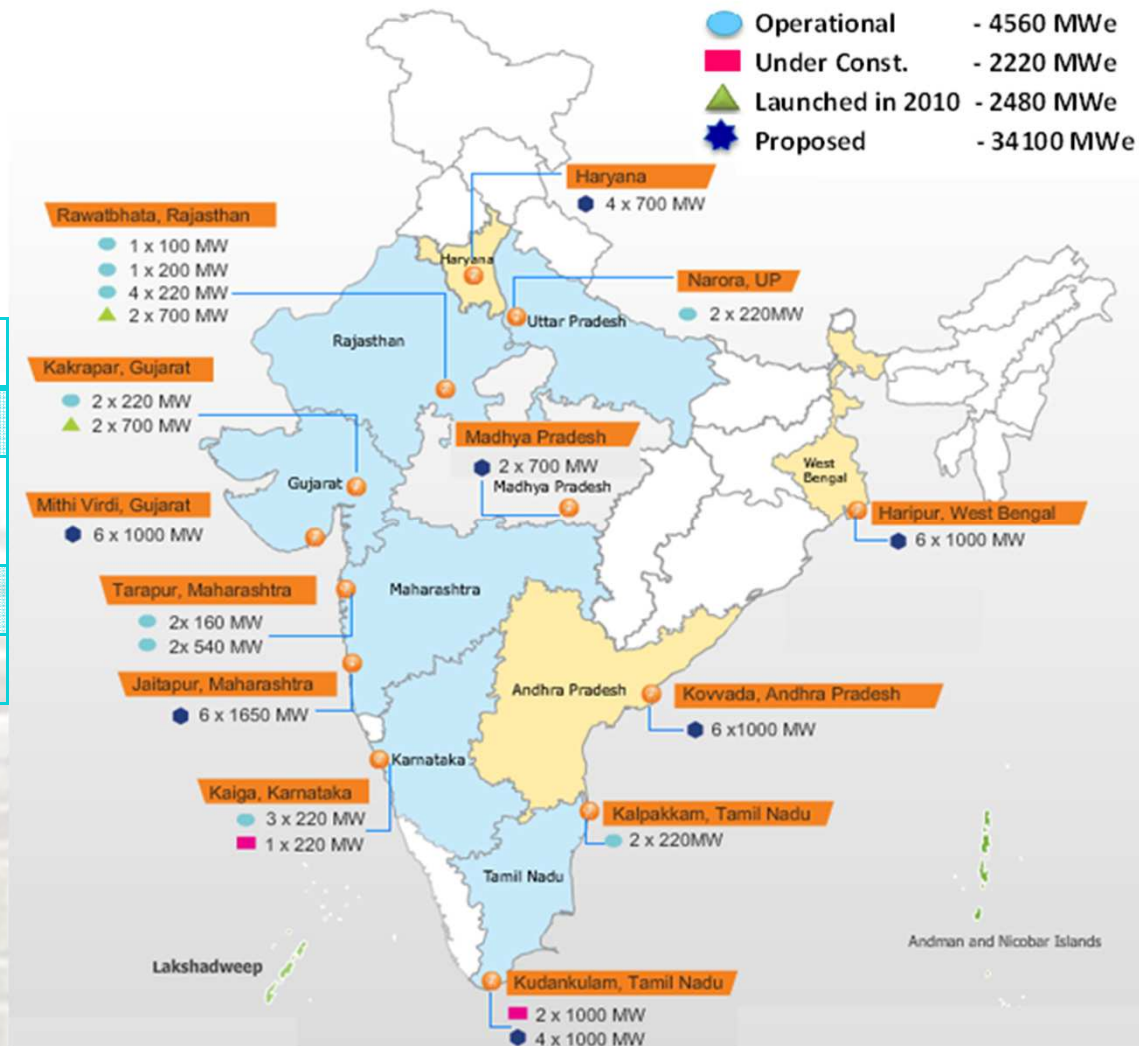


Nuclear Activity Map Of India



NPPs in India

Power Plants	Capacity
Operational	4560 MWe
Under Construction	2220 Mwe
Launched in 2010	2480 MWe
Proposed	34100 MWe



