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**International Nuclear Security**

# M2: IAEA Nuclear Security Guidance for Research Reactors

Research Reactor Sabotage Protection Workshop

SAND2025-02023O

INS International Nuclear Security
Reducing Risk of Nuclear Terrorism

# Objectives

Objectives:

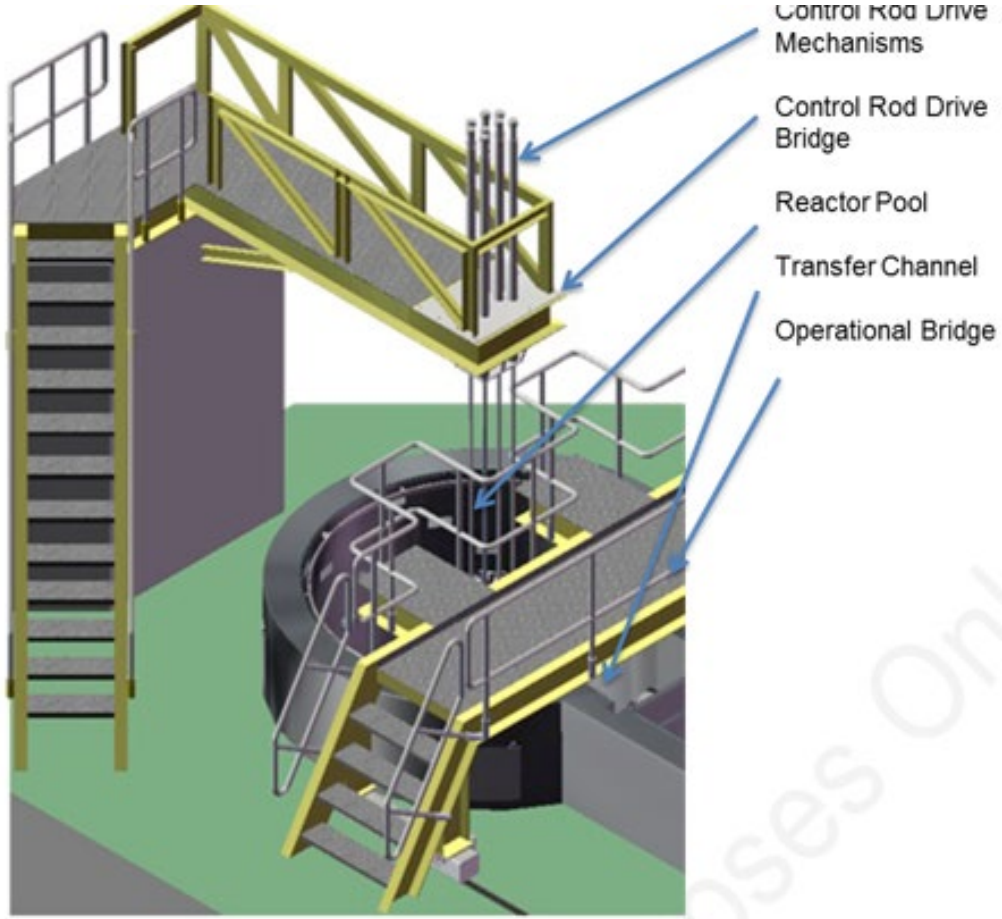
- Become familiar with different types of research reactors
- Understand IAEA approaches to protecting research reactor facilities against theft and sabotage

# What is a Research Reactor?

- 220 research reactors operate in 53 countries
- Term ‘research reactor’ is used to describe non-power reactors and associated co-located facilities (IAEA-TDL-004)
  - Reactors with power levels from 0 to 10s MW
  - Wide range of uses
    - Source of neutrons for a variety of applications
    - Training
  - Different types of designs
    - Pool-type, tank-type, ….

