State-of-the-Art Reactor Consequence Analysis Emergency Preparedness

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ACRS Subcommittee Briefing

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E/19

EP Seismic Study

- ACRS questioned adequacy of EP modeling for seismically initiated scenarios given the potential effect on emergency response
- Past risk studies have not generally considered this effect except in simplified sensitivity calculations - delay times and evacuation speed or timing
- Policy issues were also considered
- SOARCA Approach
  - Seismic assessment of infrastructure damage
    - Bridges, roads, power network (notification, traffic signals)
  - Reassessment of response
    - Route alerting versus sirens
    - New ETE based on damage to road network
    - New cohort model developed for MACCS2
  - Recalculation of offsite consequences
- Conclusion – No substantial effect on offsite health consequences

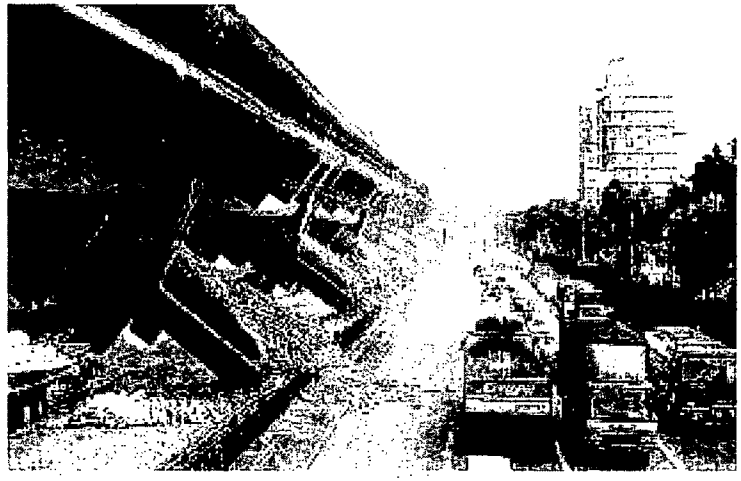
Seismic Assessment of Infrastructure Damage

•Evacuation routes can be compromised by multiple mechanisms:

-primary structural failure of bridges, culverts and over-passes,

- loss of strength of foundation or abutment materials that support the roadway or bridge.

•Screening-level assessment was performed using readily available information (U.S.G.S, State Geological Surveys, Soil Conservation Service) and judgment.

