

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

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E/18

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

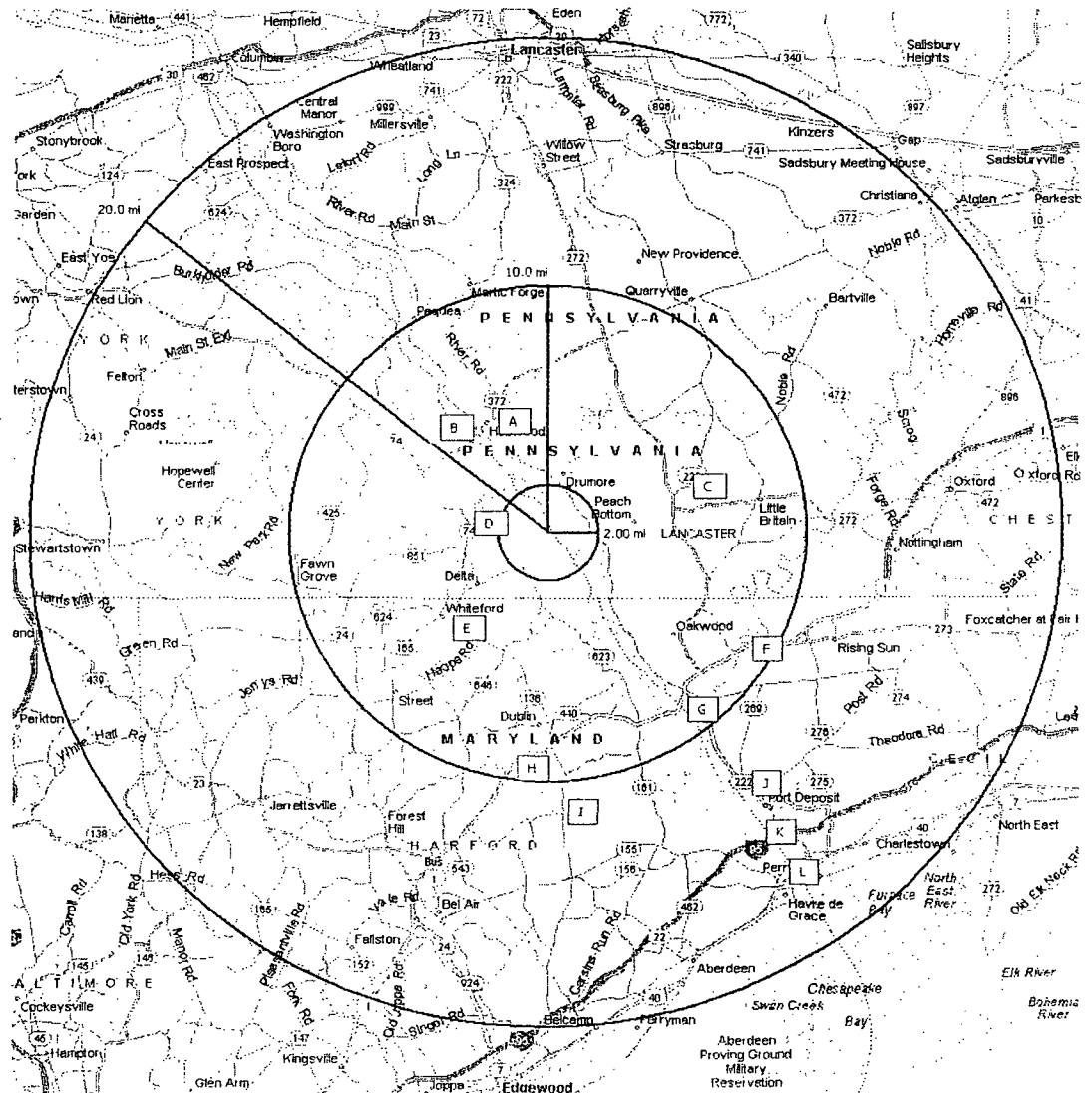
Seismic (EP) Study

- 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 Analysis

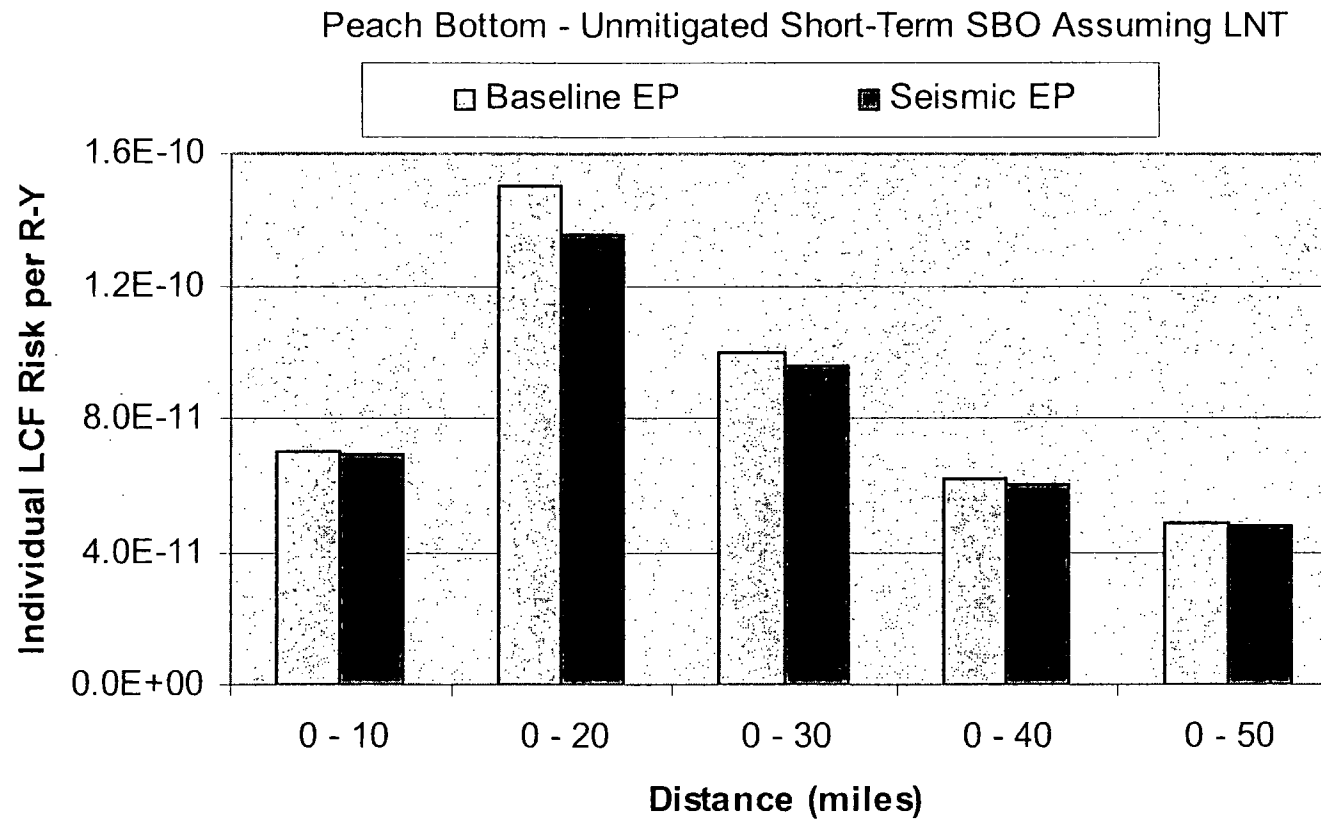


- Affects of earthquake on infrastructure
- 12 bridges/roadways affected
- Electrical system fails, no sirens sound
 - Public notification performed via Emergency Alert System, societal means and route alerting
 - Notification slower; people experienced earthquake and are more prepared to leave
- Power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



