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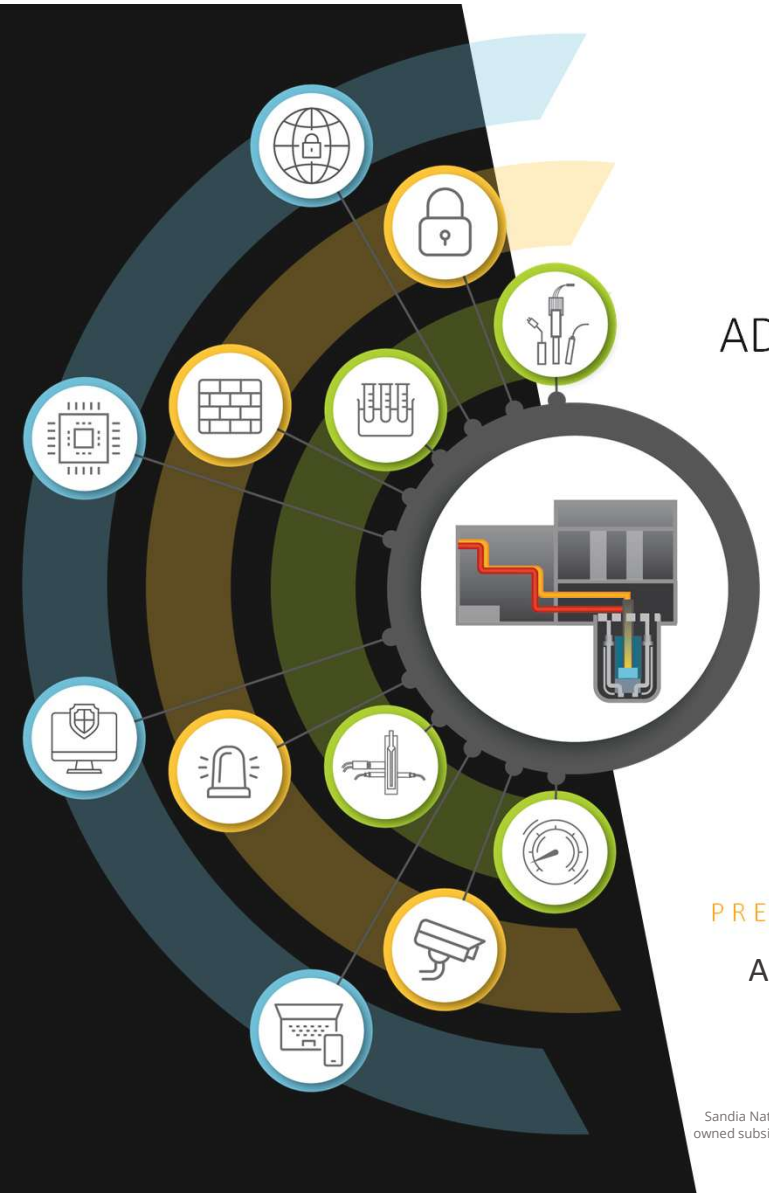

ADVANCED REACTOR SAFEGUARDS & SECURITY

PPS Analysis of Floating Nuclear Power Plants

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PRESENTED BY

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U.S. DEPARTMENT OF ENERGY

FY25 Work

Project Goal

To create a PPS design for a stationary FNPP that has onshore facilities, which can respond well to adversary attack pathways both on land and water. Specifically, have a PD of 100% and a $P_I > 0.90$ for all attack pathways.

