Office of Nuclear Security and Incident Response

How RAMP can support our mission

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NSIR

Who We Are and What We Do

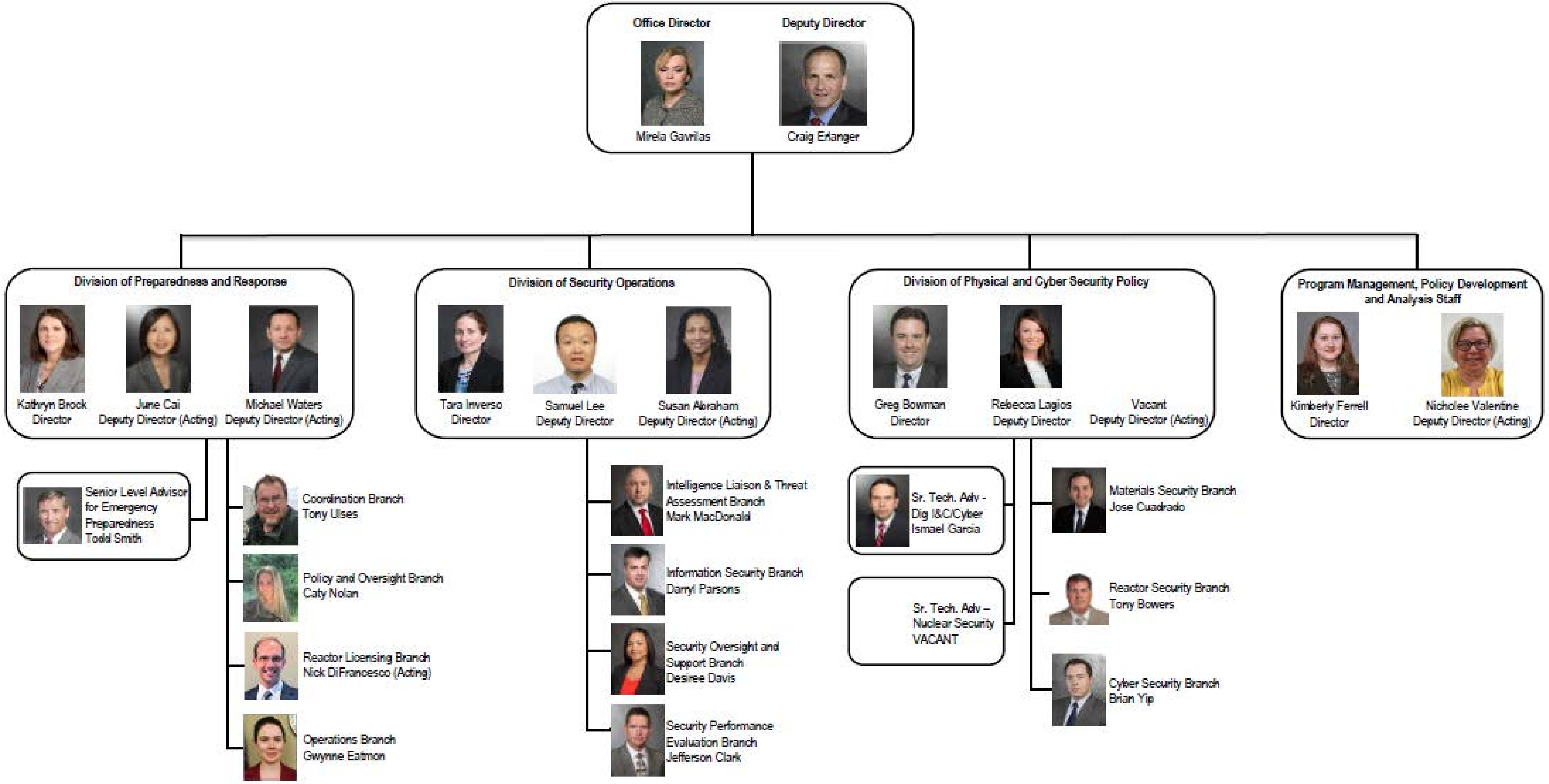
OUR MISSION

To prevent nuclear security incidents and prepare for and respond to safety and security events.