# Example: Material Test Reactor Facility (1)

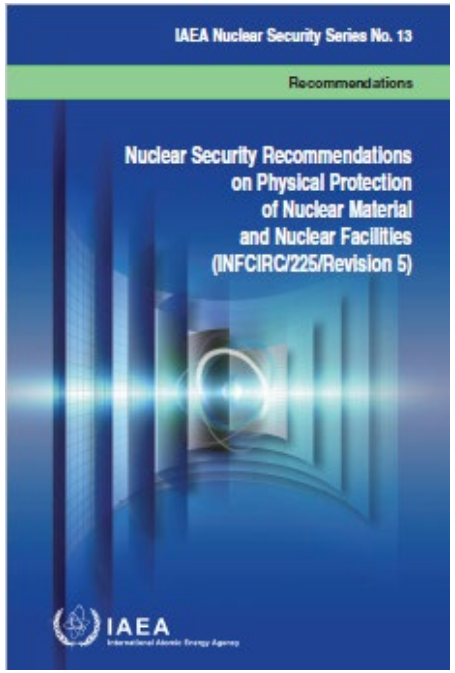
- Hypothetical MTR Facility (MTRF)
  - LEU-fueled 10 MW pool-type research reactor

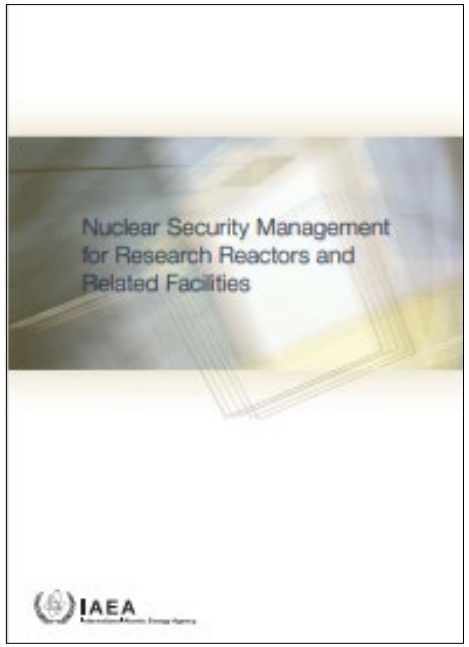



source: INS MTRF handbook

# IAEA Nuclear Security Guidance for Research Reactors

- General security concepts are described in NSS-13
  - [PPS] … should be integrated and effective against both sabotage and unauthorized removal
    - More stringent requirements apply
  - Risk-based approach
  - Graded approach
    - Category of nuclear material (theft)
    - Unacceptable and high radiological consequences (sabotage)
  - Defense in depth approach
  - PPS including detection, delay, and response
  - Mitigate and minimize sabotage consequences/ locate and recover stolen nuclear material
- IAEA-TDL-004 contains a discussion of research-reactor specific issues