Operating Nuclear Power Reactors

19 Operating NPPs ~ 4560MWe (Approx. 3% of total energy)



BWR
2x160 + 2x540
TARAPUR



PHWR
1x100, 1x200
4 X 220
RAJASTHAN



PHWR
1-170 MWe, 2-220 Mwe
KALPAKKAM



PHWR
2 X 220 MWe
NARORA

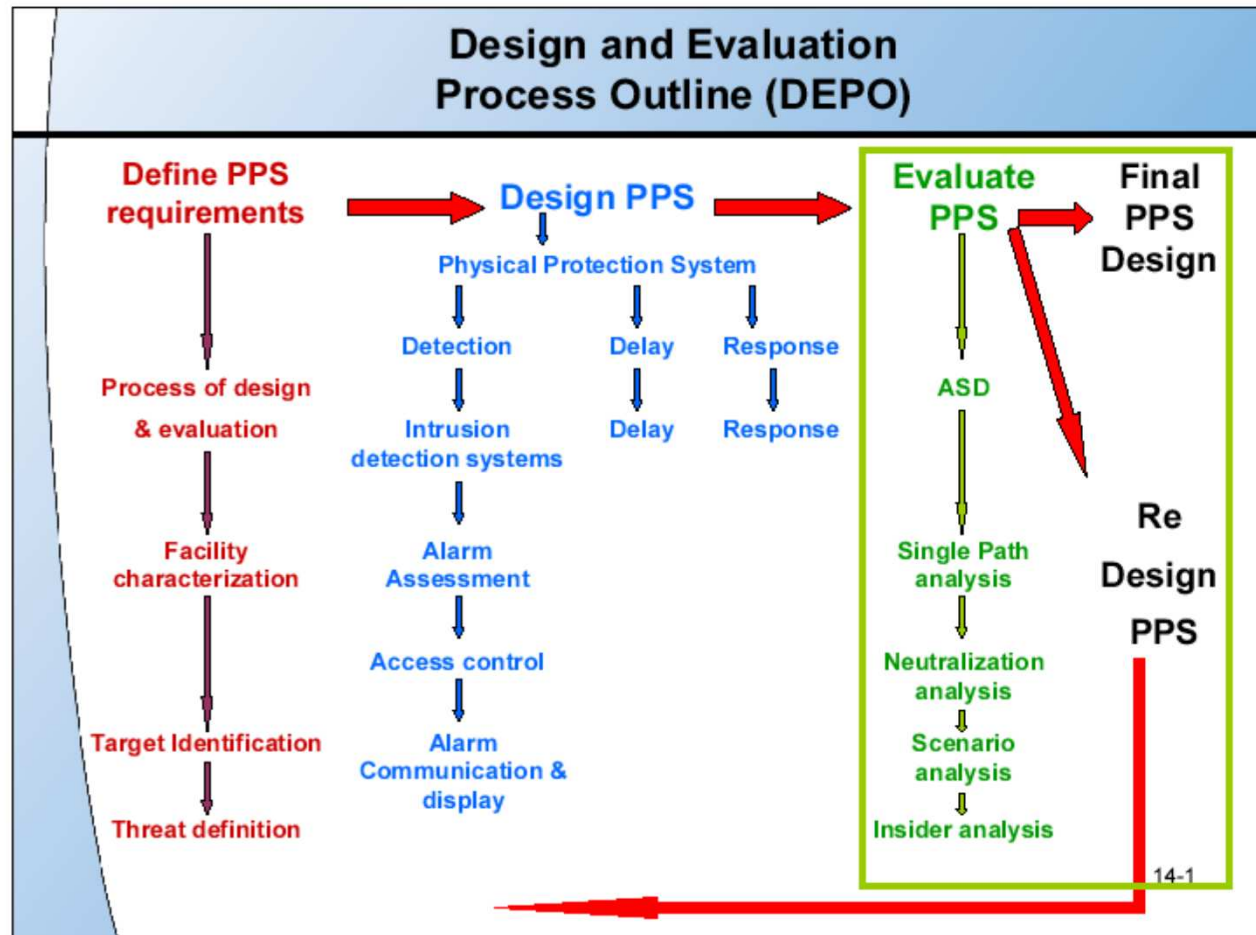


PHWR
2 X 220 MWe
KAKRAPARA



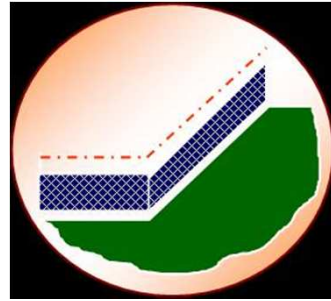
PHWR
3 X 220
KAIGA

