Written Testimony for:
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(http://www.cusec.org)

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Ad Hoc Subcommittee on State, Local and Private Sector Preparedness and Integration

Thank you Chairman Pryor, Senator Ensign and other members of the subcommittee for the opportunity to share my thoughts concerning the seismic hazard and associated risk in the central United States.

The initial impact of a major earthquake (M 7.0- M 7.9) in the central U.S. occurring on any of the three major seismic zones which include: the New Madrid Seismic Zone, Wabash Valley Seismic Zone, and the East Tennessee Seismic Zone is anticipated to be catastrophic in its potential to cause human injury and death, as well as widespread property destruction.

Experts at USGS and other leading research organizations believe that major earthquakes - earthquakes whose effects are so severe that they cause unacceptable levels of damage to buildings and infrastructure, economic loss, mortality, morbidity, and adversely affect the environment, production facilities, economic markets, and distribution systems--are inevitable in the central United States. The USGS has placed a 7%-10% probability for a major earthquake similar to the historical 1811/12 and a 25%-40% of a 6.0 or greater event.

In 1977 Congress enacted the Earthquake Hazards Reduction Act (Public Law 95-124, Oct. 7, 1977) in recognition of the fact that earthquakes pose the greatest potential threat of any single-event natural hazard confronting the nation. It directed the President to "establish and maintain an effective earthquake hazards reduction program." In doing this, Congress created the National Earthquake Hazards Reduction Program (NEHRP) which gives the responsibility to the federal government to provide direction, coordination, research and other support to efforts aimed at earthquake hazard mitigation and preparedness. The Federal Emergency Management Agency (FEMA), the United States Geological Survey (USGS), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST) were assigned specific roles. While national attention focused on high-risk areas such as California, the late Dr. Otto Nuttli of St. Louis University was pioneering research on the danger of earthquakes in the central United States. His research provided the conclusive evidence that prompted the creation of the Central United States Earthquake Consortium (CUSEC) in 1983 by those states most affected by the NMSZ. A contract between FEMA and the states was awarded on April 11, 1984, and the foundation for CUSEC was complete.

Authority for CUSEC is vested in the Board of Directors, which is composed of the Directors of the State Emergency Management agencies in each Member State. CUSEC Member States include the eight states most affected by the earthquake threat in the central U.S.: Alabama, Arkansas, Illinois, Indiana, Kentucky, Mississippi, Missouri, and Tennessee. CUSEC, a 501(c)(3) organization, is a working example of how individuals, businesses, communities, insurers, professionals, and local, state, and the Federal government can effectively work in partnership to address a common problem.

CUSEC also includes ten Associate Member States: Georgia, Iowa, Kansas, Louisiana, Nebraska, North Carolina, South Carolina, Ohio, Oklahoma and Virginia - which will serve a vital role in supporting the impacted states from a damaging earthquake in the CUSEC region

CUSEC's primary mission is "…the reduction of deaths, injuries, property damage and economic losses resulting from earthquakes in the central United States." In carrying out this mission CUSEC serves as the "coordinating hub" for an 18 state area with primary focus on the eight Member states performing the critical role of coordinating multi-state earthquake program efforts of the central region.

While each individual state is the primary implementer of emergency management functions, including earthquake preparedness through the state Earthquake Program Manager, CUSEC's role is largely facilitative in uniting and coordinating actions of the eight states.

TOPIC OVERVIEW

Describe what a catastrophic event would look like in the central US and the unique needs and challenges this part of the country faces.

An earthquake in the New Madrid seismic zone of magnitude 6 or greater could strike at any moment causing major physical, social, and economic disruption to a region that is home to more than forty million people. The potential losses from future earthquakes of magnitude 6 or greater in the New Madrid seismic zone are expected to be significant, for at least four reasons: 1) the population centers, notably Memphis and St. Louis, have thousands of structures that are not designed and constructed to withstand the effects of earthquakes; 2) large number of rural communities with high percentages of vulnerable structures; 3) the region is characterized by poorly consolidated sedimentary rocks, which are poor foundation material; and 4) an earthquake in the central US would impact a multi-state region (about 10 times larger than the area impacted by a California earthquake of comparable size). This is validated through recent and historical earthquakes (Figure 1).

