



Assessment of Emergency Response Planning and Implementation for Large Scale Evacuations

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NUREG/CR-6864

Identification and Analysis of Factors Affecting Emergency Evacuations

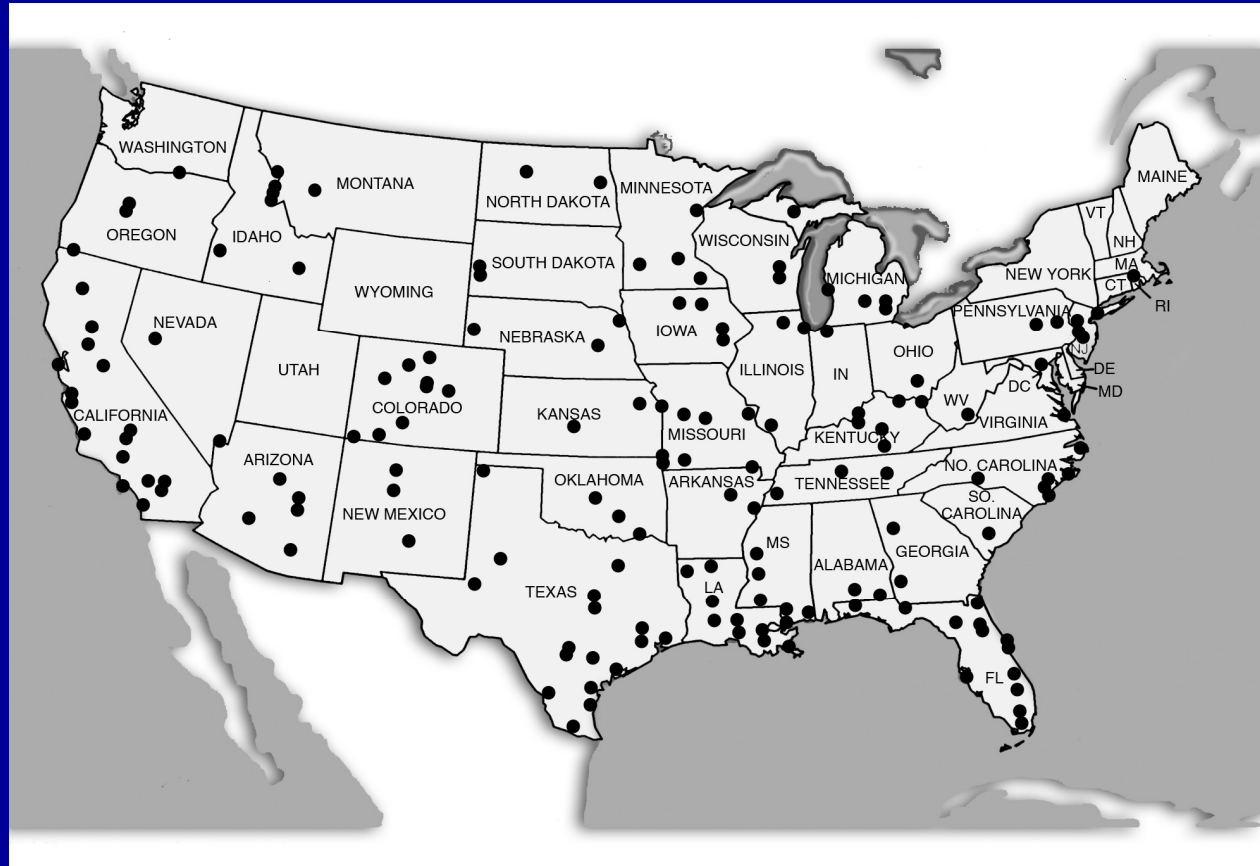
- NRC published NUREG/CR-6864
“Identification and Analysis of Factors Affecting Emergency Evacuations” January 2005
- Conducted extensive research
- Identify “universe” of evacuation incidents meeting specified criteria
- Conduct 50 case studies out of a possible 230 evacuations
- Identify factors contributing to efficient and effective evacuations (regression & correlation analyses)

