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THE STATE ATOMIC ENERGY CORPORATION ROSATOM

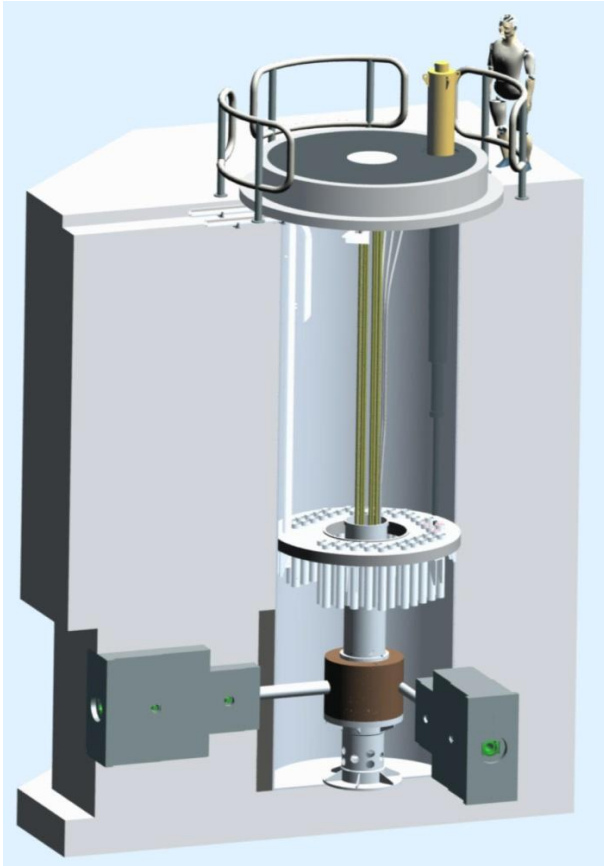
# Specifics of Physical Protection of CNST

**Dr. Vladimir Kryuchenkov**

Advisor

Technical Department

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1. General Requirements to PP system of CNST
2. Protection Measures for Multipurpose Irradiation Center
3. PP Sub-system of Nuclear Research Reactor
4. Protection of Cyclotron and Associated Facilities
5. Conclusion

- Rosatom project of Center of Nuclear Science and Technology (CNST) usually includes three main installations:
  - Pool-type nuclear research reactor (NRR);
  - Multipurpose irradiation center (MIC), containing gamma-irradiator of radioisotope Co-60;
  - Medical cyclotron complex (MCC).
- In accordance with the CNST design, these installations are located at single CNST facility site in three different buildings or complexes;
- Physical protection (PP) measures of CNST take into account characteristics of nuclear and other radioactive materials and the associated facilities;
- Following IAEA recommendations the NRR is located in a limited access area (LAA);
- MIC facility, containing radioactive source (RS) of category 1, is also in LAA.



**Functioning of PP detection and delay equipment and guard/ response operations, require appointment and training of special facility protection forces, appointed by the State Authorities.**



**Number and required skills and competencies of these forces depend on PP system equipment and threat assessment or design basis threat (DBT), developed by the State Competent Authority.**



**PP equipment operators during the work time are located at the site territory in accordance with their shift schedules.**  
**A part of response force personnel may be located outside of the facility perimeter in accordance with the approved PP plan.**



**Russian approach on designing and construction of a new nuclear facility takes in consideration PP issues, starting from site selection**

**Rosatom as the contractor applies PP regulations, in compliance with the IAEA recommendations**



**Specific security requirements are based on the State threat assessment (usually for CNST) or DBT (in case of NPP)**

**Rosatom PP equipment complex adjusted to the international nuclear security recommendations**



**Use Fundamental Principles of safety and security, including graded approach and defense-in-depth**

**Establish a high level coordinating mechanism with Regulatory Authority at all phases of the new nuclear facility life cycle**



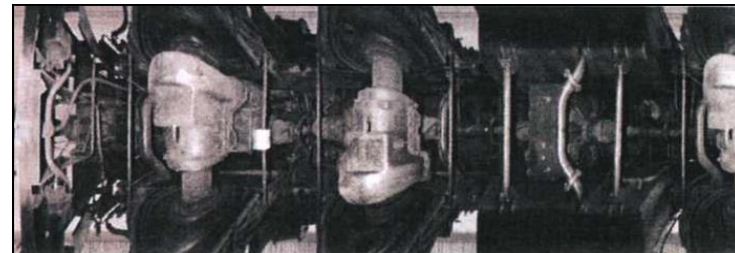
**Customer State is responsible for PP of CNST, constructed by Russian Contractor**