Physical Protection System- typical approach



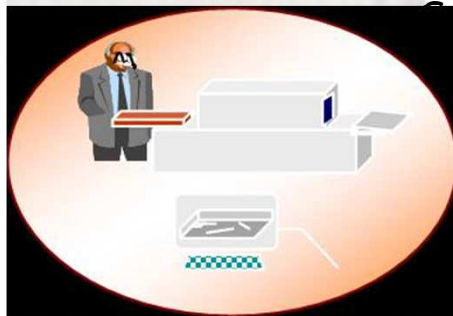
Source : Sandia National Laboratory, USA

Integrated Physical Protection System



CTV Alarm Assessment

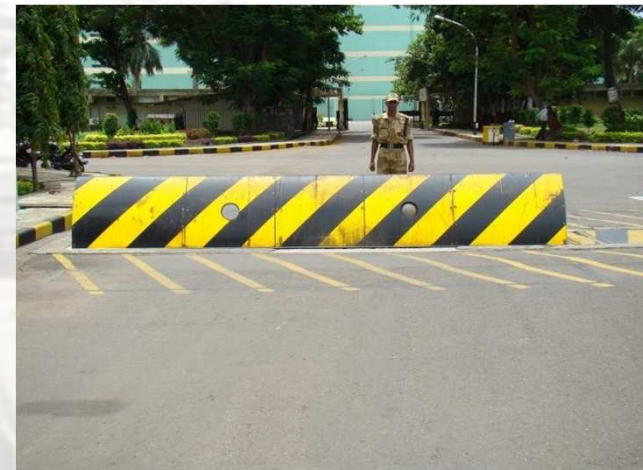
CENTRAL CONTROL
- Monitoring
- Processing
- Display Control



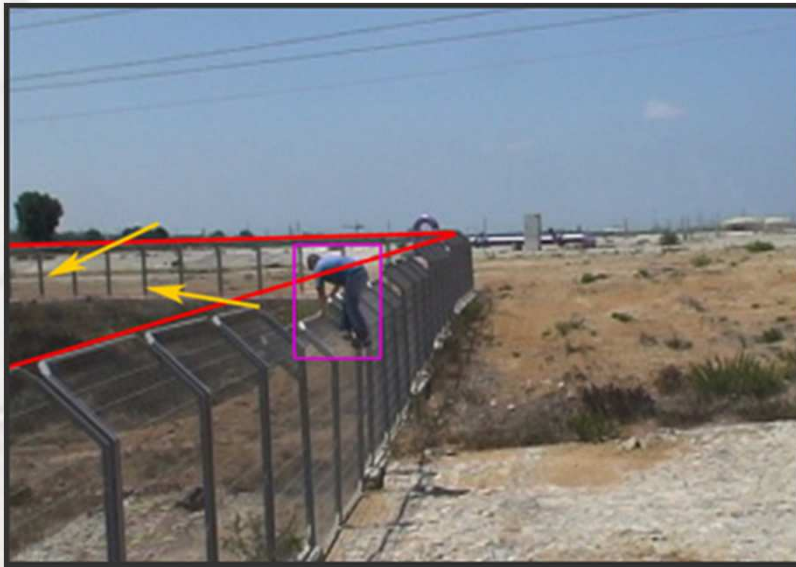
X-RAY BAGGAGE & METAL DETECTOR (Material Search)