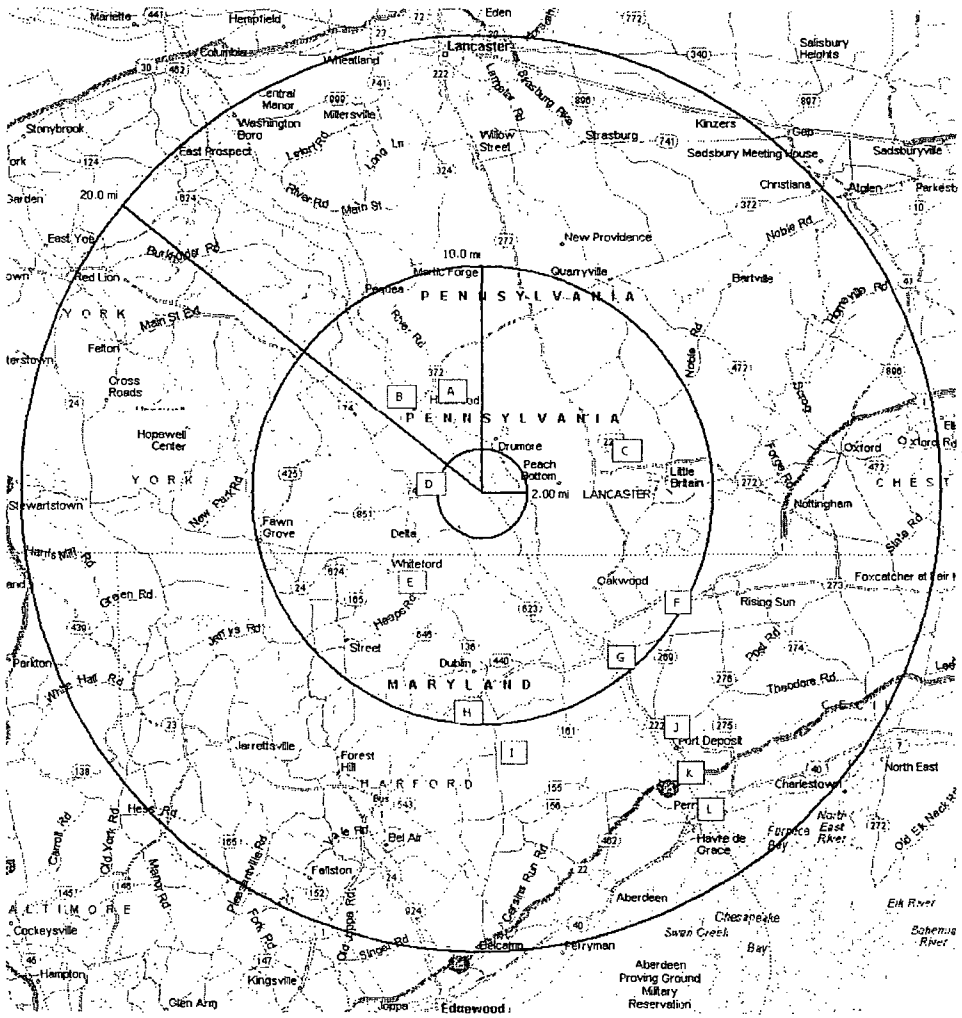


Seismic (EP) Study

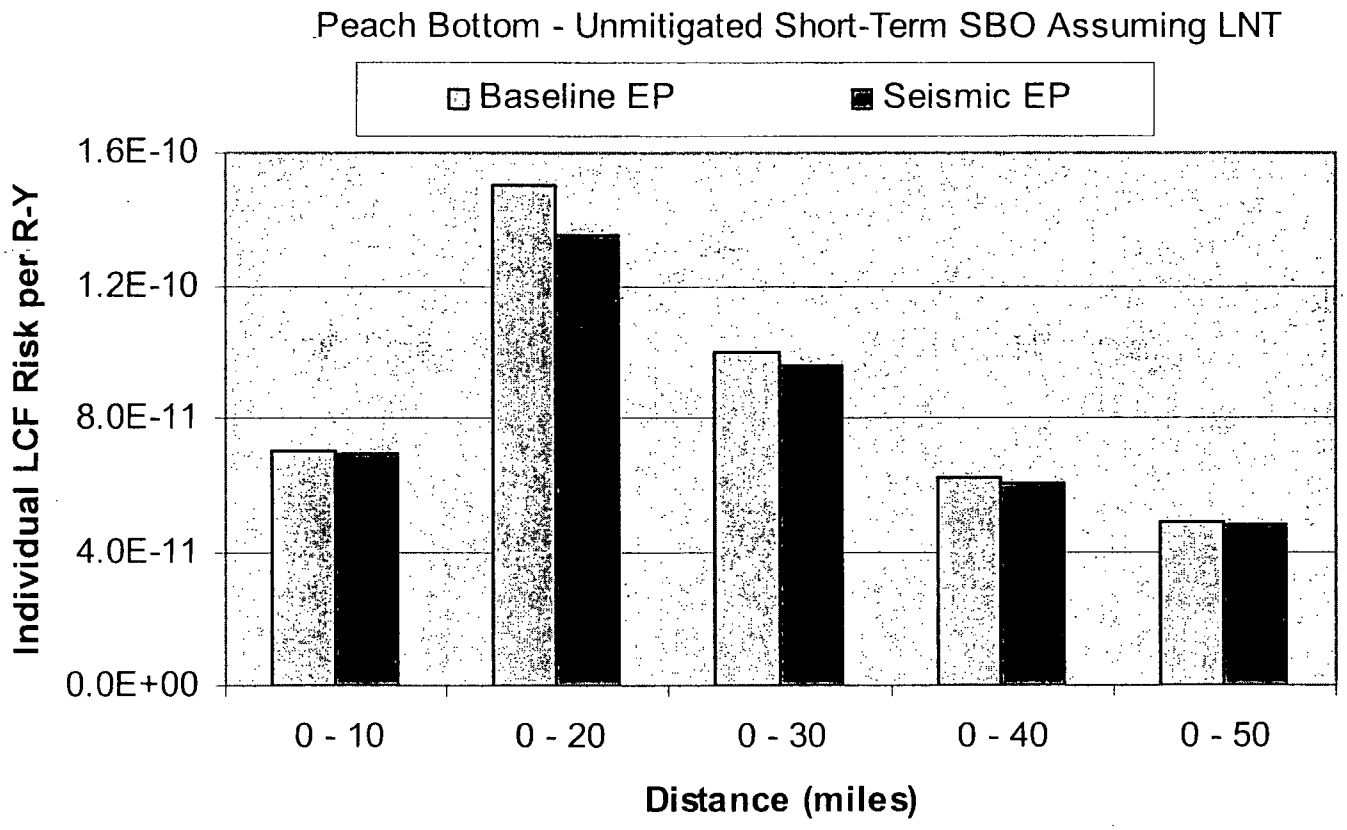
- Seismic effects are site specific
  - Peach Bottom
    - Sirens fail but alternative notification occurs
    - Larger shadow evacuation
    - Free span bridges fail –not key to evacuation,
    - Adequate road network remains and evacuation speeds are unchanged

Peach Bottom Seismic Analys

- Affects of earthquake on infrastructure
- 12 bridges/roadways potentially affected
- Electrical system fails, no sirens sound
  - Public notification performed via Emergency Alert System, societal means and route alerting
  - Notification slower; people experienced earthquake and are more prepared to leave
- Power out, but few traffic signals in affected area.
- Shadow evacuation increased to 30%.
- Negligible effect on ETE.