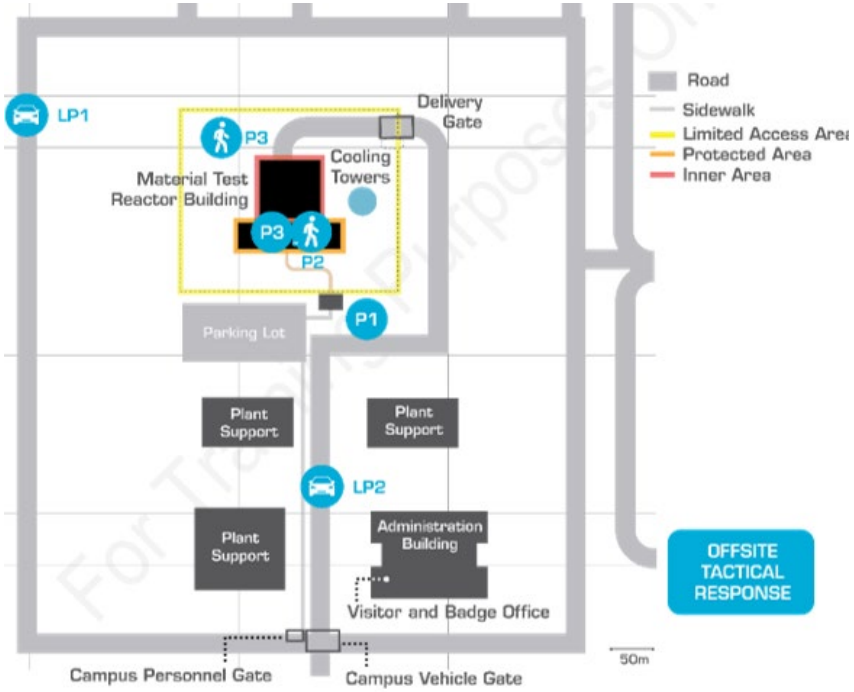



source: IAEA

# Protection Against Nuclear Material Theft

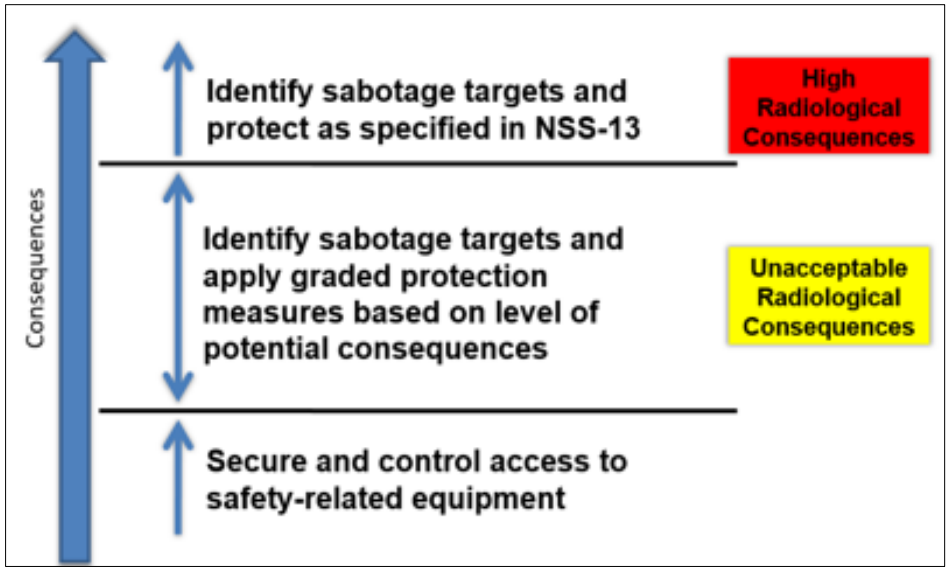
- MTRF is a Category II nuclear material facility
  - DBT is not required but may be appropriate in some cases
- Defense in depth
  - Limited access area (LAA) – Protected Area (PA)
    - Storage of target material inside a strong room is a good practice
  - Access control and detection (with assessment) at PA and strong room boundary
    - Central Alarm Station
  - Delay
  - Guards and response forces