OUR VISION

To be a valued partner in homeland security and national emergency preparedness and response

Office of Nuclear Security and Incident Response



Events that shaped our EP and security programs

Three Mile Island Accident, 1979

September 11, 2001

Fukushima Accident, 2011

EP and security programs add defense in depth

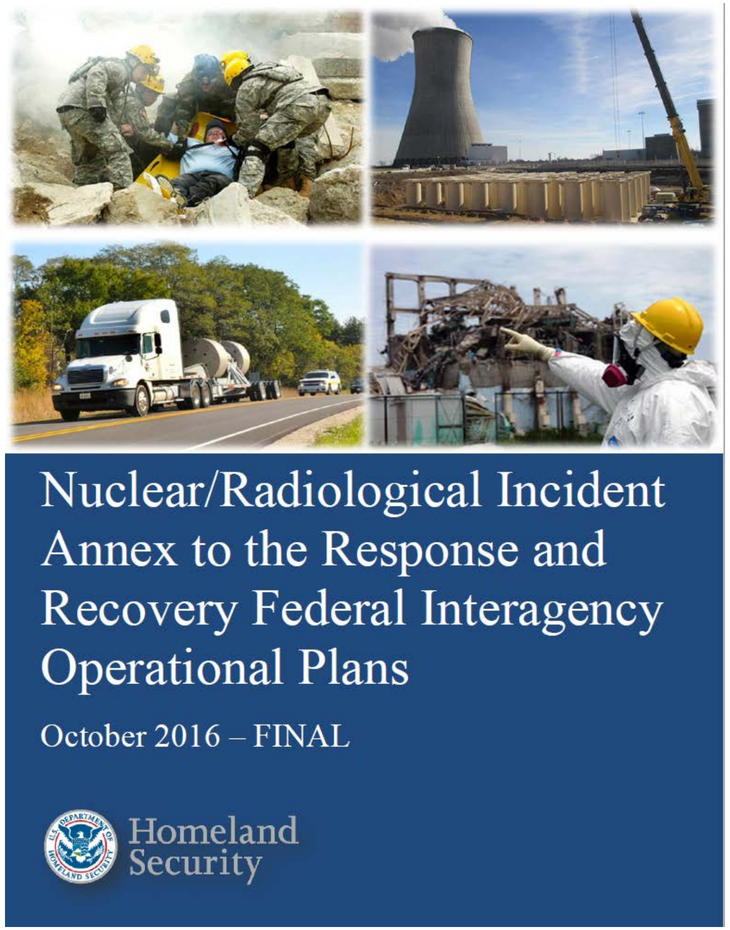
- Physical security
- Cyber security
- Information security
- Insider mitigation
- Personnel security for licensees
  - Access authorization
  - Fitness for duty
- Transportation security
- Material control & accounting
- Emergency preparedness
- Incident response
- Headquarters Operations Center
  - Headquarters Operations Officers
- Continuity of Operations Planning

National Response Framework (NRF)

Nuclear/Radiological Incident Annex

- Defines the roles and responsibilities of Federal agencies in responding to different categories of nuclear/radiological incidents.
- Describes the specific authorities, capabilities, and assets the Federal Government has for responding to nuclear/radiological incidents that are not otherwise described in the NRF.
- Provide guidelines for notification, coordination, and leadership of Federal activities.

While NRC is the Lead Federal Agency (LFA) for *incidents* involving materials or facilities licensed by the NRC or Agreement States, Department of Homeland Security (DHS) is the LFA for all deliberate *attacks* involving nuclear/radiological facilities or materials (e.g., RDDs, INDs)



NSIR builds and sustains strong collaboration

NSIR is engaged internationally

- International agreements and treaty obligations
- Exchange regulatory security and emergency preparedness information
- Bilateral cooperation with international regulators
- Trilateral with UK and Canada on physical security and emergency preparedness
- Engage with multilateral organizations such as IAEA, NEA, and WINS
- Provide assistance and training support to countries who are just starting their programs.

IAEA

NEA
NUCLEAR ENERGY AGENCY

ONR Office for Nuclear Regulation

CNSC CCSN

WINS

Regulatory Developments

Regulatory Improvements for Production and Utilization Facilities Transitioning to Decommissioning

- 10 CFR parts 50, 72 and 73; SECY-18-0055
- Adjusting EP and security requirements commensurate with the decreased risk profile of decommissioned facilities
- https://www.regulations.gov/docket/NRC-2015-0070

Risk-Informed, Technology Inclusive Regulatory Framework for Advanced Reactors

- 10 CFR Part 53; SECY-23-0021; publicly released 3/6/23)
- https://www.regulations.gov/docket/NRC-2019-0062

Alternative Physical Security Requirements for Advanced Reactors

- Limited Scope Rulemaking; SECY-22-0072
- Allows for flexible security alternatives based on radiological consequence analysis
- https://www.regulations.gov/docket/NRC-2017-0227

