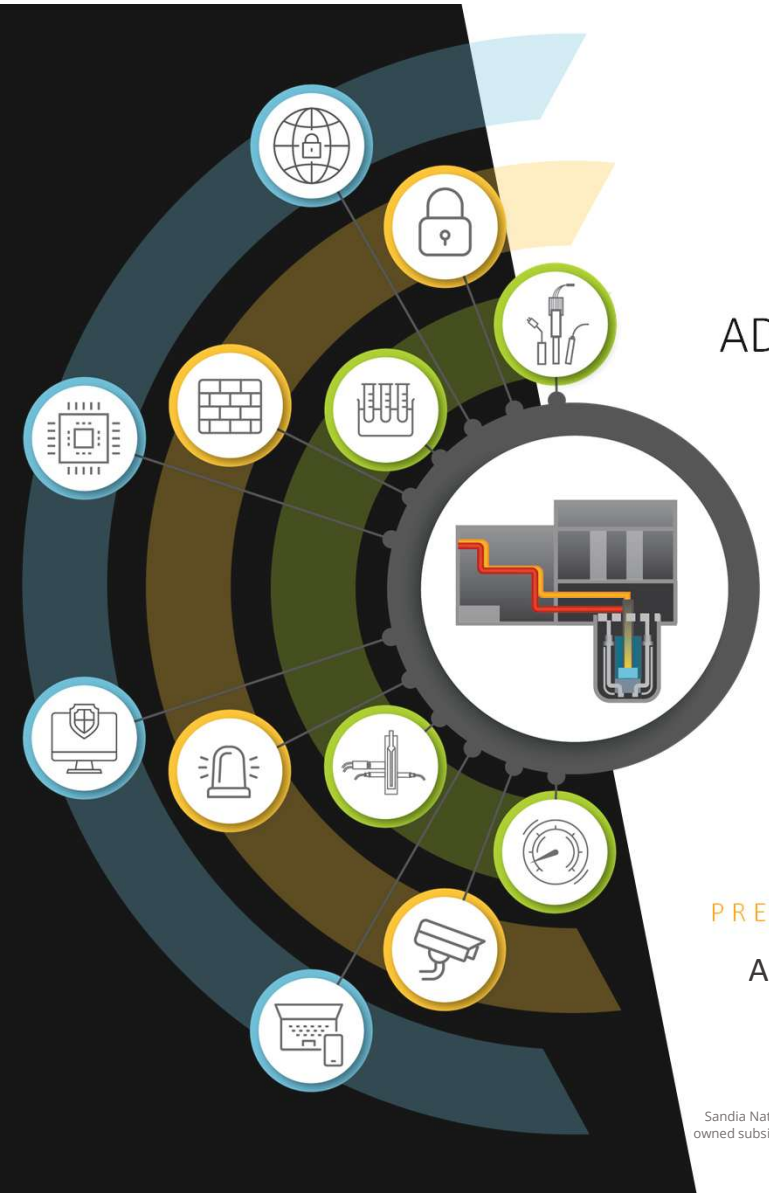

ADVANCED REACTOR SAFEGUARDS & SECURITY

PPS Alignment Between DOE-NE and NRC

Reactors and Fuel Cycle Facilities

SAND2026-20195PE

PRESENTED BY

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U.S. DEPARTMENT OF ENERGY

Objectives and Purpose

- Challenge: Reactor vendors and fuel fabrication vendors under the Reactor Pilot Program and the Fuel Line Pilot Program will face varying regulatory requirements for DOE-NE authorization and reaching commercial licensing
- What Industry Needs: Industry needs guidance for meeting the requirements for DOE-NE and NRC and streamlining physical protection system (PPS) designs to meet demonstration needs and commercialization needs
- Purpose of Our Work: Provide alignment document between DOE and NRC regulations to assist vendors in streamlining PPS designs

A Changing Regulatory Landscape

Provided the Foundation for:

- Eliminating a set number of on-site responders
- Allowing for off-site response
- Changes to Secondary Alarm Station