Seismic (EP) Study

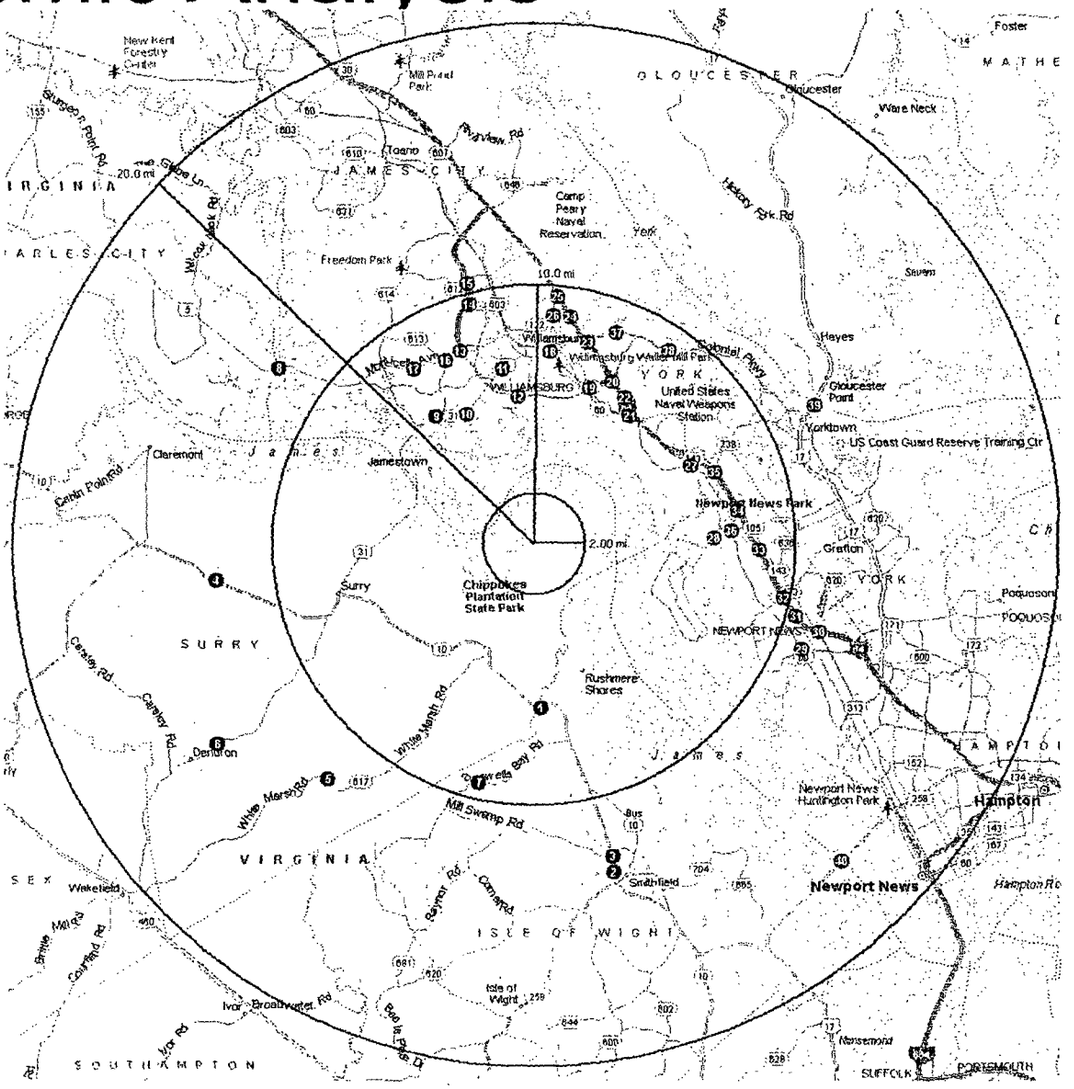


Seismic (EP) Study

- Surry
  - Sirens function (battery backup)
  - Public evacuation starts earlier
  - Larger shadow evacuation
  - Schools evacuation delayed
  - Bridge failures significantly retard evacuation
    - major effect on ETE
  - Smaller radiological release, LCF dominated by long term