Emergency Preparedness for Small Modular Reactors and Other New Technologies

- 10 CFR 50.160; SECY-22-0001
- https://www.regulations.gov/docket/NRC-2015-0225

Radiological emergency preparedness (EP)—

- *ensures protective actions can and will be taken*
- *is an independent layer of defense in depth*
- *provides dose savings*
- *is risk-informed*

The NRC applies a graded approach to EP

A graded approach is a risk-informed process in which the safety requirements and criteria are set commensurate to facility hazards

Existing NRC regulations use a graded approach to EP

- *Power reactors (low-power testing, power operations, decommissioning)*
- *Research and test reactors*
- *Fuel Fabrication Facilities*
- *Independent Spent Fuel Storage Installations*
- *Monitored Retrievable Storage*

Preparedness begins with a proven planning basis

The consequences from a spectrum of accidents, tempered by probability considerations, should be considered to scope the planning efforts for—

- *the **distance** to which planning for predetermined protective actions is warranted [the emergency planning zone (EPZ)]*
- *the **time**-dependent characteristics of a potential release*
- *the type of radioactive **materials***

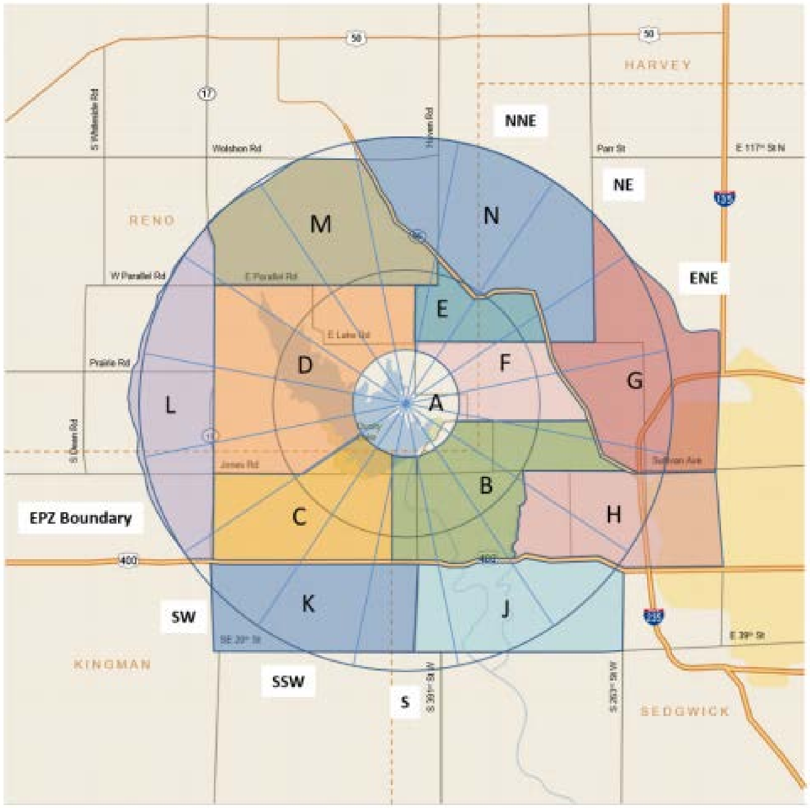
EP for Large Light Water Reactors

16 planning standards of 10 CFR 50.47 and Appendix E including:

- Classification
- Notification
- **Accident Assessment**
- **Protective Actions**

Planning basis includes risk insights from

- Design Basis Accidents (DBA)
- Beyond Design Basis Events (BDBE) including security and severe seismic
- Environmental Assessments



Major provisions of alternative EP regulations

Draft final 10 CFR 50.160 provides an alternative framework for small modular reactors and other new technologies:

- regulatory framework proportional to facility risk

  required EP functions set commensurate to radiological risk

- technology inclusive, performance based

  performance demonstration in drills and exercises

- hazard analysis for contiguous facilities
- ingestion planning capabilities
- scalable EPZ according to planning needs