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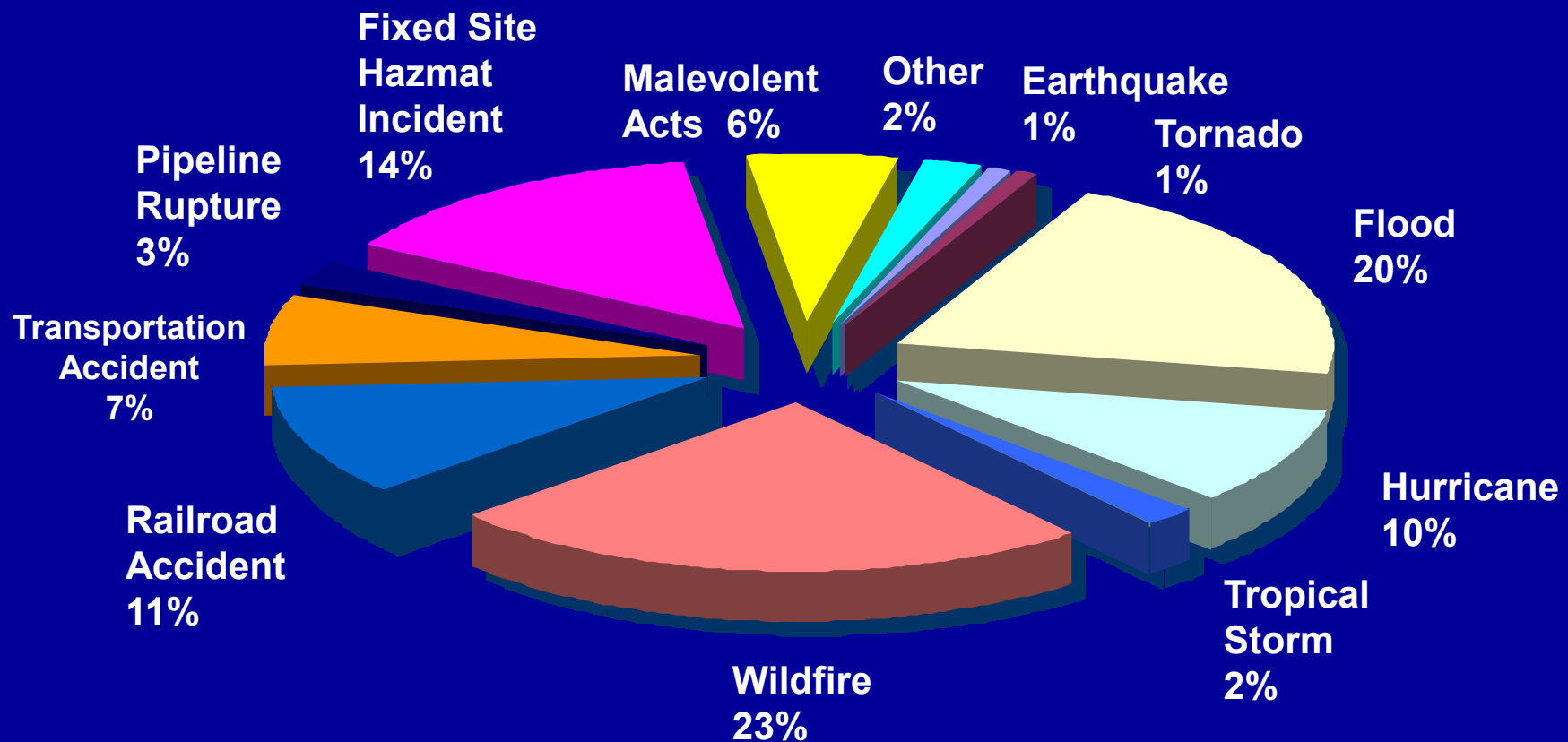
Identification and Analysis of Factors Affecting Emergency Evacuations

- Evacuation decision-making
- Notification of response personnel/officials and public
 - Emergency communications
- Traffic movement & control
 - Shadow evacuation
 - Special facilities
- Community preparedness
 - Congregate care centers
 - Prior history of emergencies & evacuations
- Law enforcement Issues
- Training & Drills
- Deaths/injuries due to evacuation
- Re-entry Issues

230 Evacuations Identified



Principal Causes of Large-Scale Evacuations in the U.S. 1/1/1990 - 6/30/2003



Major Findings

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- Evacuations successfully protect the public health & safety over a broad range of initiating circumstances & challenges
 - Public evacuations **occur frequently (~once every 3 weeks)**
 - Shadow Evacuations **Do Not affect the effective implementation of adequate protective actions**
 - Emergency workers **report to duty when asked**
 - Public education **is an important contributor to efficient & effective evacuations**
 - Route Alerting **is effective & a significant contributor to efficient & effective evacuations**

Along came a Hurricane or two..



Need to revisit evacuation study ?

