

**November 2011 Update  
National Science Foundation (NSF)  
in the  
National Earthquake Hazards Reduction Program (NEHRP)**

**Presented to the  
NEHRP Advisory Committee for Earthquake Hazards Reduction (ACEHR)  
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Washington, DC**

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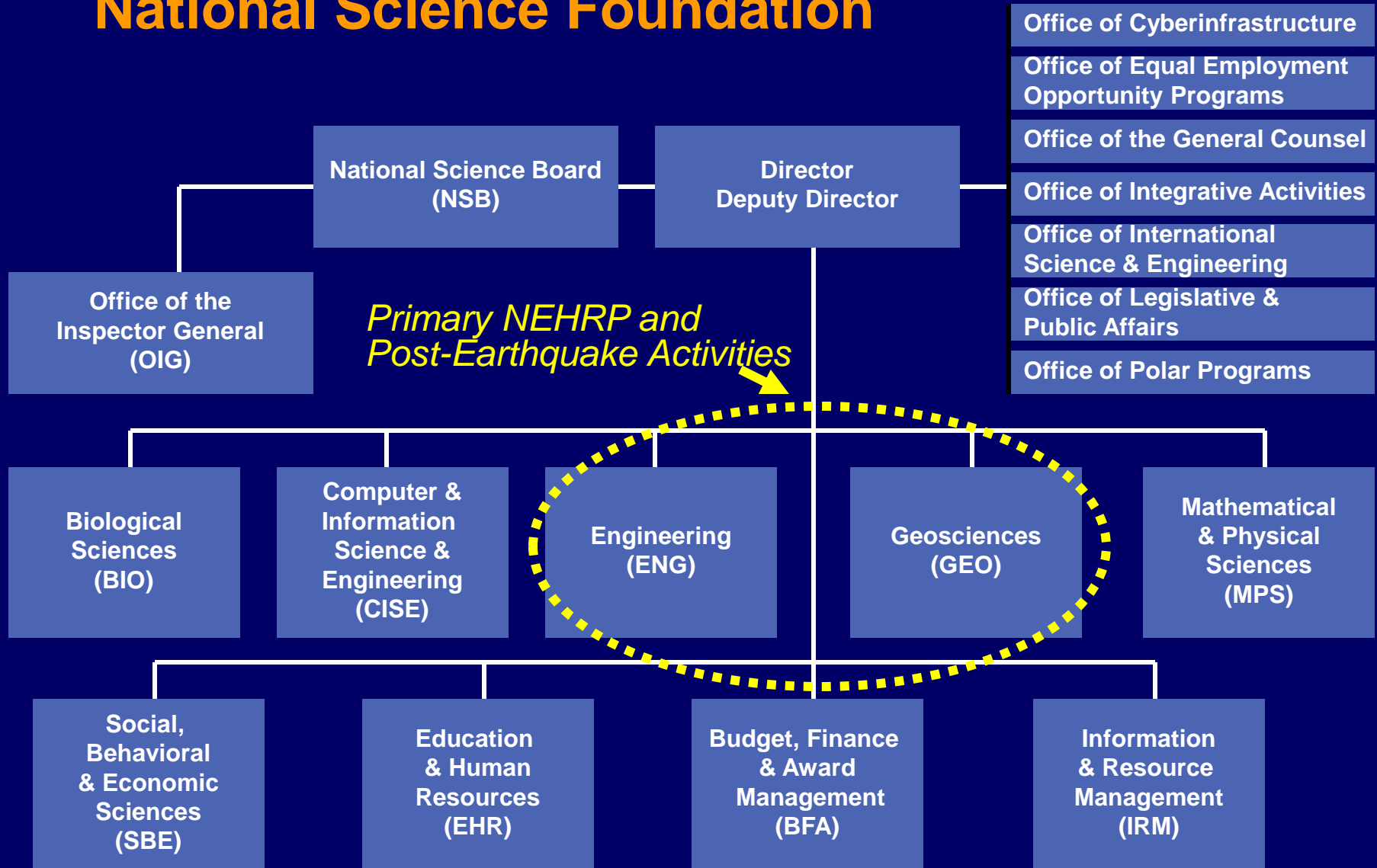