Adversaries **Targets** **Response**

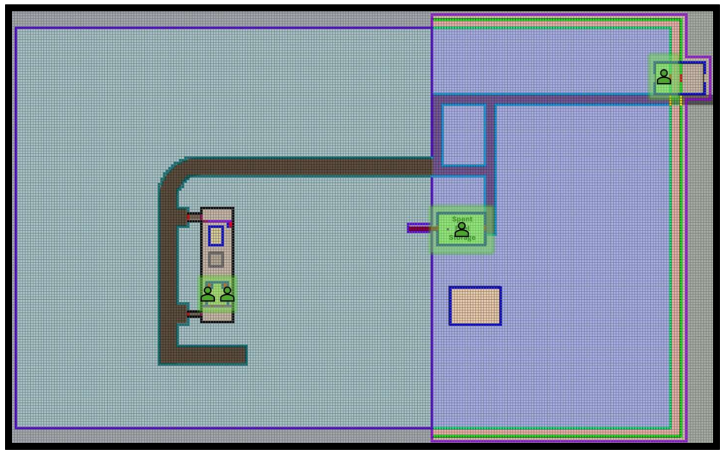
Walk Drive Swim Boat Boat 1 Boat 2 Land 1 Onsite Offsite

Method

1. Build a Baseline PPS Design for a docked FNPP in PathTrace
2. Determine target locations and attacking adversaries
3. Run MVP algorithm for every target-adversary combination
4. Attempt upgrades to PPS to address any $P_I < 0.90$
5. Report findings on paper

Results and Takeaways

- Ships benefit from many opportunities for delay through many doors and enclosed spaces
- Both offsite and onsite response adequately responded to on-boat targets after door upgrades*
- Onshore targets only benefitted from onsite response



*Caveat that the onsite response time was an optimistic 20 minutes

FNPP Layout Inspiration

General Information

- FNPP is located at a remote location in the US
- FNPP is either…
  - Docked at a stationary location with pier
  - In transit to the next location
- FNPP is not co-located with a chemical plant

Considerations for PPS Design in Transit

- Armed transit escorting or patrol craft
- Watch stander procedure
- Anti-boarding measures (restricted ladders, locked external hatches)
- Response positioning
- Methods for hull monitoring

Considerations for PPS Design Docked

- Diver detection sonar
- Controlled waterside gates
- Floating barriers and booms
- Gangway and pier control

Data Being Used

- Modeling and Simulation Probability of Detection and Delay Database
  - Hypothetical dataset used for trainings that includes P_D and delay times for various typical PPS devices and techniques such as of different sensors, identity verifications, barriers, cutting timelines, etc.
- Lone Pine Nuclear Power Plant Hypothetical Facility Data Handbook
  - Hypothetical dataset used to fill in any gaps left from the previous dataset
- If no other source was applicable, SMEs will be consulted


The information in this book is hypothetical and is not based on any performance tests that have been conducted by the United States Government, Department of Energy.

Modeling and Simulation Probability of Detection and Delay Database

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Scope

Project Goal

To extend the previous year's PathTrace work by taking the insights from the P_I analysis to inform a tabletop exercises using Scribe3D. Specifically, to explore tabletops of a docked or in-transit FNPP and report identified security design takeaways.

Method

1. Building an FNPP model in Scribe3D (90% complete)
2. Designing the PPS of the FNPP model to include delay, detection, and response strategy (50% complete)
3. Design a DBT using notional land-facility handbooks, open-source data, and SME input (in progress)
4. Design 2-3 plausible sabotage scenarios
5. Iteratively run tabletop exercises with SMEs experts and make design tweaks as needed
6. Report method, findings, and takeaways in paper

Task 1	Task 2	Task 3
Exporting Models to Scribe3D	Designing the PPS	Final Report Preparation

Progress

FNPP Model in Scribe3D

- FNPP model has been created in Scribe3D.
- Model is being upgraded for compatibility with Scribe 4 and will be under review to confirm it is appropriately marked/classified as UUR.
- Upon completion (projected May 7), the model will support visualization and iteration of the PPS design.