NRC Part 73 Limited Scope Rulemaking, SRM-SECY-18-0076

2018

2019

NRC Part 53 rulemaking started due to NEIMA Act

2024

NRC Plans to Pull Part 73 Limited Scope Rulemaking into Part 53

2025

Trump Administration Executive Orders to Reinvigorate the U.S. Nuclear Industry

2026

DOE NE Authorization Pathway for Nuclear Facilities

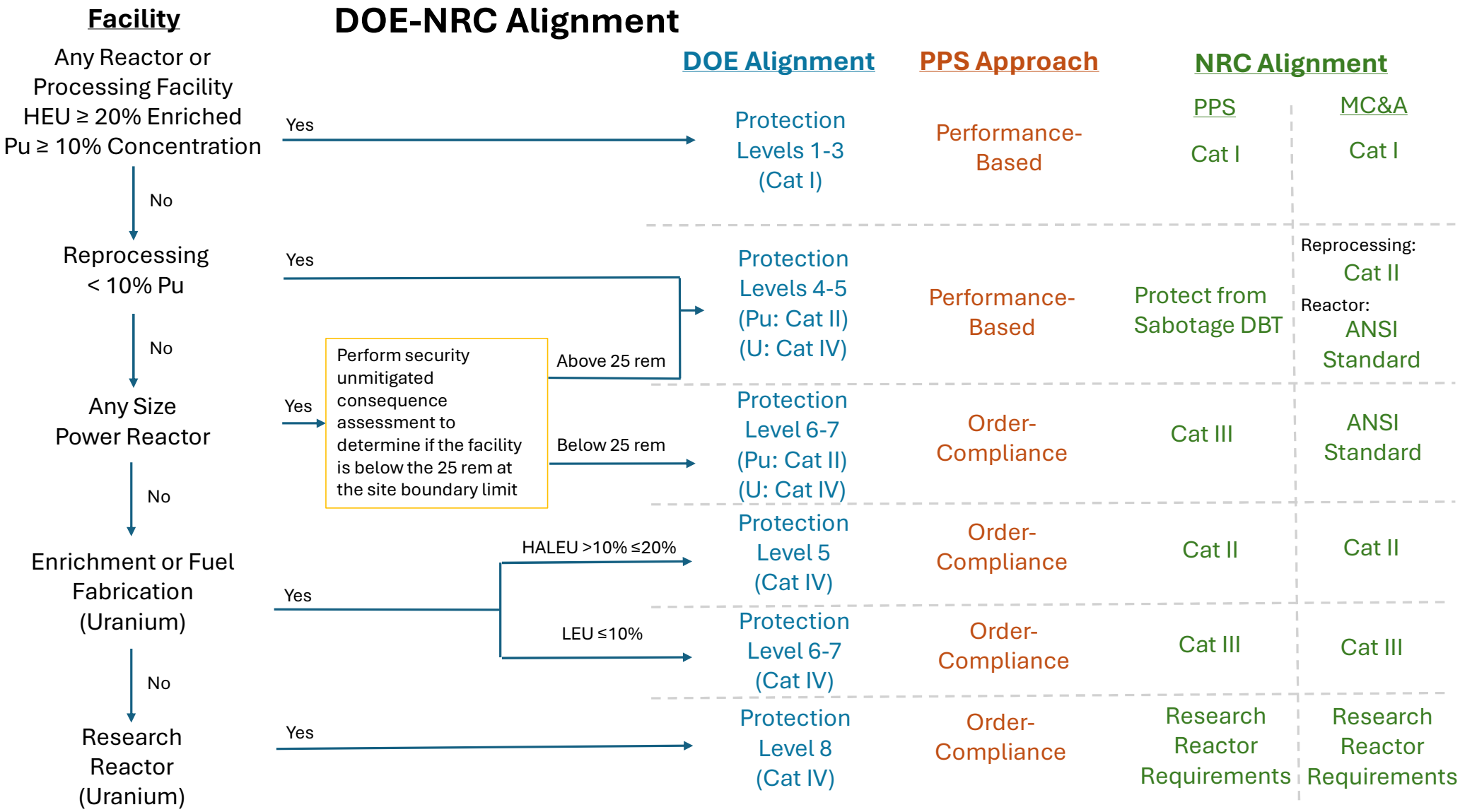
NRC Part 53 released

Process Steps

- Review DOE and NRC policies, regulations, and regulatory guides
  - DOE: 473.3, 470.4C 473.1A
  - DOE-NE: 470.1
  - NRC: 73.55, 73.100, various regulatory guides
- Create an alignment structure that allows for easier comparison of DOE and NRC existing regulatory frameworks
  - Receive DOE-NE feedback
  - Receive NRC feedback
- Incorporate feedback into a technical recommendation and alignment document that can be used by industry, DOE-NE and NRC

Early adoption of leveraging Sandia and DOE LLM tools for assisting in regulatory comparisons