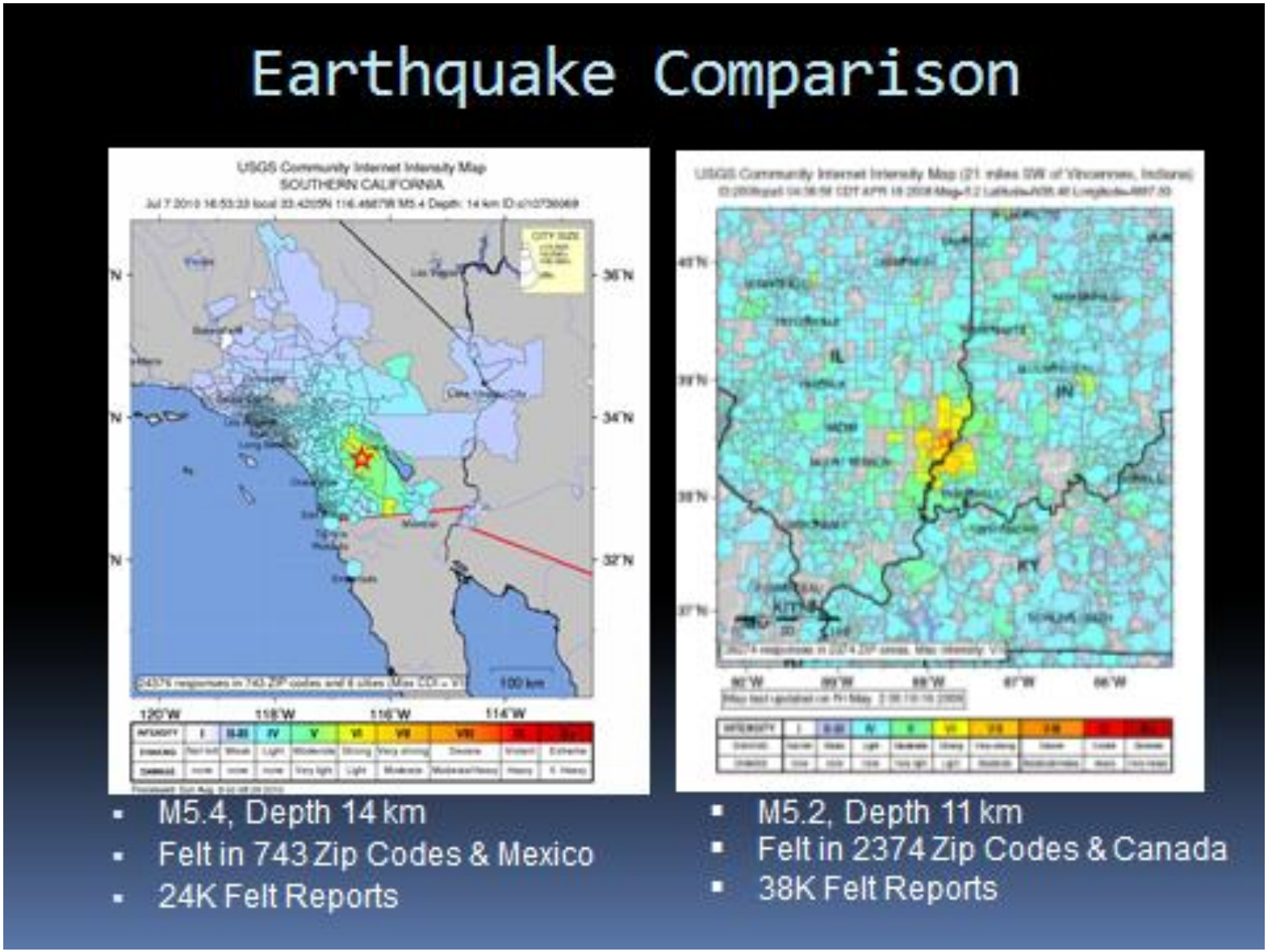
Earthquake Comparison
USGS Community Internet Intensity Map
SOUTHERN CALIFORNIA
M5.4, Depth 14 km
Felt in 743 Zip Codes & Mexico
24K Felt Reports
M5.2, Depth 11 km
Felt in 2374 Zip Codes & Canada
38K Felt Reports