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Seismic (EP) Study



Seismic (EP) Study

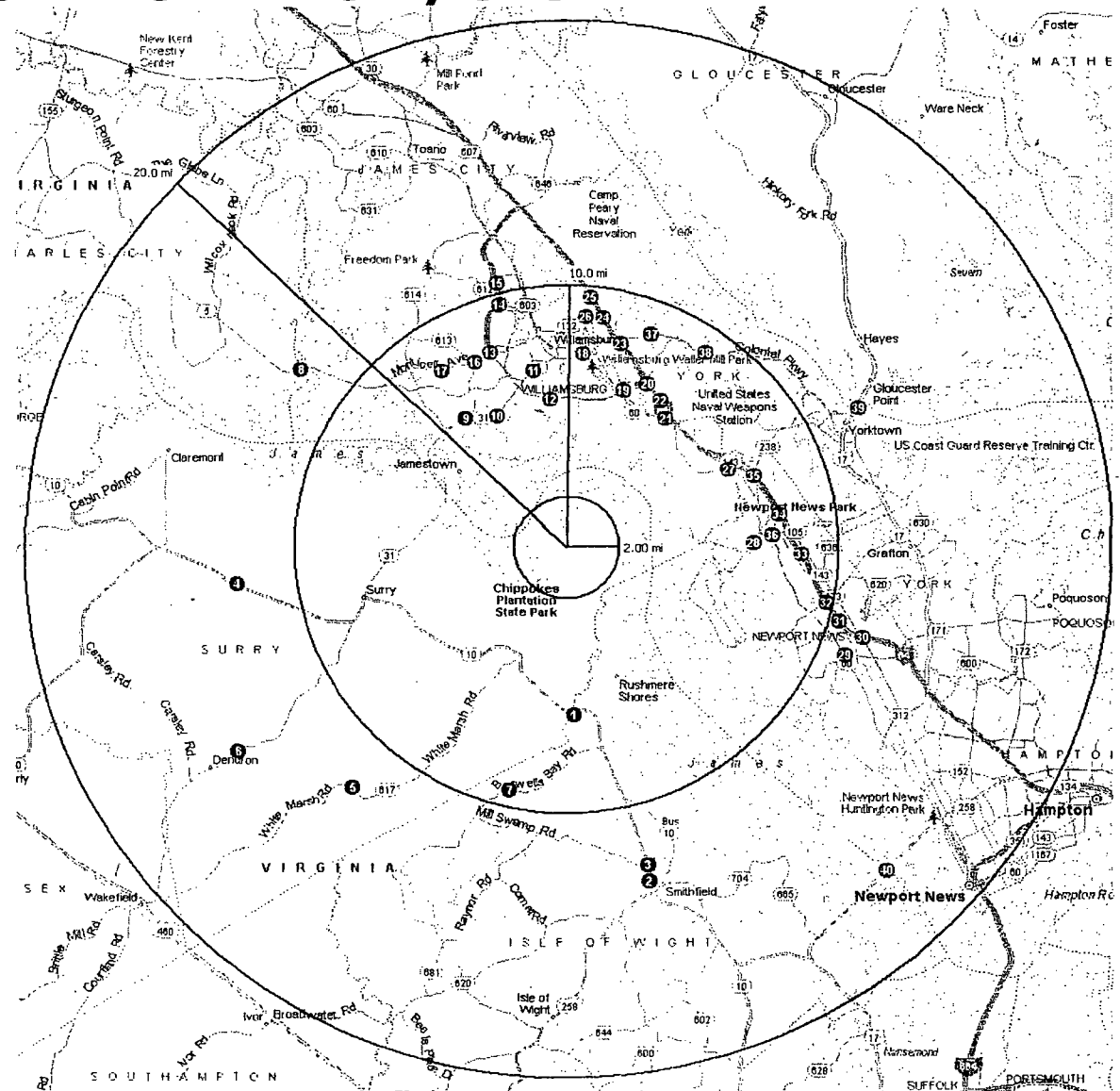
– Surry

- 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 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