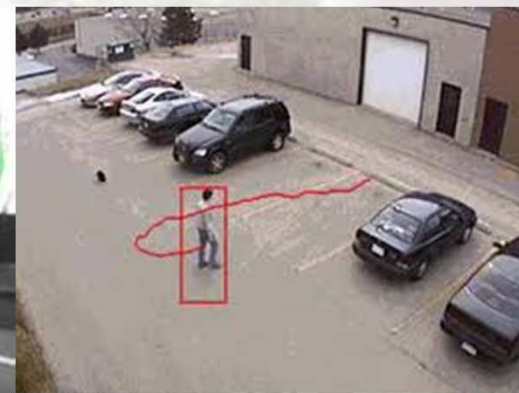
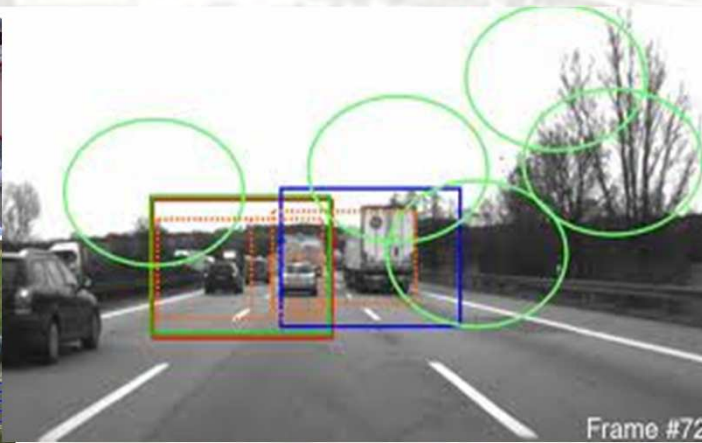
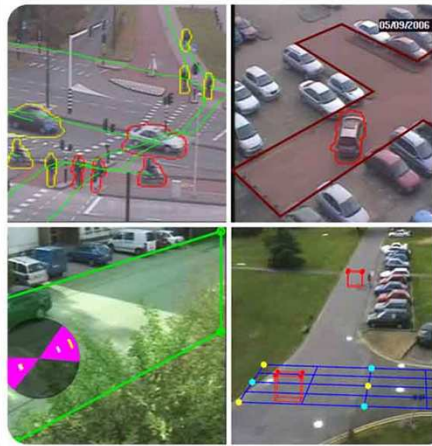
IPPS – Vehicle Access control



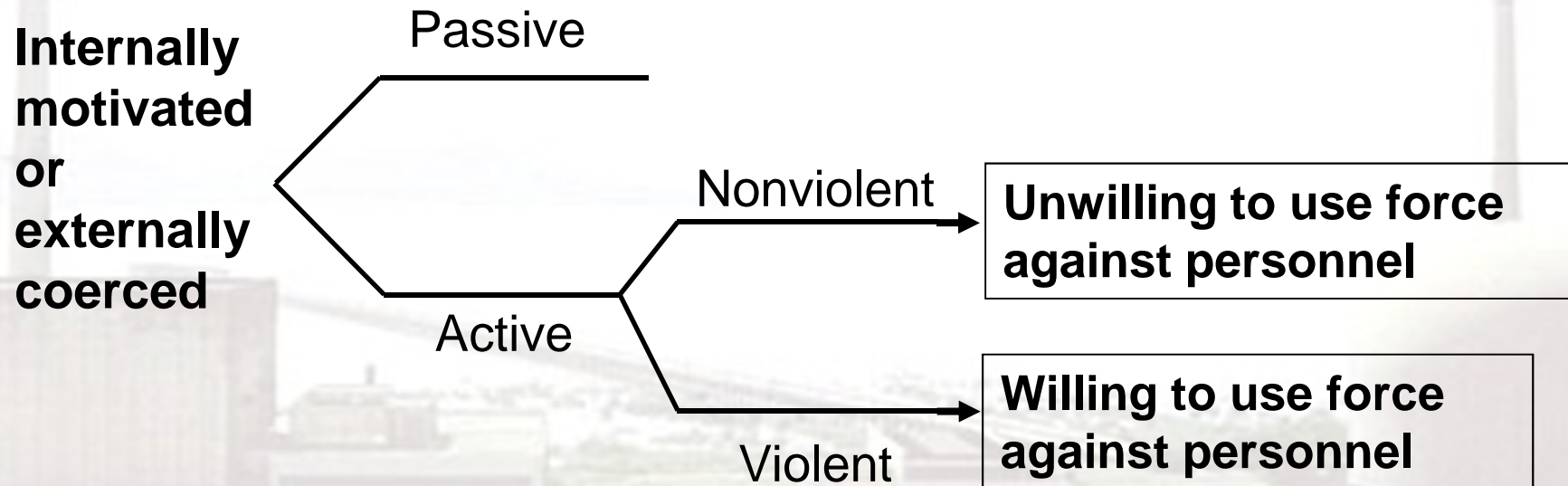
Integrated Physical Protection Systems -Surveillance



Video Analytics



Insiders threat



All insiders can use stealth and deceit.