Figure 1

A repeat of the historical 1811/12 seismic event today would truly be catastrophic. Unlike the frontier of 1811 where there were few established communities, today the central US is home to more than forty million people of which approximately 7 million people live in the highest projected impact area encompassing 141 counties within the eight CUSEC states. Of these the city of Memphis has a population of 650k and the 350k for the city of Saint Louis with the remaining 6 million people scattered among suburban and rural communities spread out between Memphis and Saint Louis.

While it's clear that large cities have a concentration of population and infrastructure, they also have a distinct advantage over smaller communities in that they have economic and infrastructure diversity that will increase the survivability of the overall community. This is not to imply that large cities will not be negatively impacted - they will, and in some areas catastrophically. But by comparison, small rural communities which are already, by their very nature, remotely situated, are also often limited in their ability to attract and hold new industries and in many cases only have one or two key industries, with the remainder being medium to small business which are less likely to have a strong economic base, and thus are overall more at risk to losing a larger percentage of their community. This presents two challenges: one, the ability to respond in an efficient way to multiple communities simultaneously, and two, the ability of those communities to come back in the recovery phase of the disaster.

The economic, health and medical, and transportation concerns seen in these rural communities on a daily basis alone lead congress in 2000 to establish the Delta Regional Authority (DRA) to enhance economic development and improve the quality of life for residents of this region. A seismic event today will only exacerbate the current situation of these communities, many of which may never recover.

In addition to direct impacts to the community there are also secondary effects from earthquakes, such as flooding from damaged dams and levees, liquefaction, landslides and fire following the event.

As a major transportation corridor, it would be highly probable that transportation through the region would come to an abrupt stop affecting highways, rail, river systems, and airports. According to the 2002 Commodity Flow Survey by the Bureau of Transportation Statistics (BTS), more than 968 billion ton-miles, or about 31% of the total US commodities originate, pass through, or arrive in the central U.S. region (BTS, 2005)-(MAE Report 09-03, Oct 2009). Three-fourths of the nation's $7 billion exported soybean crop goes down the Mississippi River and the most northeastern county in Arkansas is one of the largest steel-producing counties in the country, with two Nucor mills – (St. Louis Post Dispatch-07/02/2005 Bracing for the Big One). Loss of the transportation infrastructure alone would be catastrophic.

Other key infrastructure interruptions, including oil, petroleum, and gas pipelines, and the electrical grid would cause a much larger indirect impact from a seismic event all along the east coast, including the District of Columbia making a NMSZ event a truly national crisis, especially if it should occur during a period when the US economy is already weak and many resources are diverted to international missions.

The consequences from a major New Madrid earthquake would be substantial, estimated at nearly $300 billion – (MAE Report 09-03, Oct 2009). The destruction to the building and transportation systems would make up a significant portion of those losses.