# Presentation Outline

- Post-earthquake rapid response research support
- CAMRA
- EarthCube
- NEES Update
- Progress on studies for earthquake engineering research infrastructure support beyond 2014



# National Science Foundation



# Post-disaster Rapid Response Research Support

- 2010/2011 New Zealand (NZ) earthquakes and 2011 Japan earthquake/tsunami
  - NSF 11-045 and 11-049 Dear Colleague Letters for RAPID proposals
  - Over 60 RAPID Awards: CISE, EHR, ENG, GEO, OISE, OPP, SBE
  - Workshop on Research Needs Emerging from the NZ and Japan RAPIDs
    - NSF ENG Award 1154279, Earthquake Engineering Research Institute (EERI)  
<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1154279>
    - Location: National Science Foundation, Arlington, VA, February 9-10, 2012
- August 23, 2011 Virginia Earthquake
  - GEER Report  
[http://geerassociation.org/GEER\\_Post%20EQ%20Reports/Virginia\\_USA\\_2011/Cover\\_Virginia\\_2011.html](http://geerassociation.org/GEER_Post%20EQ%20Reports/Virginia_USA_2011/Cover_Virginia_2011.html)
  - NSF GEO Awards 1160663 and 1160666: IRIS/PASCCAL EarthScope Flexible Array instrumentation deployment to capture aftershocks to identify seismogenic structures at depth as well as energy propagation characteristics
- Eastern Turkey October 23, 2011 earthquake
- Workshop on Deploying Post-Disaster Quick-Response Reconnaissance Teams
  - NSF ENG Award 1153981, University of Delaware, James Kendra, PI  
<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1153981>
  - Location: National Science Foundation, Arlington, VA, June 11-13, 2012



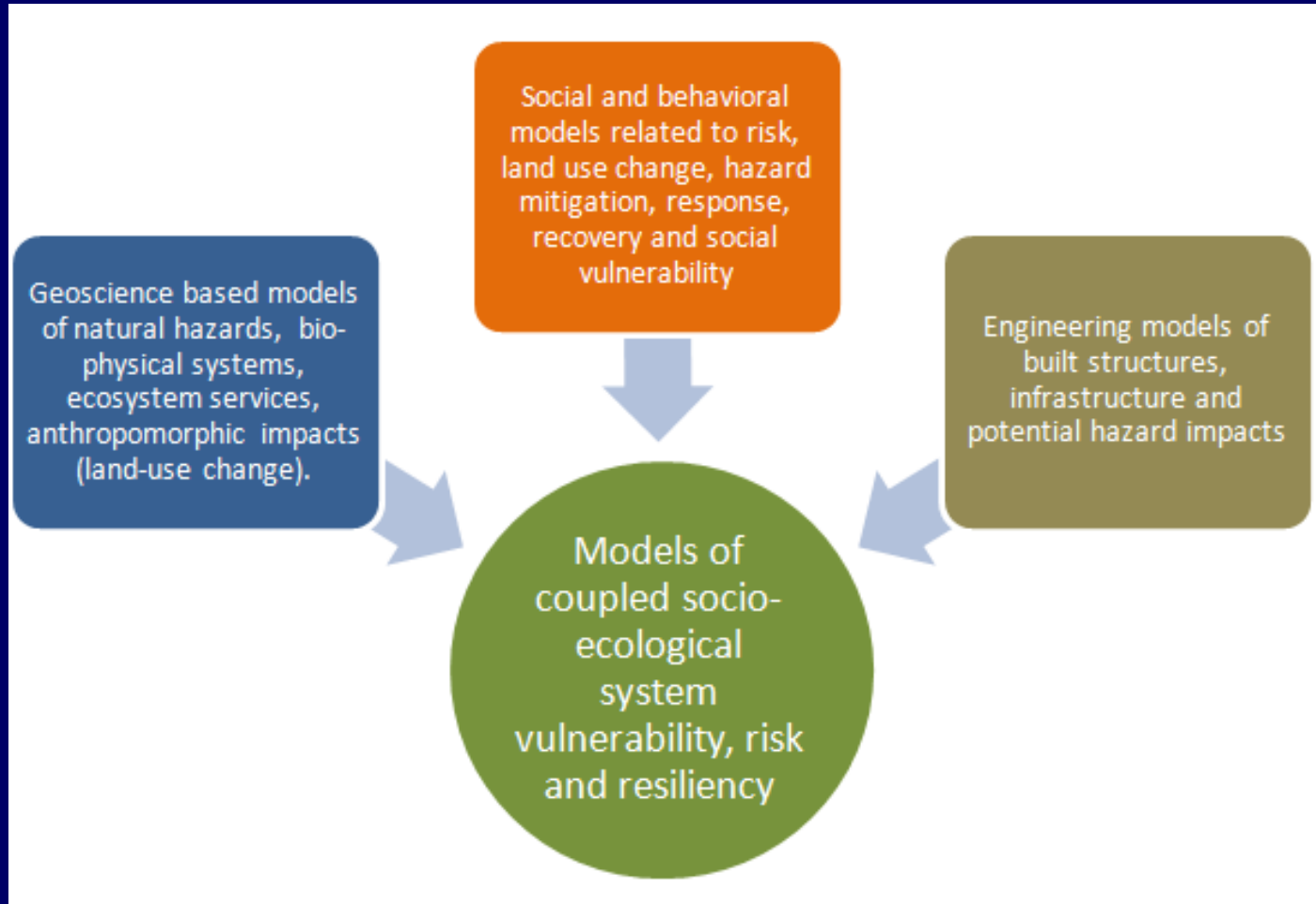
# Creating a More Disaster Resilient Community (CAMRA)

