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PHYSICS-BASED SABOTAGE OF ADVANCED REACTOR CONCEPTS

SFRs, HPMR, HTGRs, and MSR

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BACKGROUND

- Advanced reactors planning to be online as soon as 2027
- As the physical properties of many of the designs differ from traditional light water reactor designs, they will have different target points for sabotage and different Design Basis Threat (DBT) analysis that will require varying physical protection systems (PPS)
- This project focuses on physics-based attacks on four advanced reactor concepts: Sodium Fast Reactors (SFRs), Heat-piped based microreactors (HPMR), High Temperature Gas Reactors (HTGRs), and Molten Salt Reactors (MSRs)
- The first product is a short report on each reactor type detailing the potential attack targets, a qualitative rating, and a recommendation on if it should be included in the PPS
- The second product is a timing and consequence analysis of medium to high rated attack types using MELCOR



UNIQUE PHYSICS AND CHEMISTRY

Sodium Fast Reactors

- Highly reactive with water
- Positive void coefficient
- Nonmechanical pumps

Heatpipe-Based Microreactors

- Mobility / Portability
- Center of gravity
- Passive cooling

High Temperature Gas Reactors

- Pebbles / TRISO
- Gas coolant
- Onsite pebble storage

Molten Salt Reactors

- Liquid fueled
- Conductivity of salt
- Passive safety features



RESULTS AND FUTURE WORK

Results

- CUI level reports for vendors
- MELCOR analysis of targets for HTGRs

Future Work

- MELCOR analysis of targets for all other reactor types