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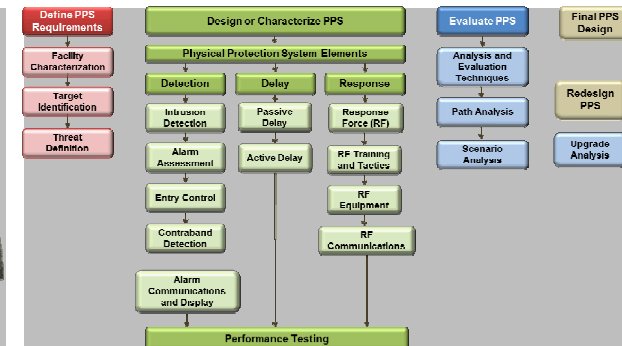Sandia National Laboratories

Target Identification and Characterization

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NNSA National Nuclear Security Administration

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Objectives

- After this presentation, you should be able to:
  - List major target identification process steps
  - Determine how to prioritize targets based on consequences
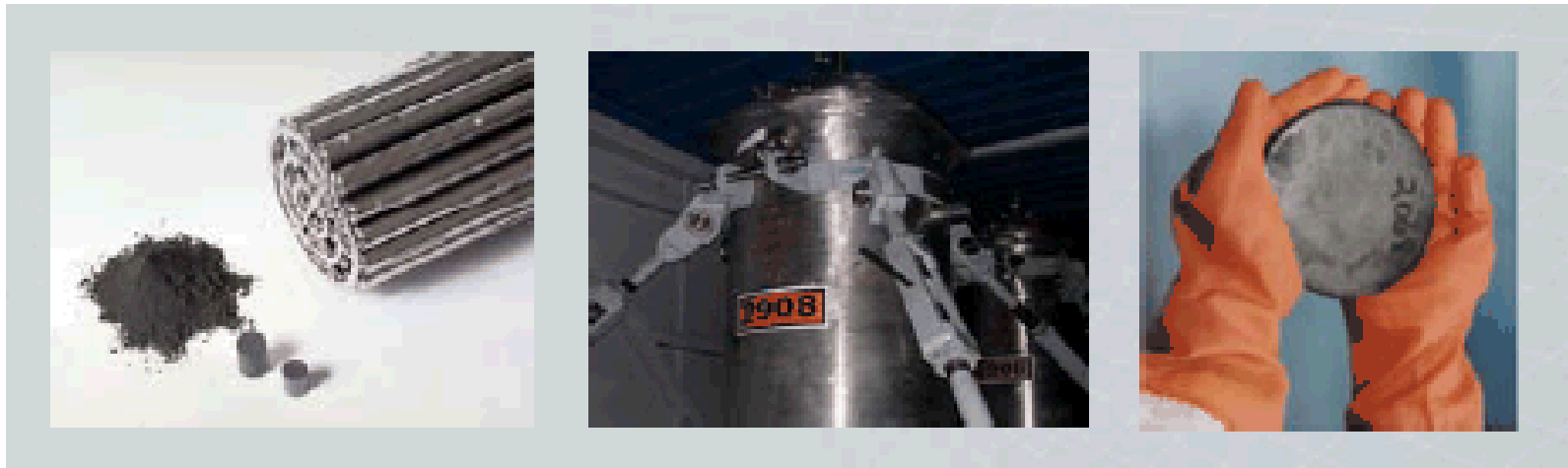
Design and Evaluation Process
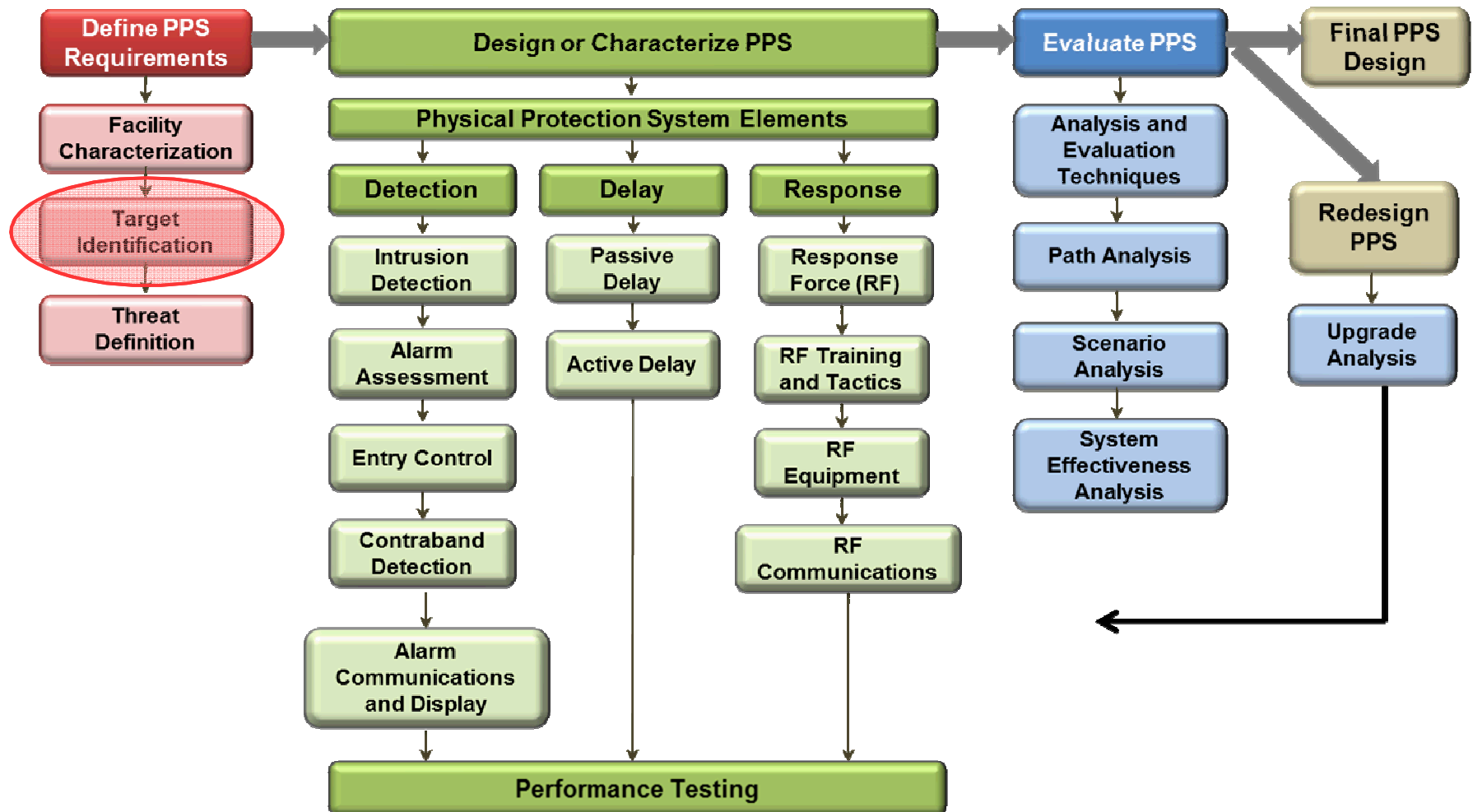
Targets