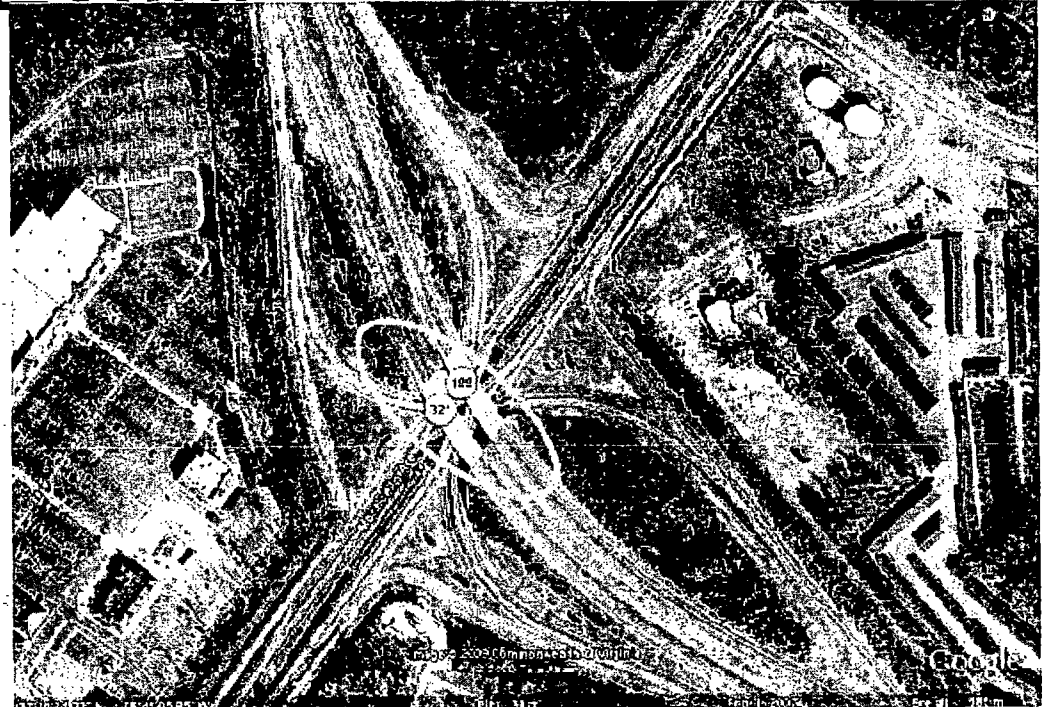


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Typical Bridge Affected by Seismic Event

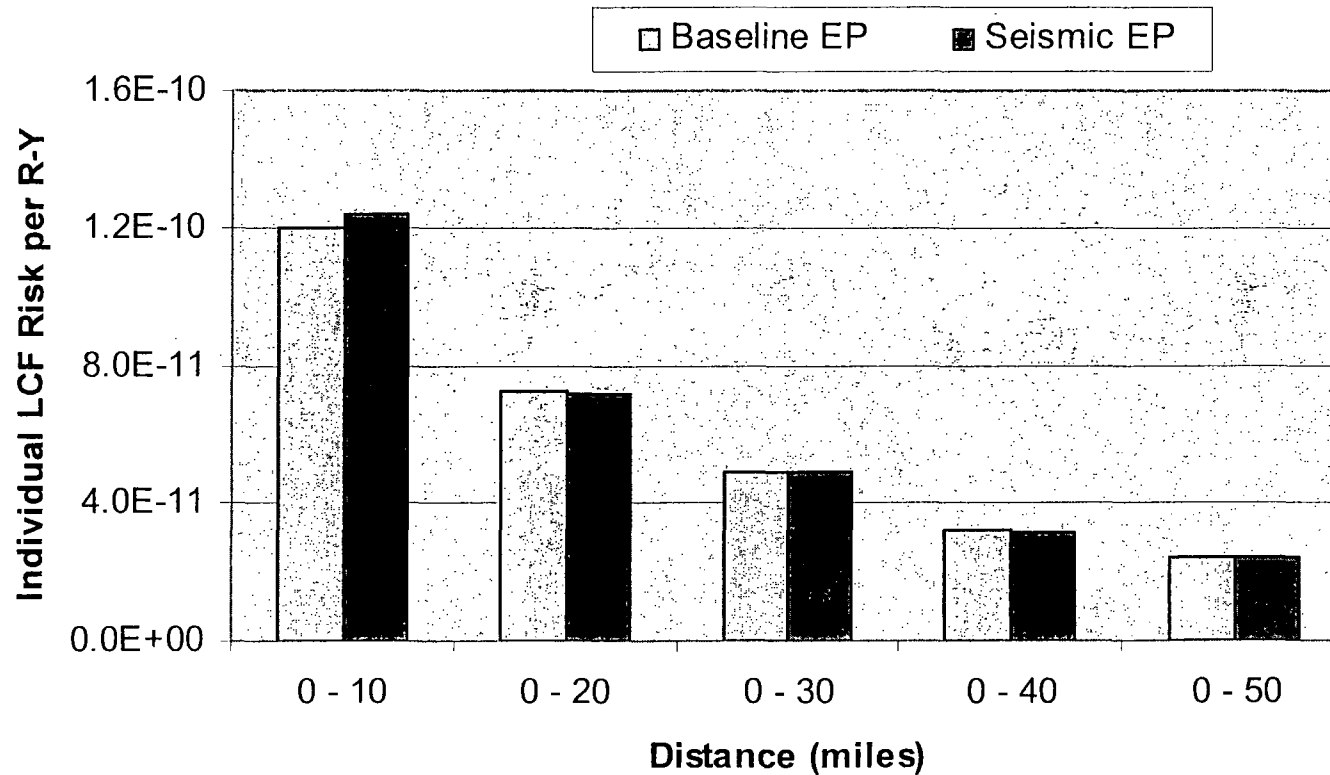


- Significant bridges assumed to fail, with large effect on ETE
- Overpass and underpass become unusable in many locations
- Use of secondary routes to points outside of affected area – delays travel



Seismic (EP) Study

Surry - Unmitigated Thermally Induced Steam Generator Tube Rupture Assuming LNT



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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
- At these sites, seismic effect on consequences are minimal