source: INS MTRF handbook

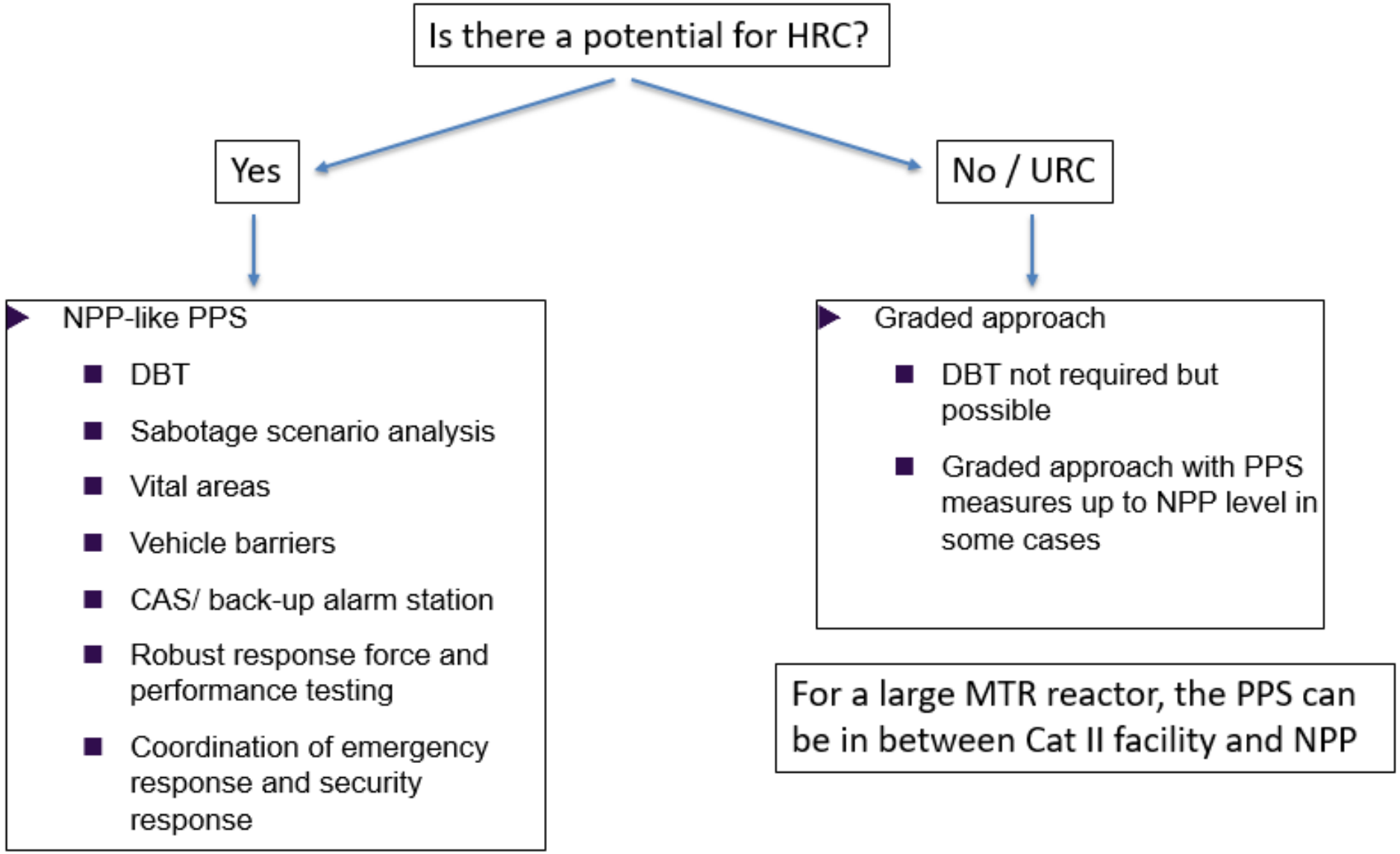
# Protection Against Radiological Sabotage (1)

- Sabotage (NSS 13 definition)
  - Any deliberate act directed against a nuclear facility or nuclear material …which could directly or indirectly endanger the health and safety of personnel, the public or the environment by exposure to radiation or release of radioactive substances
- The level of protection required depends on whether there is a potential for Unacceptable Radiological Consequences (URC) or High Radiological Consequences (HRC)
  - URC and HRC are defined by the State based on technical and policy analysis and considerations




source: INS MTRF handbook

# Protection against radiological sabotage (2)



# In Conclusion

- Research reactors are non-power reactors that are used to generate neutrons and for training
- Research reactors may require protection against both theft and sabotage
- NSS 13 provides recommendations for security measures based on a graded approach
- NSS 48-T presents a methodology for vital area identification

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# Questions, Comments, Concerns?

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