- ENG, GEO, and SBE
- Focus - interdisciplinary program for disaster resilience, vulnerability, and risk reduction
- Workshop held during June 2011 at NSF  
Report <http://archone.tamu.edu/hrrc/camra/report.pdf>
- Recommendations
  - Focus on natural and technological hazards
  - Focus on interdisciplinary research
  - Stimulate comparative hazard research
  - Facilitate long-term data collection activities
  - Form a collaborative network of multidisciplinary observatories

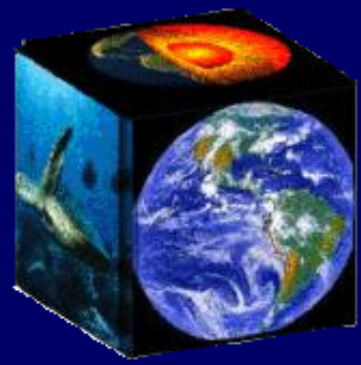


# CAMRA Workshop Report

## Conceptual Representation of CAMRA's Research Agenda



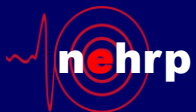
(Figure 1 of Workshop Report)



# NSF GEO Update - EarthCube

<http://www.nsf.gov/geo/earthcube/index.jsp>

- Develop national integrated data infrastructure for earth system science
- Timeline
  - On-line community information (August to November, 2011)
  - EarthCube charrette (November 1-4, 2011)
  - Post charrette (Mid-November to April, 2012)
  - EarthCube ideas/lab (Tentatively Early May, 2012)
  - Prototype development (May to December, 2013)
  - Fully integrated geosciences infrastructure (2014-2022)



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# NEES Community

3200 registered NEEShub users and thousands of NEES users of equipment sites and cyberinfrastructure at any point in time highlight the global reach of NEES



NEES Sites

## NEEScomm

- Data Repository
- Computational Simulation
- Community Support



Cornell University



University of California, Davis



University of Texas, Austin



Rensselaer Polytechnic Institute



University of California, Los Angeles

| Legend                                   |                     |
|--|---------------------|
| <span style="color: green;">●</span>     | NEES Equipment Site |
| <span style="color: lightblue;">●</span> | NEES Partnership    |
| <span style="color: yellow;">●</span>    | NEES Researcher     |