- Reliance of the EP Planning Basis on the efficacy of public evacuations
 - What happened in these evacuations?
 - Lessons learned to enhance emergency preparedness around nuclear power plants?

Evacuations Researched

Date	Incident	Name	State	# Evacuated (approximate)
September 1998	Hurricane	Georges	FL, MS, AL	1,200,000
October 2003	Wildfire	2003 Southern California Fires	CA	100,000
September 2004	Hurricane	Ivan	FL, NC, MS, GA	2.3 million
August 2005	Hurricane	Katrina	LA, MS, AL, FL	2 million
September 2005	Hurricane	Rita	TX, LA	3 million
September 2005	Technological	Chemical Fire Romulus, MI	MI	3,000
October 2005	Hurricane	Wilma	FL	300,000
May 2006	Flood	New England Flooding	NH, MA, ME	7,000
October 2006	Technological	Chemical Fire Apex, NC	NC	17,000
October 2006	Earthquake	Hawaii Earthquake	HI	3,000
October 2007	Wildfire	2007 California Fires	CA	900,000

Evacuations Researched

- **Hurricane Katrina evacuation was considered successful from a traffic management perspective**
- **Hurricane Rita had over 100 deaths attributed to the evacuation and 0 deaths due to the hurricane**
- **2007 CA fires implemented lessons learned from 2003 CA fires resulting in fewer consequences and improved communications**

Incident Response Elements Assessed

#	Planning	Implementation
1	<ul style="list-style-type: none">• Training	<ul style="list-style-type: none">• Training
2	<ul style="list-style-type: none">• Public education	<ul style="list-style-type: none">• Public education
3	<ul style="list-style-type: none">• Communication with Public	<ul style="list-style-type: none">• Communication with Public
4	<ul style="list-style-type: none">• Communication with Responders	<ul style="list-style-type: none">• Communication with Responders
5	<ul style="list-style-type: none">• Evacuation	<ul style="list-style-type: none">• Evacuation
6	<ul style="list-style-type: none">• Special Needs	<ul style="list-style-type: none">• Special Needs
7	<ul style="list-style-type: none">• Shelter Facilities	<ul style="list-style-type: none">• Shelter Facilities

Criteria were established to support rating each element

Rating Criteria

Planning:

- **Was the plan comprehensive and broad enough to encompass the hazard encountered?**
- **Did the plan include adequate descriptions of responsibilities and authorities?**
- **Did the plan include elements necessary for a successful evacuation including public education, training, chain of command, public notification and warning, communications, transportation routes and modes, special needs individuals and facilities, and sheltering?**
- **Did plans include coordination with other jurisdictions?**

Implementation:

- **Was the chain of command followed?**
- **Were timely and effective decisions made?**
- **Were the evacuation elements carried out in accordance with the plan?**
- **Were plans coordinated with other jurisdictions, if applicable?**

Assessment of NRC Emergency Planning and Implementation

- **Success of implementation is, as may be expected, directly related to the level of planning.**
- **Training and Communications with Responders receive much attention and have been areas of growth and improvement over the last 5 years: Very Effective ratings.**
- **Public Education, Communication with the Public, Evacuation, and Shelters rated Effective**
- **Special Needs was the only element rated Marginally Effective**
 - **Largely based on the special needs facilities issues experienced in Hurricanes Katrina and Rita and a consistent lack of planning for special needs individuals that do not reside in special facilities.**

Themes Identified

- **Regional resources are being integrated into large scale evacuation planning.**
- **Evacuation techniques improve when tested.**
 - **Such as communications, contraflow, etc.**
- **Enhancements in emergency communications have improved response effectiveness.**
- **An awareness has developed for the need to plan for special needs individuals who do not reside in special facilities.**

NRC and FEMA Potential Enhancements*

EP program could be enhanced through planning that addresses:

- **Special needs individuals that do not reside in special facilities;**
 - **Accommodation of special needs individuals in congregate care centers;**
 - **Integrating a regional approach to evacuations;**
 - **Assessment of traffic management aspects of evacuations to better understand implementation time;**
 - **Local review of evacuation plans for special needs facilities to assure resources are available to support an evacuation;**
 - **Communication to the non-affected public to support staged evacuations and mitigate shadow evacuations;**
 - **Consistent terminology for shelter facilities / congregate care centers;**
 - **Consideration of the effect of parents arriving at the school to pick up their children; and**
 - **The need to accommodate pets at congregate care centers.**
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- ***These are not just “NRC/FEMA” enhancements, but good lessons learned for emergency planners**