**Rosatom as the Contractor recommends PP regulations, in compliance with the IAEA NSS guidance**



**Customer provides specific requirements, based on the State threat assessment (DBT in case of NPP)**

**Rosatom PP complex of engineering and technical means adjusted to the Customer requirements**



## Identify malicious acts and consequences:

- Theft of nuclear material (NRR) or other radioactive material (MIC, Labs)
  - ✓ Nuclear proliferation
  - ✓ Radiation exposure device
  - ✓ Radiation dispersal device
- On-site radiological sabotage
  - ✓ Radiation exposure to employees
  - ✓ Radiation exposure off-site to the public
  - ✓ Radioactive contamination of environment

## Identify targets for unauthorized acts:

- Theft of NRM
  - ✓ Location of materials
  - ✓ IAEA categorization of nuclear material or radioactive sources
  - ✓ Quantity, type and isotope content of the materials
- Radiological sabotage
  - ✓ Nuclear or other radioactive materials
  - ✓ Safety and process systems and components
  - ✓ Computer based systems

## Nuclear research reactor

- Theft targets:
  - ✓ NM Cat. II, ...
- Sabotage targets:
  - ✓ RR core, Cat. B
  - ✓ Spent fuel pool...

## Multipurpose irradiation center

- Theft targets:
- Sabotage targets:
  - ✓ Co-60 irradiator...

## Radioactive waste facility

- Theft targets:
  - ✓ Solid RW...
- Sabotage targets:
  - ✓ Liquid and gaseous RW...

## Cyclotron complex and laboratories

- Target set 1 (theft)
- Target set 2 (sabotage)

*The target list (presented by...) when defined, should be protected as sensitive information !*





PP system measures for CNST installations with use of Rosatom PP engineering techniques may be based on “*Prescriptive approach*” (IAEA Guide NSS # 27, 2018) with use of host State threat assessment requirements.



CNST site perimeter may be protected as a limited access area (LAA) and equipped with a fence and access management techniques.  
LAA perimeter may be equipped with personnel checkpoints, vehicle checkpoints with passive and active delay barriers.



LAA perimeter protection will include a lighting system and patrolled by foot or mobile patrols.  
Perimeter intrusion detectors with alarm assessment cameras should be connected to a central alarm station (CAS), located inside LAA.



**Functioning of PP detection and delay equipment and guard/ response operations, require appointment and training of special facility protection forces, appointed by the State authorities.**



**Number and required skills and competencies of these forces depend on PP system equipment and design and on threat assessment ( or DBT), developed by the State Competent Authority.**



**PP equipment operators during the work time are located at the site territory in accordance with their shift schedules.**

**A part of response force personnel may be located outside of the facility perimeter in accordance with the approved PP plan.**

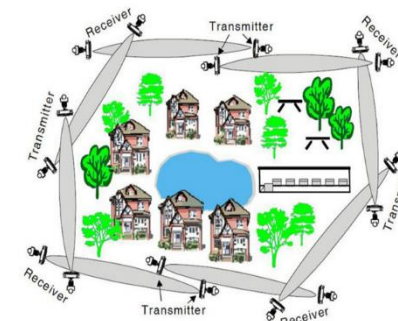
# Protection Measures for Multipurpose Irradiation Center



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## 1

- Use IAEA guidance on safety and security of radioactive sources based on categorization requirements
- Intrusion detection sensors and alarm assessment techniques along the Irradiator building perimeter



## 2

- Interior detection/ alarm system when the Irradiator Co-60 source is in storage water pool
- CCTV monitoring of irradiation process when the source is in use
- Locks on doors and inner security systems (incl. monitoring)

## 3

- Access controls at the Irradiator entrance and its premises
- Personnel identification biometry



## 4

- Landline telephones, or radio, or protected mobile phone for communications with CAS

*Important to apply IAEA Code of Conduct on Safety and Security of Radioactive Sources and follow IAEA guidance NSS-11*

1

- RR complex will be located in Protected Area (PA) (IAEA recommendations NSS-13)
- Protection of PA includes interior intrusion detection and alarm assessment cameras
- Procedures for transferring custody of the NM to the succeeding handler