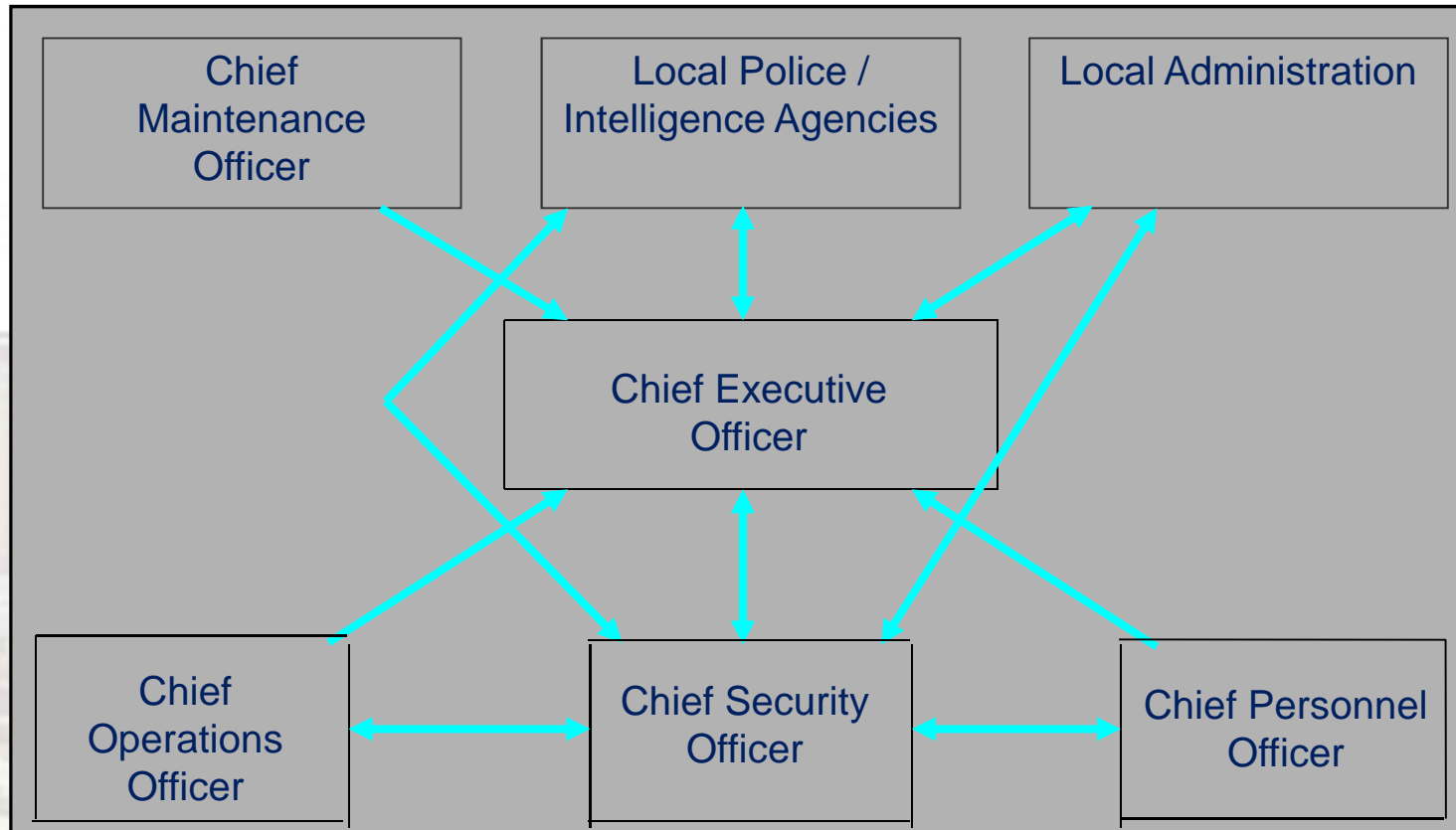
Violent insiders may be rational or irrational.