Mid America Earthquake Center Phase 2 Modeling
Impact of New Madrid Seismic Zone Earthquakes on the Central USA – Report 09-03

- 8 State Population - 43 Million 400K Sq. Miles
- 141 County Study Region (Impact Counties)
- 7 Million People
- 15.7 Million Buildings (Eight State Total)
- 20,000 Schools
- 2800 Hospitals
- 165,000 Bridges
- 1,800 Rail Segments
- 2,000 Ports
- 3,700 Airport Facilities
- 715,000 buildings at least moderately damaged
- 25 Counties are catastrophically damaged at 60% or greater building loss
- 40 Counties incur substantial damage with 20%-60% building loss
- 300,000 buildings beyond repair
- 15-20% of manufactured housing at least extensive damage
- 3,500 Bridges at least moderately damaged
- 15,000 hospital beds unavailable
- 1,350 schools w/complete damage
- 1 Million households w/out Water
- 2.4 Million households w/out Electric
- $113 Billion in Building Damage
- $10 Billion in Transportation Infrastructure Damage
- $172 Billion in Utility Infrastructure Damage
- $300 Billion Total Direct Economic Loss

An additional impact from an earthquake 6.0 or greater is the process known as liquefaction. Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking causing the ground to lose its ability to support the weight of the overlying soil, buildings, roads, houses, etc., then the soil will flow like a liquid and cause extensive surface damage. Liquefaction and related phenomena have been responsible for tremendous amounts of damage in historical earthquakes around the world and according to Dr. Tish Tuttle, a Paleoseismologist and expert in Liquefaction fields in the central U.S. are some of the largest in the world.

Liquefaction induced damages could cause difficulty during rescue or recovery efforts following an earthquake in the central US. Many of these infrastructures will be needed but many will take a long time to repair. Long term impacts such to the agricultural communities would be significant with large tracks of land rendered un-usable do to the large volumes of sand deposited on the surface, displacement of irrigation and drainage canals as well as disruption to ground water systems.

An additional and unique feature about the seismic hazard in the central US that separates it from other seismic prone areas is the fact that earthquakes like those of 1811/12 are not single events. Research by USGS and others have clearly shown evidence of this sequence event in

A.D. 1450, A.D. 900, and 2350 B.C. – (USGS Fact Sheet 2009-3071) This added feature to earthquakes in the central US redefines catastrophic where damaging shaking could take place for months severely impacting response and recovery efforts and possibly changing the landscape of the central U.S. forever.

ACTION

What efforts are underway to address the needs and challenges?

For the past three and half years, the CUSEC Member states along with its primary planning partner, FEMA, have been involved in the New Madrid Catastrophic Planning Initiative. This initiative is a bottom up approach starting at the local level of government and moving up to the state, regional, and national levels to refine or develop the necessary plans to address a large damaging earthquake in the central US. The purpose of the Initiative is to improve response capabilities for a catastrophic earthquake event and related hazards within the NMSZ. What separates this effort from other planning efforts is the need to address the interconnectivity of these efforts for a hazard that cross state lines.

The planning initiative is based on the scenario-driven catastrophic response plan development process, which placed *Response Operations Personnel* and *Emergency Planners* in the same room to develop plans based on scientifically generated scenario data that:

- Combines the planning and exercise phases of plan development
- Produces functional plans ready to use immediately post-workshop
- Promotes communication and builds strong relationships between Federal, State, local, and volunteer agencies
- Partners FEMA, CUSEC, states, universities, business, volunteer organizations, local government
- Develop an environment for continued focus, planning, and exercises will greatly enhance our preparedness for earthquakes; help mitigate their impacts; and foster the level of local, regional, and national cooperation required to survive and recover.

Working with our planning partners workshops were held throughout the eight state CUSEC area focused on a select number of topical issues including: direction and control, communications, damage assessment, first responder issues, medical and mass care, transportation and evacuation, debris management, congregate shelter, reception areas and infrastructure recovery.

Plans will be tested as part of the Department of Home land Security/ FEMA National Exercise Program's (NEP) New Madrid National Level Exercise in May of 2011. The exercise which is being co-developed with CUSEC and its member states and FEMA NED along with various other local, state and federal partners will provide an opportunity to evaluate plans and determine what areas need improvement.

