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FEMA RAC Chair Briefing on State-of-the-Art Reactor Consequence Analyses (SOARCA)

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Background

- Security assessments of reactor events indicated that radiological releases for scenarios representative of "typical and important severe accident scenarios" are delayed and smaller than that assumed in past safety/consequence studies (1982 Siting Study)
- Offsite health consequences predicted for security assessments were substantially smaller than 1982 Siting Study values
  - Earlier studies were believed to be excessively conservative in their assumptions and treatment
- Advanced, integrated, realistic modeling
  - Plant response using MELCOR code
    - Phenomenological modeling based on extensive severe accident research
  - Offsite consequences predicted using MACCS code

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Background

- Staff began SOARCA in 2005
- Focus on more likely and risk important scenarios
- Realistic, best estimate of accident progression, radiological source terms and offsite consequences
- Include all plant improvements/updates
- More detailed site-specific realistic EP response
  - Public protective actions
  - Onsite mitigation measures

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SOARCA Objective

- To develop a body of knowledge on the realistic outcomes of severe reactor accidents
  - Incorporate plant improvements not reflected in earlier assessments (hardware, procedures, security related enhancements, emergency planning)
  - Incorporate state of the art modeling
  - Evaluate the benefits of recent improvements (10 CFR50.54hh)
  - Enable the NRC to communicate severe accident aspects of nuclear safety to diverse stakeholders
  - Update the quantification of offsite consequences found in earlier publications such as NUREG/CR-2239 (1982 Siting Study)

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MACCS2 Model

- MACCS2 is the NRC consequence model used for the SOARCA analysis
  - Modeling of cohort movement
  - Modeling of evacuation roadway network
  - Shielding factors for cohorts
  - Health consequences by cohort and distance

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Cohorts

- Definition: A segment of the population that mobilizes or moves differently than other population groups
  - 0 to 10 General Public
  - 0 to 10 Schools
  - 0 to 10 Special Facilities
  - 0 to 10 Tail
  - 0 to 10 Non-evacuating Public (0.5%)
  - 10 to 20 Shadow Evacuation
- For Peach Bottom, a 0 to 10 mile Shadow was included because sirens are sounded at SAE

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Source of Data

- Licensee Emergency Action Levels used for timing of emergency declarations
- ORO FEMA approved plans for response
  - Peach Bottom: schools notified at SAE, sirens sounded
  - Surry: schools notified at SAE, sirens not sounded
- Metrics on siren performance (e.g., Surry 99.9% reliability)
- Both states have KI program

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Evacuation Time Estimates (ETE)

- The site specific ETE provided information including:
  - Population cohorts: (general public; special facilities; schools)
  - Speeds
  - Timing of mobilization and evacuation tail
    - Tail is last 10% of evacuees
- ETE developed for 10 to 20 analyses

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Accident Scenarios

Accident scenarios were developed for each site

- Peach Bottom: 3 accident scenarios (LTSBO; STSBO with RCIC and STSBO w/o RCIC)
- Surry – 5 accident scenarios (STSBO; STSBO with TI-SGTR; STSBO with TI-SGTR mitigated; LTSBO; ISLOCA)
- 3 Sensitivity studies for each site
  - evacuation to 16 miles
  - evacuation to 20 miles
  - delay of 30 minutes in implementation of protective actions
- Seismic analysis –loss or communications, infrastructure, etc.

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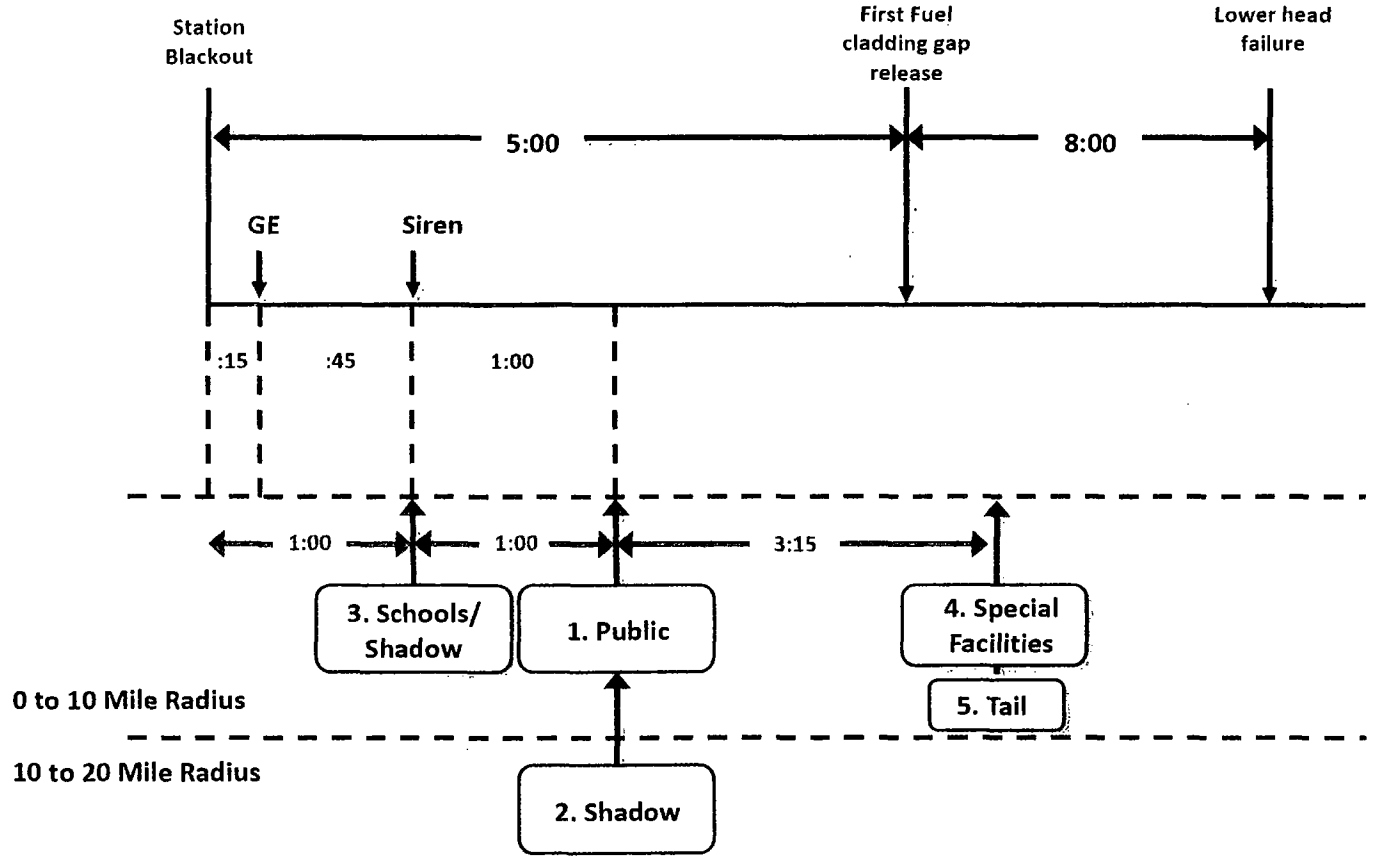
Example Timeline
STSBO w/RCIC Blackstart
(Peach Bottom)