University of Minnesota



University of Illinois at Urbana - Champaign



University at Buffalo



Lehigh University



University of California, Berkeley



University of Nevada, Reno



Oregon State University



University of California, Santa Barbara



University of California, San Diego





# NEES Project Warehouse for Experimental Data Archiving

<http://nees.org/warehouse>

The screenshot shows the NEEShub Project Warehouse website. At the top, the NEEShub logo is displayed with the text "George E. Brown, Jr. Network for Earthquake Engineering Simulation". Below the logo is a navigation menu with items: About NEES, Tools & Resources, Learning & Outreach, Project Warehouse, Simulation, Sites, Collaborate, and Explore. A breadcrumb trail indicates "You are here: Home » Project Warehouse".

The main content area features a large banner with the text "PROJECT WAREHOUSE" overlaid on images of experimental data and project documentation. Below the banner, there is a section titled "In the Spotlight" with three columns of links:

- Projects**
  - Public Projects
  - My Projects
  - Enhanced Projects
- Documentation**
  - User Guide
- Tools and Resources**
  - Project Editor
  - Databases
  - PEN
  - inDEED

To the right of the spotlight section is a text box describing the Project Warehouse as a centralized data repository for sharing and publishing earthquake engineering research data. It mentions that the data is associated with research projects funded by various agencies, including the National Science Foundation, and includes experiments performed at NEES and non-NEES equipment sites. A "Learn more" link is provided.

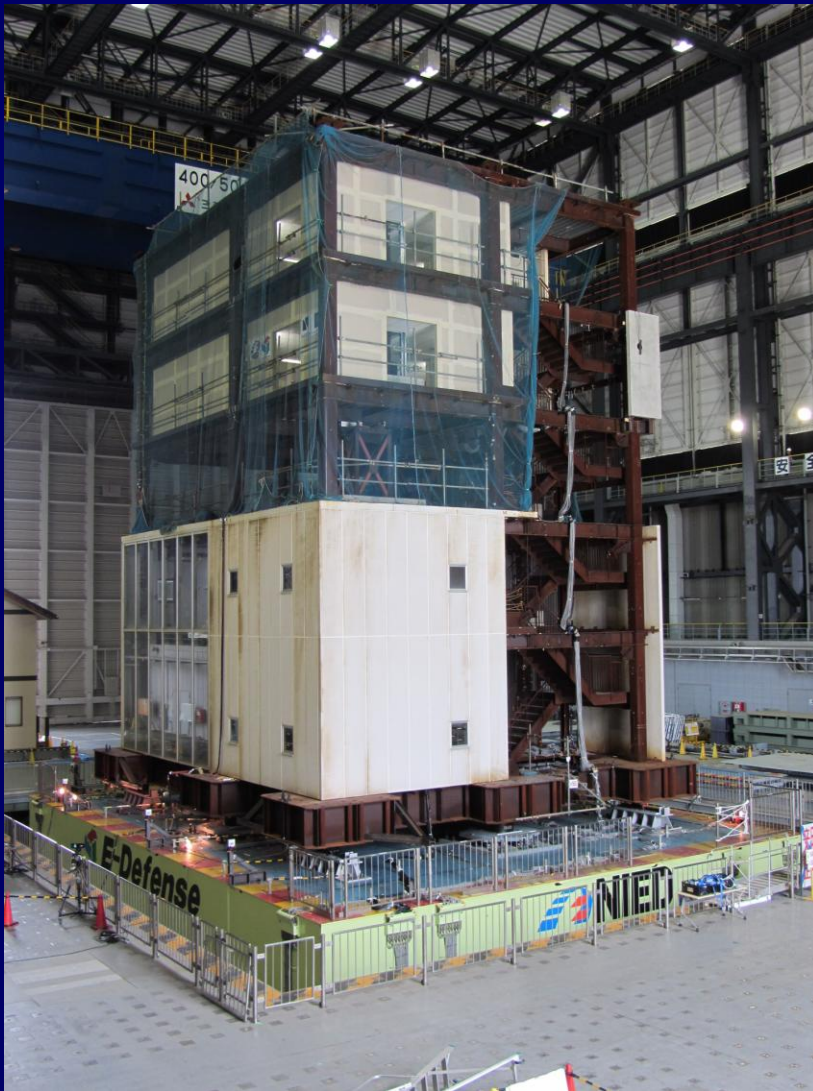
Below the spotlight section is a "Highlighted Projects" section with a horizontal scrollable list of project cards. Each card includes a thumbnail image, a title, and a brief description:

- Pile Pinning Effects on a Bridge Abutment in Laterally Spreading Ground:** 3 centrifuge tests were conducted at UC Davis.
- SASW Measurements at Stanford University:** URS Corporation has updated seismic hazard evaluation.
- Seismic Performance of Bridge Systems:** Simulations verified with experimental data establishing reliability.
- Performance Based Design of New Masonry:** Quasi-static testing is being conducted at UT Austin and at NC A&T State University.
- Soil-Foundation-Structure Interaction:** Using NEES tools to collect, communicate, and archive large volumes of data.
- Dynamic Passive Pressure on Full-Scale Pile Caps:** Soil subjected to earthquake-like loadings.

On the far right, there is a "Quick Links" section with two links: "NSF NEES page" and "NEES award search".



# NEES Updates/Highlights



Workshop and five-story test on base isolation and non-structural systems at Japan's E-Defense shake table facility during August 2011  
(NSF NEESR Awards 1113275, Keri Ryan, PI and 0721399, Emmanuel Maragakis, PI)



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# NSF Award 1134940 NEESR: Induced Partial Saturation (IPS) Through Transport and Reactivity for Liquefaction Mitigation

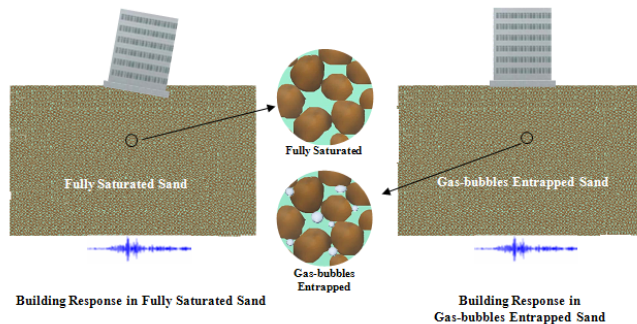
## Limitations of Current Liquefaction Mitigation Techniques:

- expensive
- not applicable for existing structures

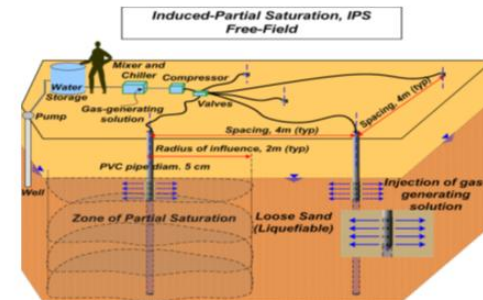
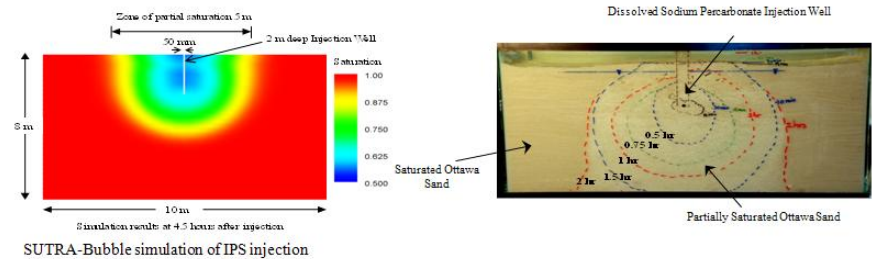
## NEES-R Research Goal: A New Mitigation Technique, IPS:

- cost-effective
- easy and wide application
- for existing and critical structures

### Induced Partial Saturation (IPS)



NEES-R Research on IPS  
Fundamental research combining analytical, laboratory, and field investigations to develop IPS as a cost-effective liquefaction mitigation measure