Emergency response functions provide capabilities

Event classification and mitigation

Protective actions

Communications

Command and control

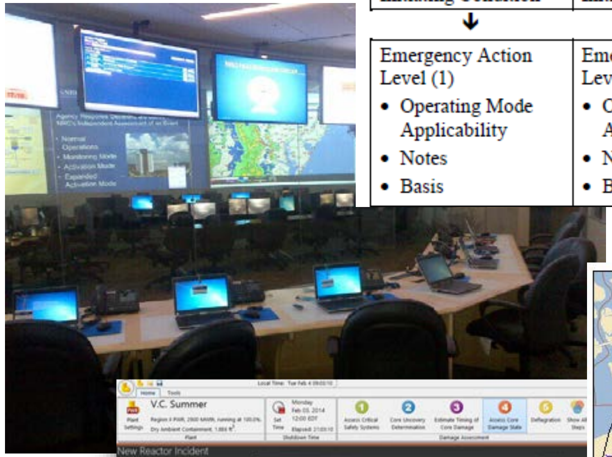
Staffing and operations

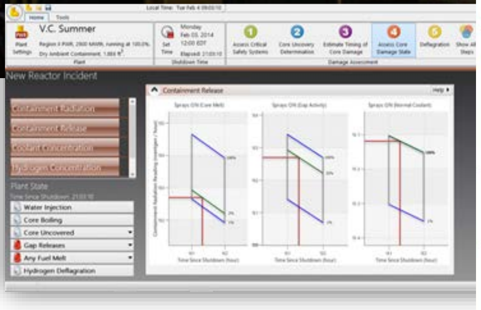
Radiological assessment

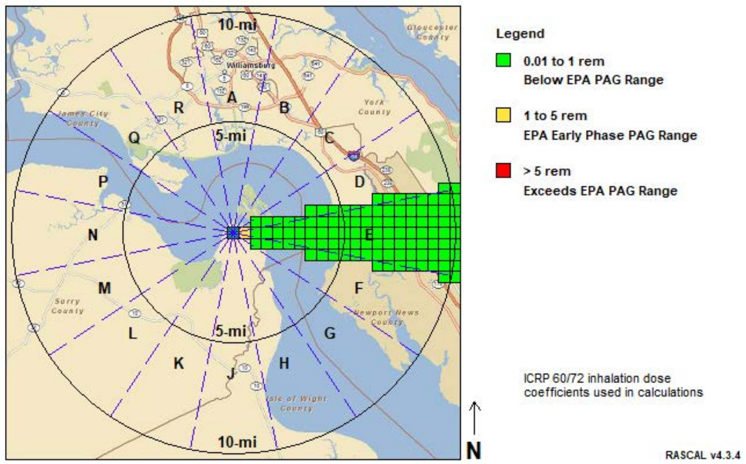
Re-entry

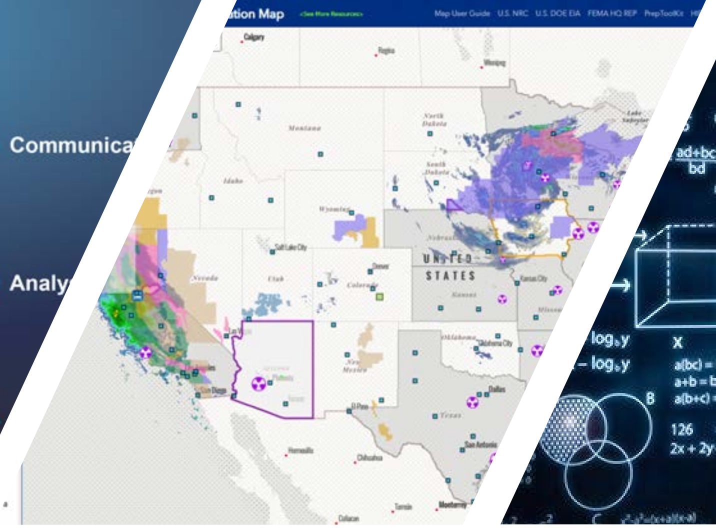
Critiques and corrective actions

Emergency Classification Level			
Unusual Event	Alert	SAE	GE
↓	↓	↓	↓
Initiating Condition	Initiating Condition	Initiating Condition	Initiating Condition
↓	↓	↓	↓
Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis