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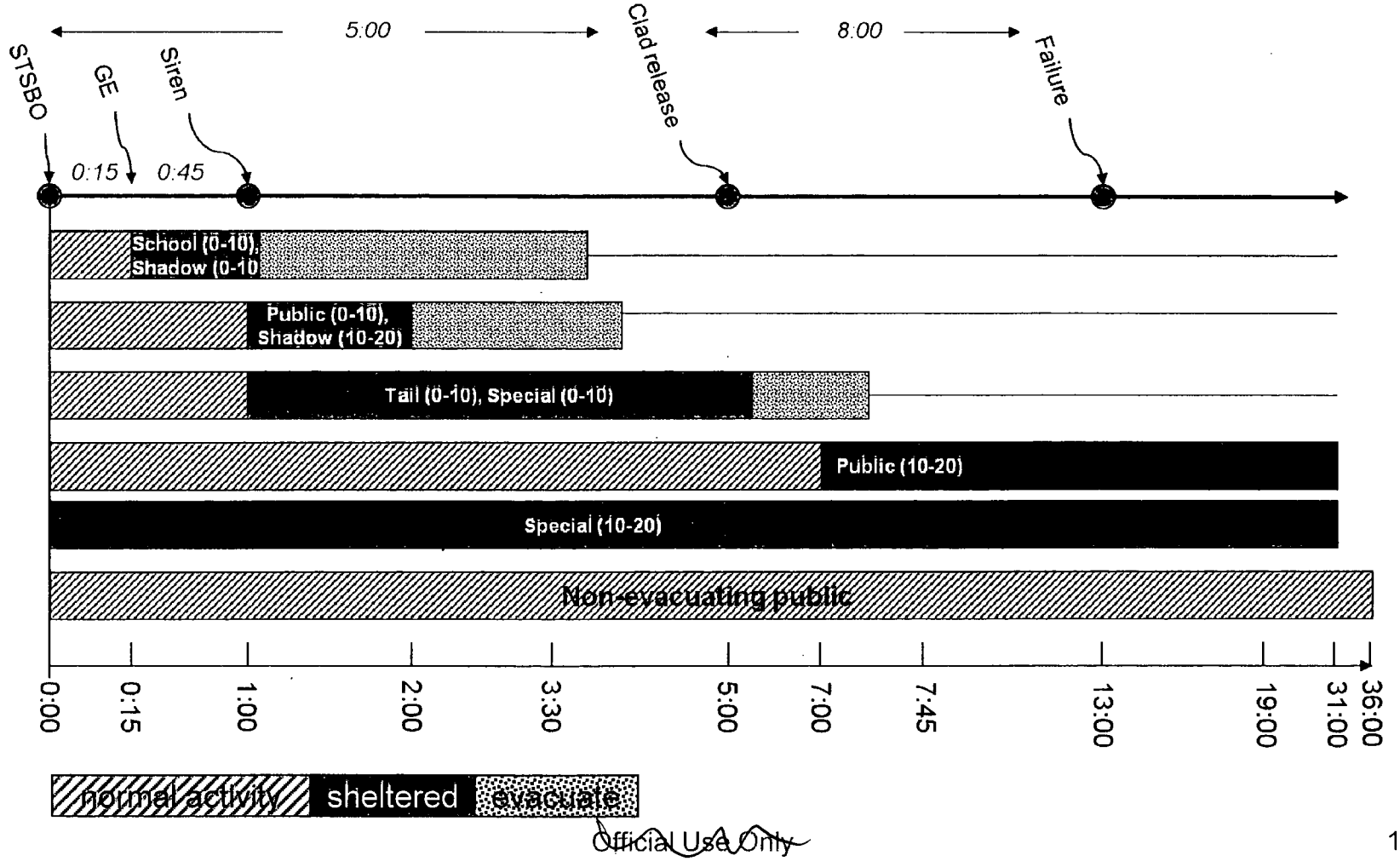
STSBO w/RCIC Blackstart (Peach Bottom) Cohort Modeling Activities



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Questions???

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