2

- Technical means and procedures for access control, such as keys and computerized access lists, protected against compromise
- Interior CCTV monitoring



3

- Protection of nuclear safety computer systems from compromise, manipulation and falsification
- Communication means with central alarm station (CAS)



4

- Inventory of irradiated targets (samples)
- Radiation monitoring at the exit from the RR complex to the site exit

*Application of these security measures should be in compliance with safety requirements*

1

- Medical installation, including cyclotron, and laboratories are located in LAA and do not contain nuclear material
- It will produce and use low-activity radionuclides for medical applications, e.g. diagnostics

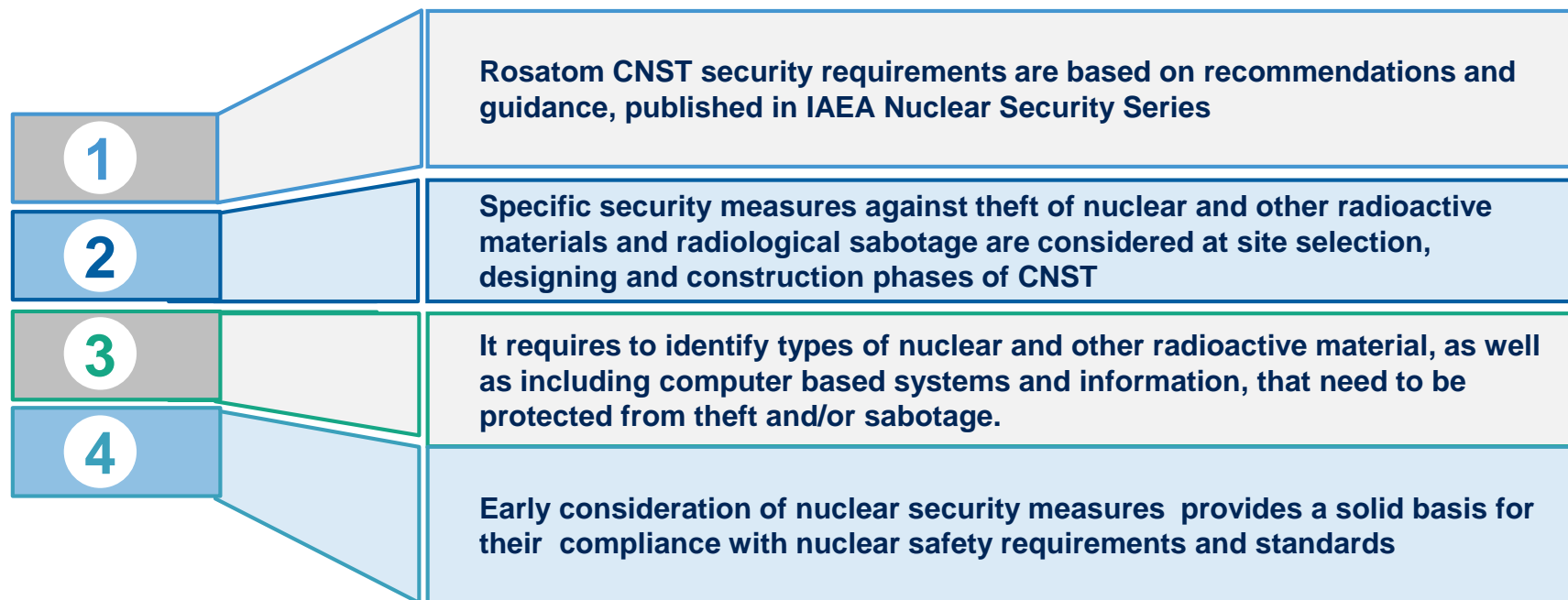
2

- Safety and security measures include inventory of produced radioactive materials (computerized inventory system)
- Control/ monitoring of these materials for safety and security is needed at the facility site and in case of transportation outside CNST

3

- Prevention of unauthorized removal (theft) of the RM by radiation monitoring at the site checkpoint (LAA exit)
- Access control at the entrances, locks at doors and gates of the buildings







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## CONTACTS

**Rusatom Overseas**

**e-mail:** [raos@rosatom.ru](mailto:raos@rosatom.ru)

**web page:** [www.rusatom-overseas.com](http://www.rusatom-overseas.com)