Graphics courtesy of Professor Mishac Yegian, Northeastern University, PI

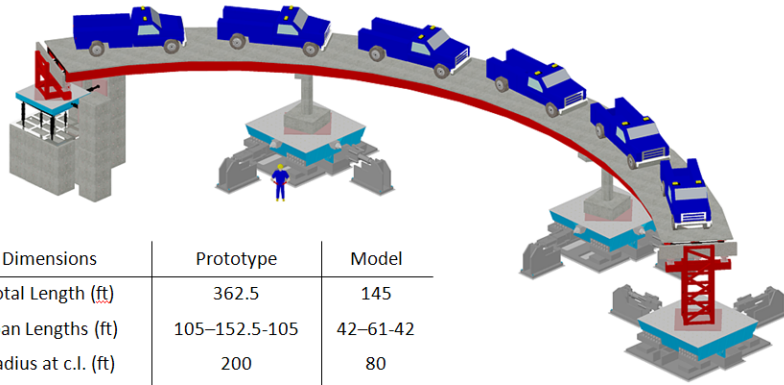




# Seismic Resilience of Curved Bridges

## NEES facility at University of Nevada, Reno

### Prototype and model dimensions



| Dimensions          | Prototype     | Model    |
|---------------------|---------------|----------|
| Total Length (ft)   | 362.5         | 145      |
| Span Lengths (ft)   | 105-152.5-105 | 42-61-42 |
| Radius at c.l. (ft) | 200           | 80       |
| Total Width (ft)    | 30            | 12       |
| Girder Spacing (ft) | 11.25         | 4.5      |
| Column Height (ft)  | 20            | 8        |



Six F250 trucks on bridge model  
(fish-eye view)

Graphics courtesy of Professor Ian Buckle, University of Nevada, Reno  
Project supported by FHWA, Caltrans, and NSF/NEES



# NSF Engineering - Program Planning for Future of Earthquake Engineering Research Infrastructure Support beyond 2014

- Dear Colleague Letter informing community of planning process for the future of earthquake engineering research infrastructure support beyond 2014 (NSF 10-071)  
<http://www.nsf.gov/pubs/2010/nsf10071/nsf10071.pdf>
- Community input for research agenda and infrastructure requirements
- Two evaluation studies during 2010 - early 2012
  - National Research Council (NRC)
  - Science and Technology Policy Institute (STPI)



# NSF Planning Framework for Future of Earthquake Engineering Research Infrastructure Support

Community Input for Grand Challenges Research Agenda and Research Infrastructure

NRC Workshop on Grand Challenges and Networked Facilities  
(March 14-15, 2011)

STPI Study: Retrospective and Prospective  
(2010 – early 2012)

NSF Decision for Plan beyond 2014

NSB Information Item & NSF Dear Colleague Letter  
(by Fall 2012)

# National Research Council

## Grand Challenges in Earthquake Engineering Research: A Community Workshop Report

[http://www.nap.edu/catalog.php?record\\_id=13167](http://www.nap.edu/catalog.php?record_id=13167)

### Five Grand Challenges

- Community Resilience Framework
- Decision Making
- Simulation
- Mitigation
- Design tools





# NRC Workshop Recommendation: Network of Facilities

|  |  |
|--|--|
| Community resilience observatory             | Networked geotechnical centrifuges                       |
| Instrumented city                            | Soil-structure interaction shake table                   |
| Earth observation                            | Large-scale shake table                                  |
| Earthquake engineering simulation center     | Advanced structural subsystems characterization facility |
| Earthquake engineering data synthesis center | Non-structural, multi-axis testing facility              |
| Rapid post-earthquake monitoring facility    | Mobile facility for in situ structural testing           |
| Sustainable materials facility               | Tsunami wave simulator                                   |



# Further Information

**National Science Foundation**

*<http://www.nsf.gov>*

**CMMI Grantees Conference and NEES  
Annual Meeting**

**July 8-12, 2012**

**Boston, MA**

*<http://www.cmmigranteeconference.org/>*



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