Surry
Seismic Analysis

- 40 bridges/roadways potentially affected
- Interstate 64 fails within the EPZ
- Assume electrical system fails sirens have battery backup
- Public is prepared to leave
- Traffic signals default to 4 way stop
- Shadow evacuation increased to 30%.
- Considerable effect north of the James River – 18 hour ETE
- Negligible effect on the rural area south of James River



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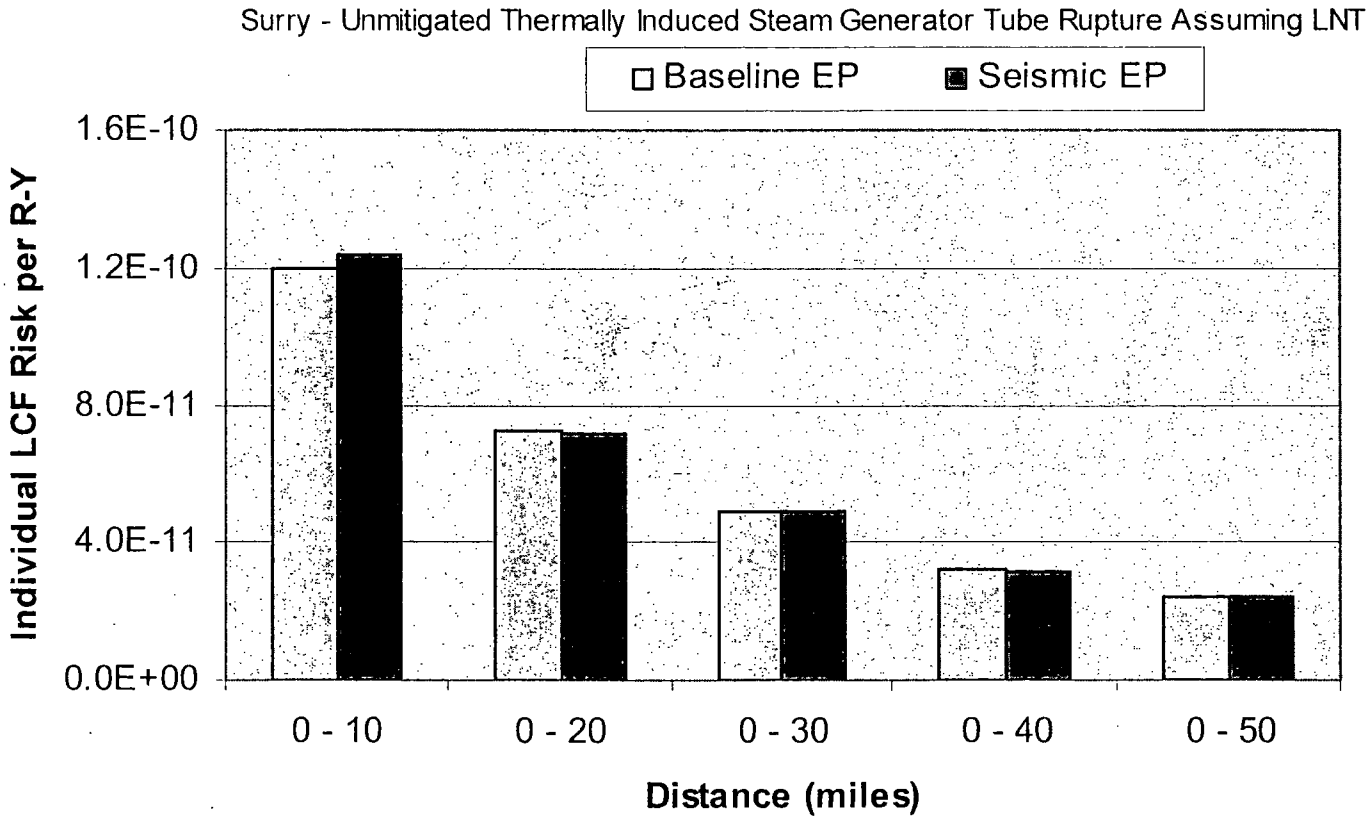
Seismic (EP) Study



Summary

- This evolutionary analysis presents the most detailed modeling of emergency response performed by NRC
- Integration of EP improves realism by modeling established and tested response programs
- EP Modeling is set up in WinMACCS and then the source term applied to develop consequence estimates
- A screening-level identification of transportation routes that could be compromised by a significant seismic event was performed
- At these sites, seismic effect on consequences are minimal