Although not originally developed for the NLE or in support to the NMSZ catastrophic planning effort we will be utilizing a survey developed by FEMA's Community Preparedness Division which conducts Citizen Corps National Surveys to measure the public's knowledge, attitudes, and behaviors relative to preparing for a range of hazards. This will be used baseline to look post NLE to see what has changed.

In support of the NLE -2011 CUSEC, in partnership with FEMA, member states and the Southern California Earthquake Center are conducting the Great Central US ShakeOut (www.ShakeOut.org/centralus) scheduled for April 28th, 2011. Conducted as part of number of scheduled events in observance of the 1811/12 earthquakes, CUSEC is striving to raise awareness through a broad-based outreach program in partnership with media and public advocacy groups by hundreds of partners that earthquake preparedness isn't just a responsibility of the government.

A key aspect of the ShakeOut is the integration of comprehensive science-based earthquake research and the lessons learned from decades of social science research about why people get prepared. The result is a "teachable moment" on par with having an actual earthquake (often followed by increased interest in getting ready for earthquakes). ShakeOut creates the sense of urgency that is needed for people, organizations, and communities to get prepared, to practice what to do to be safe, and to learn what plans need to be improved

With a target goal of 1 million participants, the 2011 ShakeOut drill will be the largest earthquake preparedness event in central U.S. history.

Although great strides have been made in the level of preparedness in the central US clearly more effort is needed.

CHALLENGES

What areas of preparedness need improvement?

With the central US having less visibility than other areas of the country, preparedness efforts in the area of risk reduction, response and recovery planning can be a challenge. Add to the mix shifting priorities, budgetary constraints, and a complex set of issues involving multiple levels of government, and it's easy to see how difficult it can be to maintain a consistent level of support and focus on preparedness efforts.

Emphasis on establishing and maintaining some level of support to ensure that preparedness efforts continue to move forward without loss of momentum is paramount. Planning efforts undertaken during the NMSZ catastrophic planning initiative over the past few years were purposely built around a short set of achievable planning priorities defined by the CUSEC and its member state emergency management agencies but in partnership with FEMA. It was, and it remains, the intent of the CUSEC states to build on this list as we move forward, but it requires a commitment from our federal partners to do the same. The planning efforts thus far should not be viewed a box that simply gets checked off as if planning efforts are done. Success in preparedness efforts is highly contingent on a true partnership effort that links the states with its federal partners as well as the private sector.

CONCLUSION

The challenges presented by the earthquake hazard in the central US are numerous and in many ways unique to this region. The documented sequencing of large events, the lack of understanding and frequency of events coupled with a high percentage of aging infrastructure not built to withstand a seismic event, all provide a clear picture that much more remains to be done. The only manageable way to address it is by a thorough and deliberate approach that prioritizes the topic areas rather than approaching it as we do with many other smaller and more manageable hazards.

While we all have read and heard numerous times that earthquakes cannot be prevented, certainly we can minimize casualties and damages by being prepared. I cannot overemphasize the importance of awareness/self-preparation. We have been very fortunate in the United States not to have experienced a catastrophic earthquake in modern times but the clock is ticking and we must do everything in our power to reduce the vulnerabilities while we simultaneously prepare to respond and recover when it does occur.

It has been my honor to provide you with information concerning the seismic hazard and associated risk in the central U.S. as your Subcommittee works to identify areas for improvement in preparedness efforts across the United States.

Sources:

Mid America Earthquake Center:

- IMPACT OF NEW MADRID SEISMIC ZONE EARTHQUAKES ON THE CENTRAL USA, REPORT 09-03

Central U.S. Earthquake Consortium (CUSEC) Publications:

- EARTHQUAKE VULNERABILITY OF TRANSPORTATION SYSTEMS IN THE CENTRAL UNITED STATES
  REDUCING THE RISK: EARTHQUAKES IN THE CENTRAL UNITED STATES

US Geological Survey

- FACT SHEET 2009-3071 EARTHQUAKE HAZARD IN THE NEW MADRID SEISMIC ZONE REMAINS A CONCERN