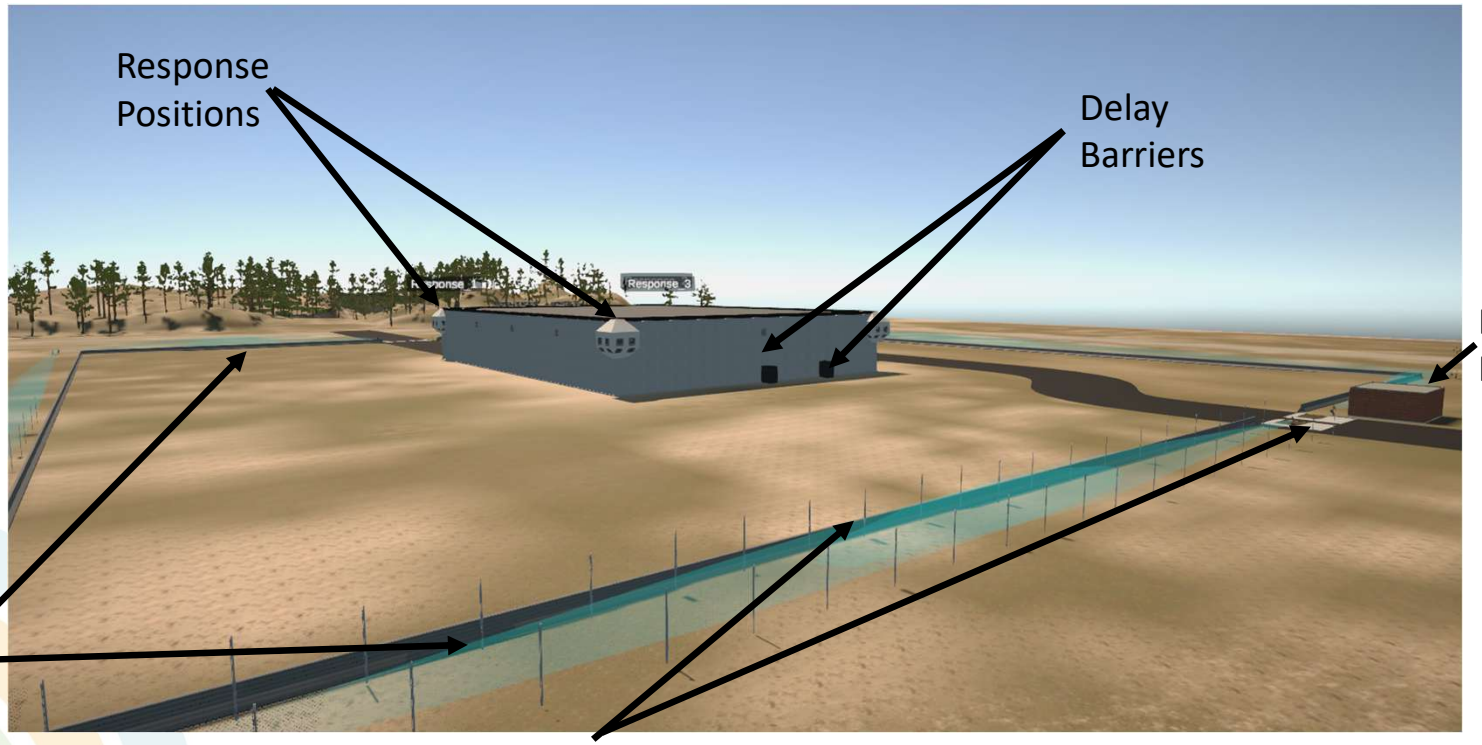
DOE-NRC Alignment



Performance-Based vs Order-Compliance

- Performance-Based: Facilities with potentially higher consequences based on radiological releases or the category of nuclear material
  - Require vendors and utilities to achieve a high assurance of protection against theft and/or sabotage
  - Minimal prescriptive requirements, technology agnostic, requires proof for evaluation by the vendor or utility
- Order-Compliance: Facilities with potentially lower consequences based on radiological releases or the category of nuclear material
  - Requires assurance of protection
  - Prescriptive requirements (intrusion detection, access control, and agreements with local law enforcement, or a contract with an offsite security company)

