

Witness Testimony

**Richard M Allen, Ph.D.**

Director, Berkeley Seismological Laboratory;  
Professor, Department of Earth and Planetary Sciences  
University of California, Berkeley

Hearing on:

**“Whole Lotta Shakin’: An Examination of America’s Earthquake Early Warning System Development and Implementation”**

Before the U.S. House of Representatives Committee on Natural Resources,  
Subcommittee on Energy and Mineral Resources

**June 10<sup>th</sup>, 2014**

Chairman **Lamborn**, Ranking Member **Holt**, Members of the Committee, thank you for the invitation to testify at this hearing about bringing earthquake early warning to the population of the United States.

The earthquake risk in California is substantial, *and too easily forgotten*. A FEMA study estimates that more than 50% of the nation’s earthquake risk is in California where there are large populations on many faults. There is a 99% probability of an earthquake with magnitude greater than 6.7 in the next 30 years. The southern San Andreas Fault south of Los Angeles, and Hayward Fault through the East San Francisco Bay Region are the highest hazard faults with more than 25 million people at risk. Oregon and Washington are threatened by even larger earthquakes.

**We must remain vigilant and push forward with new and improved ways to reduce this risk. Earthquake early warning presents one such opportunity.**

I am the Director of UC Berkeley’s Seismological Laboratory, and a professor of Earth and Planetary Science. The lab has a long history of research into earthquake phenomena, and the application of that research to reduce the impact of future earthquakes, stretching all the way back to the installation of the first seismometer in the western hemisphere, back in 1887. JD Cooper originally proposed an early warning system for San Francisco following the 1868 Hayward Fault earthquake, based on the new telegraph cables radiating from the city. My colleague Tom Heaton at Caltech, re-proposed a system in 1985 in the age of the personal computer. The seismology community in the US has been working towards a system for the last decade, including my group at UC Berkeley. **We now see a clear opportunity to take the next step in earthquake mitigation. What is needed is definitive action by policy makers.**

**Earthquake early warning is a proven technology.** An alert was issued in Japan before the shaking started in the recent magnitude 9 Tohoku-Oki earthquake.

Trains were stopped, manufacturing was paused, school children took cover under desks. The overall impact of the earthquake was reduced. The Japanese system was built following the 1985 Kobe earthquake, which killed more than 6000 people. In a survey almost a year after the recent Tohoku-Oki earthquake, 90% of people said that they thought earthquake early warning is useful. Mexico City has had a warning system since 1991. In the recent magnitude 7.2 earthquake, the city received more than 60 seconds warning. These warnings are now routine. China, Taiwan, Turkey and Romania also have warning systems in place. **The US does not.**

The Berkeley Seismological Laboratory is part of the California Integrated Seismic Network, which is a statewide collaboration with the California Institute of Technology, the California Emergency Management Agency, the California Geological Survey, and the US Geological Survey. With my colleagues in these institutions we have been developing and testing a statewide earthquake early warning system since 2006, a system that we now call **ShakeAlert**.

ShakeAlert has been running as a demonstration system in California for more than two years. It continuously processes data from 400 seismic stations that are part of the Advanced National Seismic System, detects earthquakes, and pushes alerts out. The alerts currently go to a group of test users including the Bay Area Rapid Transit System (BART), Metrolink, CalTrans, Google, Amgen, Southern California Edison and several other private sector companies. Also to the departments of emergency management for San Francisco, Los Angeles, Long Beach, Ontario, Riverside County, San Bernardino County, and the California Office of Emergency Services.

In the recent Anza earthquake it provided 40 sec warning in Los Angeles. In another, small earthquake near to the epicenter of the 1989 Loma Prieta earthquake it provided 24 sec warning to San Francisco and Oakland, meaning there would be about 24 sec warning in a repeat of the Loma Prieta event. In the last few months, three temblors have shaken much of the Los Angeles region, in all cases a warning was issued within 4 seconds of the earthquake beginning. For the really big, magnitude 8 earthquakes in the state, it could provide up to a minute of warning. Oregon and Washington could receive even more warning.

**We are now ready** to leverage the existing federal investments in our seismic and GPS networks **to deliver a robust public warning system** that will provide warnings to all Californians, Oregonians and Washingtonians. Built within the framework of the Advanced National Seismic System (ANSS), this capability could then be rolled out nationwide.

**This will save lives, and reduce the financial losses in future earthquakes.** Already BART uses the warning to slow and stop trains potentially saving hundreds of lives by preventing derailments during an earthquake.

The USGS is the federal agency with the responsibility for issuing alerts. But as seen in Japan, there is also a critical role for the private sector. Their expertise is needed

to distribute the alerts broadly through cell-phone and internet providers, TV and radio. A warning system will also create new business opportunities to provide specialized alerts for specific users, consultancy on how to use the warning, and the development of automated control systems.

As outlined in the implementation plan that the USGS has developed, this system could be operational in two years. The cost of building and operating the west-coast system for the first five years is about \$120 million. It will then cost \$16 million per year to operate in addition to the current spending on the ANSS. By comparison, preventing one BART train from derailing will save about \$30 million, and that is just the value of the train. Investing in this system now will provide ***fast, accurate and robust*** warnings.

The earthquake threat along the US west coast increases every day as the strain builds on our faults. It is not ***if***, but ***when*** will the next earthquake strike? We are due for an earthquake in multiple locations along the west coast. If there was an earthquake today, we would build this warning system tomorrow. Lets not miss this opportunity.

I would like to thank the committee for its time and consideration of this important issue.