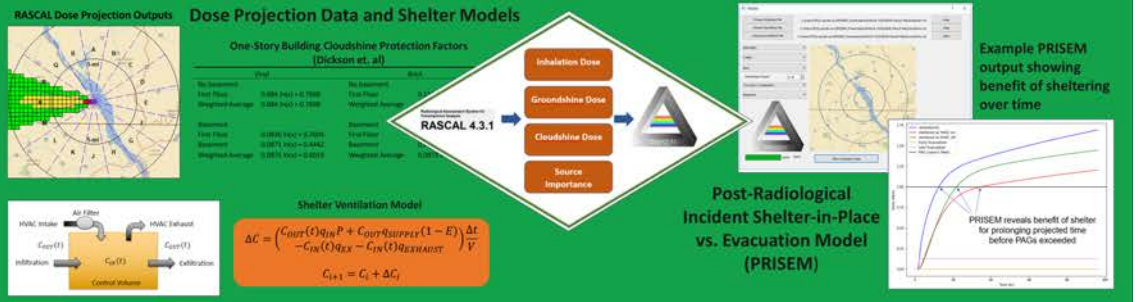
IPAWS

Technology enables the future of EP

NSIR and RAMP create opportunity

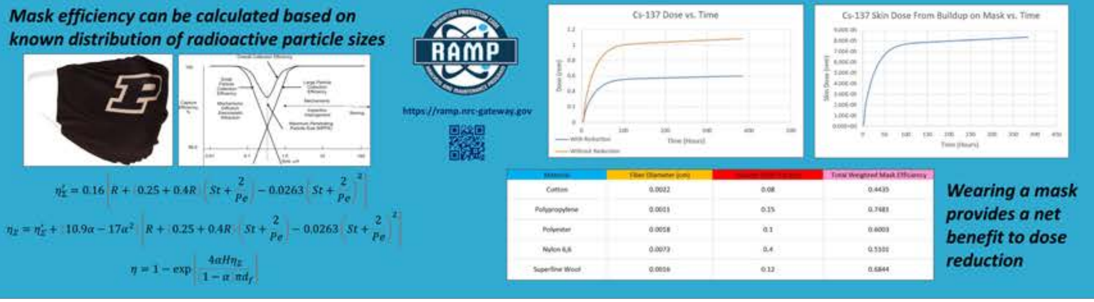
Design of a Novel Protective Action Decision-Making Tool

The student team combined dose projection outputs from RASCAL with state-of-the art models of shelter protection efficiency and evacuation into a user-friendly rapid decision-making aid for protective actions (PRISEM)



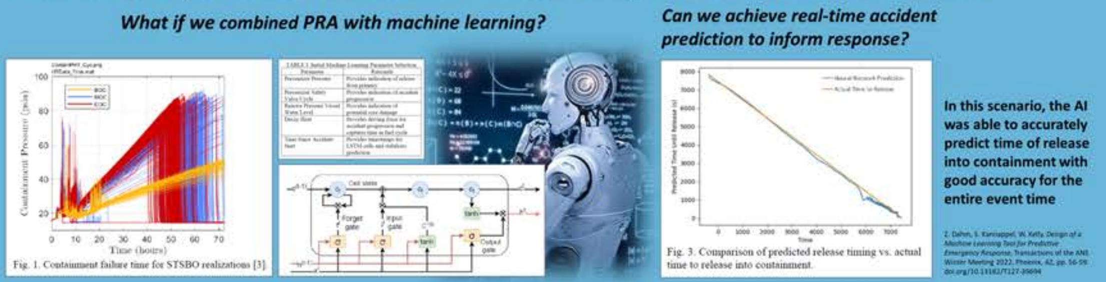
Optimization of Mask Designs for Dose Reduction

The student team optimized a mask designed to reduce inhalation dose. The team also used release data from Fukushima and made use of available NRC RAMP radiation protection codes to quantify the benefit of wearing a mask for a radiological emergency.



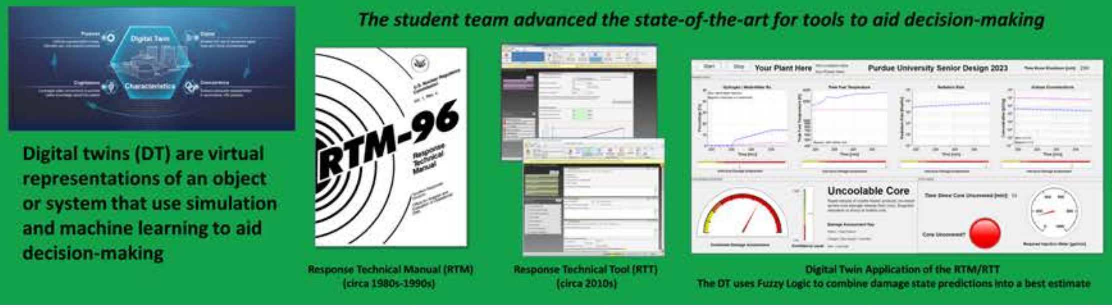
Use of Machine Learning for Predictive Emergency Response

The student team combined probabilistic risk assessment (PRA) with artificial intelligence (AI) to develop a machine learning tool to accurately predict accident release timing based on developing plant conditions. Such a tool could provide decision-makers with advanced warning of a release in time to inform action.



Design and Application of Digital Twins to Emergency Response

The student team designed a Digital Twin (DT) capable of operating in a fully-automated, real-time, remotely accessible manner. The DT is a modern update to the Response Technical Manual and Response Technical Tool which are used for manually estimating core damage states during an emergency based on plant data.



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