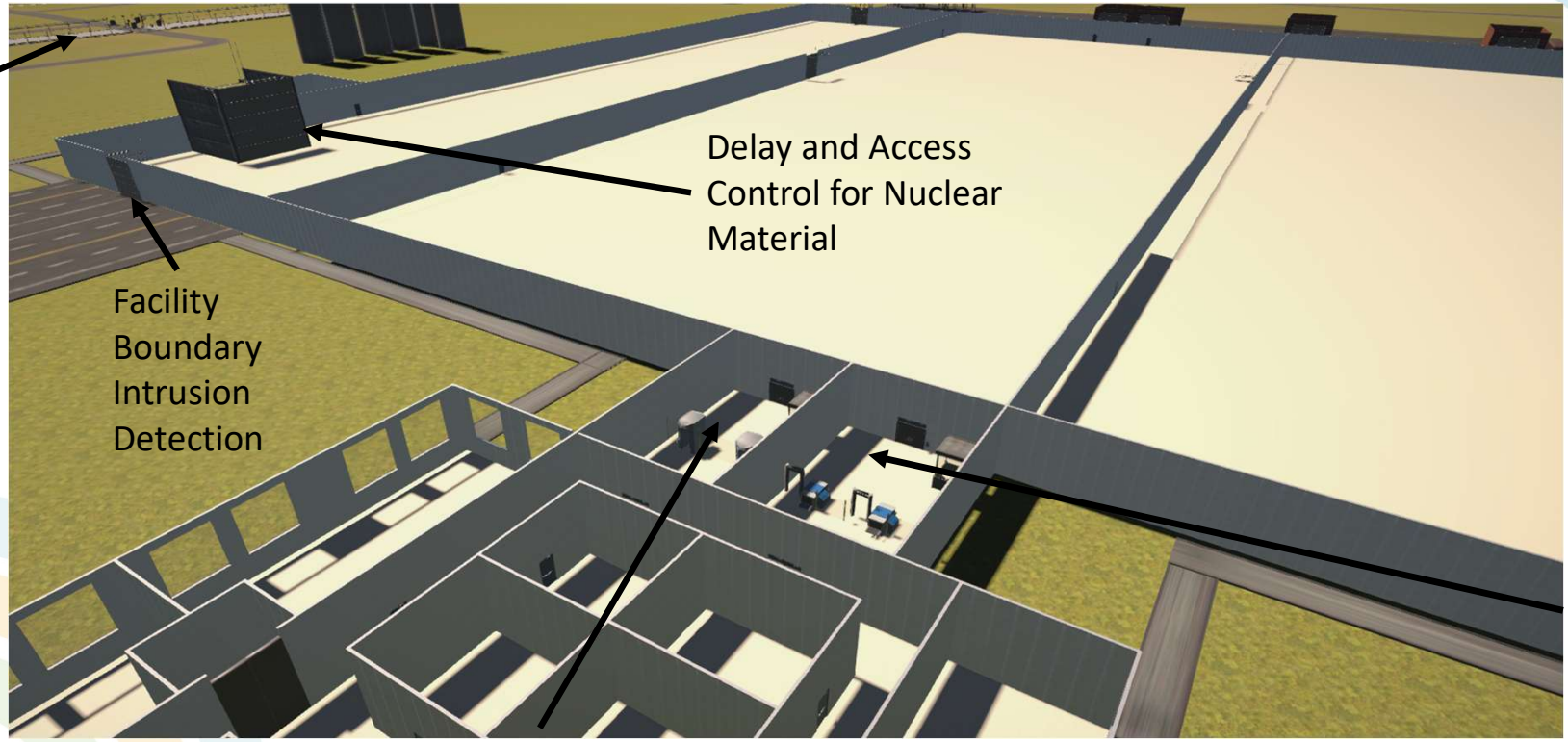
Performance Based Facilities: High Level



Performance Based Facilities: High Level View

- Response force that is capable of defending the facility against a Design Basis Threat attack.
- Intrusion detection capabilities that allow for timely detection of adversaries to ensure a proper response.
- Vehicle barriers at appropriate standoff to protect targets and vital equipment, and to protect security personnel.
- Delay barriers to increase adversary task time, or used as a force multiplier to neutralize an adversary threat.
- Entry control points with contraband detection to prevent or mitigate the introduction of weapons, firearms, or other tools that could be used by an adversary.

Order Compliance Facilities: High Level



Order Compliance Facilities: High Level View

- Property boundary to demarcate where nuclear security is applied.
- Intrusion detection capabilities around the perimeter of the building, or structure housing nuclear material.
- Intrusion detection, delay barriers and access control around nuclear material locations.
- Entry control points with contraband detection and access controls to prevent or mitigate the introduction of weapons, firearms, or other tools that could be used by an adversary.

Vendor Engagements

- ARSS is supporting many vendors at this time in a wide variety of deployment contexts
  - Physical protection system equipment needs based on DOE NE O 470.1
  - Consequence analysis to support DOE-NE authorization and commercialization with NRC
  - Evaluation of explosive capabilities and impact on bullet and blast resistant enclosure structures
  - Multi-unit and colocation deployment opportunities
  - Vendors deploying various sizes of reactors to demonstrate operations before commercial licensing

Conclusions

- ARSS has been supporting a technical recommendation and alignment document between the DOE-NE Orders for the Reactor Pilot Program and NRC licensing
- Use of a performance-based approach can be used to create cost-effective systems for advanced reactors
- Use of an order-compliance approach can be used to create cost-effective security systems for advanced reactors with minimal consequences
- Supporting vendors in a broader context for demonstration under DOE-NE and future licensing under NRC