- Target – Something that is subject to danger, risk or harm or loss

- Theft targets
  - Nuclear and radioactive materials

- Sabotage targets
  - Nuclear and radioactive materials
  - Process or support equipment needed to prevent unacceptable radiological consequences

- Other potential targets
  - Facility may have other assets it chooses to protect
  - Design and evaluation process applies to any type of target

Targets – What Are They?

- Pure products
- High-grade and/or low-grade materials
- Radioisotope sources
- Power reactors
- Production processes
- Facilities / locations processing plutonium or highly enriched uranium (Pu or HEU)
- Radioactive waste storage areas
- Transport vehicles
- Facility safeguards and security systems

Target Identification

- Basic target identification concepts
  - Protection needs
  - Operational impacts
  - Target worth
  - Target location
- Target identification application
  - Security policy
  - Target types
  - Consequence measures
  - Referential information

Target Identification Process

1. Identify protection goals
   - What must be protected and from whom?

2. Identify types of materials and facilities
   - Target type

3. Target categorization and consequence
   - Conservative analysis

4. Develop target listing
   - Material inventories

Material Categorization

- Nuclear material – Attractiveness level
  - Material form
    - Related to ease in which material could be used to make a nuclear explosive device
  - Categorization
    - Usually dependent on element, isotopic concentration, mass, and irradiation history

- Radiological material
  - Similar to that of nuclear material
    - Level of health risk
    - Material amount

Material	Form	Cat. A	Cat. B	Cat. C
P_u	Unirradiated	> 2 kg	>500 g < 2 kg	>15 g 500 g
U^{235}	Unirradiated >20 %	> 5 kg	>1g < 5 kg	>15 g 1 kg
U^{235}	Unirradiated 10-20 %	> 2 kg	< 2 kg > 500 g	1 kg to 10 kg
Fuel	Irradiated	------	< 10% fissile	------

Example: Categorization of Nuclear Material

Consequence

- Consequence is impact of target loss
    - Type and quantity
    - Effect on health and safety
    - Effect on national security

- Consequence values indicate relative importance
    - Consequence values may range from 0.0 to 1.0

- Values come from national / international consensus group to provide consistency across facilities

Additional Consequence Considerations

- Target factors
    - Location
    - Container characteristics
    - Restraints
    - Weight
    - Portability
    - Discrete or roll-up

Material Consequence – Examples

Nuclear Material Consequence Table

Material	Consequence Value
Weapon or Test Device	1.0
Cat A Pure Products	0.8
Cat A Simple Compounds	0.7
Cat A Low Grade Material	0.6
Cat B Quantity	0.4
Cat C Quantity	0.2
Cat D Quantity	0.1

VS.

Radiological Material Consequence Table

Radiological Sabotage	Consequence Value
> 2.5 Sv	1.0
1.0 - 2.5 Sv	0.5
0.5 - 1.0 Sv	0.2
0.25 - 0.5 Sv	0.1
< 0.25 Sv	0.01

Summary

- Target identification process steps
  1. Identify protection goals
  2. Identify types of materials and facilities
  3. Identify target categories
  4. Develop target list
- Consequence is impact of target loss