Response Forces and Legal Aspects

- ❖ Strategies for effective responses– Day and Night supports
- ❖ Linkages with different Ministries – records
- ❖ Atomic Energy Act 1962 and its amendments in 2006, 2008 and 2009.
- ❖ Forensics supports



Typical Reporting and Communication



Activities at other than Nuclear Installations

- Cross borders
- Seaports
- Airports
- Radioactive Sources in Industry, Agriculture and Hospitals

Radiation Detectors and Deployment



Personnel Search Radiation Detectors

Personal Detectors



Environment Radiation Detectors

Aerial Monitoring



Mobile Monitoring Laboratory



Radiation Detectors

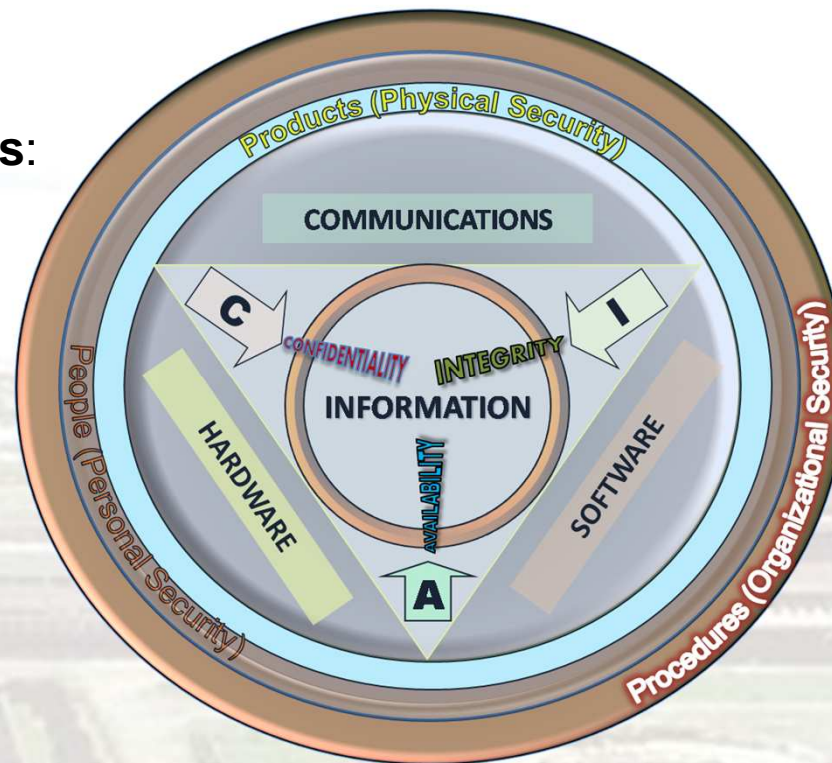
- Type of detectors



Information security

Information Security Components:

- ❑ Confidentiality
- ❑ Integrity and
- ❑ Availability





Support needed for a sustainable NS system

- ❑ Resources for PPS/Nuclear Security
- ❑ Technical/ operational manpower
- ❑ Training in PPS/Nuclear Security

Challenges in Sustainable Nuclear Security

- ❑ Addressing the ever changing need of Nuclear Security in line with change in DBT
- ❑ Ensuring systems meet the end objective of robust Nuclear Security for all nuclear fuel cycle activities.
- ❑ Communication amongst Security Managers / Plant operating staff for better harmony
- ❑ Development of Security Culture

Human Support Development

- **Regional Training Courses (RTC) with IAEA – Including a visit to the Nuclear Power Plant**
- **National Courses on**
 - Nuclear Security ,
 - Security of Radioactive Materials, and
 - Radiation Safety
- **Setting up Global Centre for Nuclear Energy Partnership – near New Delhi, India.**

Human Support Development



DEPARTMENT OF ATOMIC ENERGY



GLOBAL CENTRE FOR NUCLEAR ENERGY PARTNERSHIP

• Schools

- Advanced Nuclear Energy Systems Studies
- Nuclear Security Studies
- Radiological Safety Studies
- Studies on Applications of Radioisotopes and Radiation Technologies



Government of India



Major Public Events – Commonwealth Games, New Delhi



Needs to

- ❑ Interface between safety and security
- ❑ Standardization for inspection/ reviews
- ❑ Sustained availability of equipments
- ❑ Possibility of upgrades without radical changes in the integrated plan.
- ❑ Meeting the challenges of dynamically changing security scenario
- ❑ Organizing the 'INTEGRATION' in a secure manner – As Per Country's policy

CONCLUSION

- State may have to develop their own Nuclear Security regime as per obligations.
- Technical support is best drawn from the strength within the state- even if the plant is imported
- Indian model will keep the TSOs motivated as they feel part of R&D with opportunities
- Can provide best support to Regulatory as well as to Utility
- Linkage with Academia is best possible
- Global partnership is good to the extent applicable.



Thank You