Designing the PPS of the FNPP Model

- BMS alarmed and access-controlled entrance ramps
- BMS alarmed and access-controlled entry to lower levels
- Video motion detection on the interior of the ship
- Passive infrared in and around the target rooms
- Metal door equivalent door delay

After Model Completion

- Camera placement on the top deck
- Camera placement on in the interior
- Response location and strategy

Iterative TTX Design Process

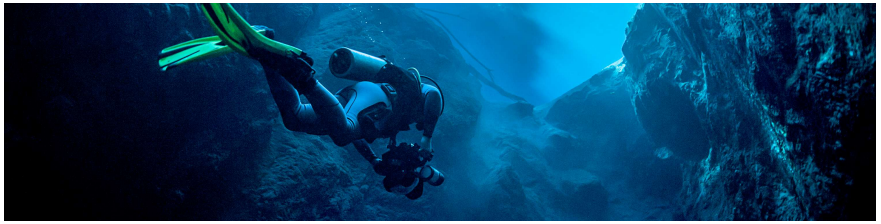
For the 2-3 plausible sabotage attack scenarios

1. Conduct TTX with red team, blue team, and evaluator
2. Identify vulnerabilities and identify areas where improvements could be made
    1. Response post locations on the ship
    2. Detection measures to support earlier detection…
        1. Reaches the ship
        2. Breaches the first layer of security on the ship
    3. Detection and surveillance measures to support response understanding of adversary location
    4. Delay barriers to support and improve response force neutralization effectiveness
3. Rerun adversary scenarios to ensure mitigation effectively protect against the adversary attack scenario, **stop when all attack scenarios are addressed**.

Potential Vectors for Consideration

Surface Vectors
- Small craft, fast approach
- Disguised and benign appearing vessel (service or fishing)
- Boarding by ladders, gangway, external hatches

Underwater Vectors
- Diver or swimmer approaching gangway or hull
- Boarding by ladders, gangway, external hatches



Aerial Vectors
- Small UAS used for surveillance
- Small UAS used for assessment
- Small UAS for distraction/diversion

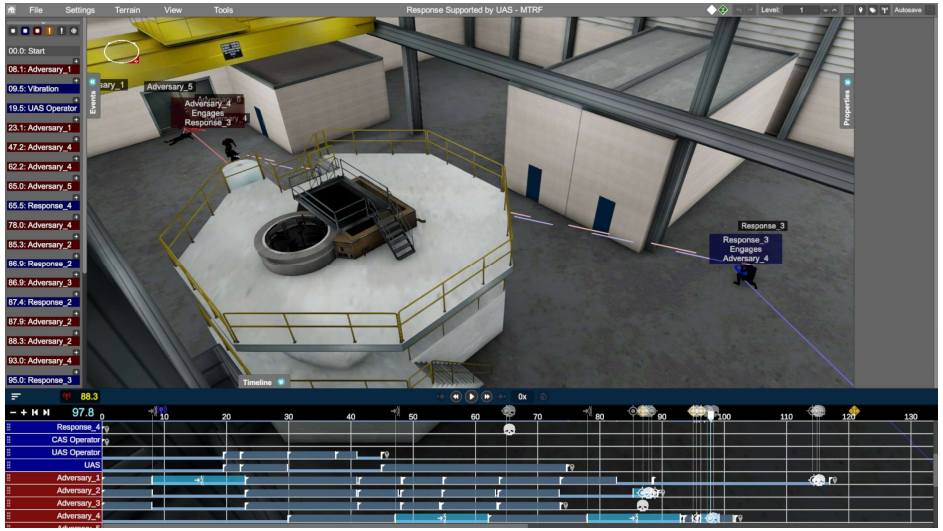
Questions to Answer with Tabletop Exercises

Scribe Specific Benefits

- Response placement
- Line-of-sight determinations
- PhPk determinations in engagements
- Camera and sensor placement

FNPP Specific Questions

- How does response placement on ship affect engagements?
- How effective can assessment be in the perimeter around the ship?
- How do open deck engagements differ from indoor closed engagements?



Final Report Preparation

- The paper will feature the following sections:
  - **Model Description** - Relevant details of the PPS on the 3D model including sensors, delay measures, and response procedure
  - **Evaluation Methodology** – Details on the DEPO as they are relevant to the Scribe3D tabletop exercises
  - **Results** – A listing of events from each scenario explored and the outcomes
  - **Takeaways** – Observation and discussion of findings

Thank you!

Questions?