Earthquake Research and Implementation Activities at DOE

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DOE was once a leader in seismic and other natural phenomena hazard characterization and design; created the DOE “1020 series” of standards in the mid-1990s.

The Department saw attrition of its NPH staff over the last decade.

Major projects continued (Hanford, Savannah River waste treatment plants) and problems arose.

The Chief of Nuclear Safety (CNS) is working to improve DOE’s performance in seismic and other natural phenomena hazard mitigation.
DOE Research and Implementation Activities

Seismic Lessons-Learned Panel

♦ The CNS instituted the SLLP in August 2007 to provide DOE recommendations for improvement.

♦ Specific suggestions include:
  - Stipulate expectations, standards in contracts
  - Rigorous peer review of seismic designs
  - Enhanced involvement/oversight by DOE staff

♦ The Panel meets every 6-8 months to discuss concerns specific to DOE projects as well as more generic issues affecting nuclear facilities.
CNS Activities: CEUS-SSC

- CNS and DOE Office of Nuclear Energy partnered with EPRI, NRC to support the CEUS-SSC for Nuclear Facilities Project.
- A SSHAC Level 3 study to provide high confidence of capturing center, body and range of the informed technical community.
- Participatory Peer Review Panel.
- A regional model requiring site-specific enhancements.
- Slated for completion February-March 2011.
CNS Activities: NGA-East

- CNS and Nuclear Energy again combining efforts to provide DOE’s support, with EPRI, NRC, USGS.
- Five-year study to develop new attenuation relationships for the CEUS.
- As with CEUS-SSC, the results should improve seismic hazard calculations and ideally, reduce uncertainty as NGA-West did.
- CNS less directly involved in this effort so far.
Other CNS Projects

- Commissioned research paper, *Investigation of Seed Record Selection on Structural Response*.
- Commissioned topical report on modeling, seismic analysis and qualification of pressure vessels.
- Investigating potential problem with SASSI code.
- Planning future research into foundation input response spectra.
- Helped sponsor 2010 Earthquake Engineering conference in Toronto.
New Hanford PSHA

- DOE sites are required to review NPH assessments every 10 years, update if necessary.
- Operations at Hanford will continue for decades.
- Mid-Columbia Dam PSHA suggests higher hazard.
- Considerable uncertainty and contention in characterizing Yakima Fold Belt sources.
- SSHAC Level 3 study to examine seismic sources and attenuation expected to start soon.
An effort is underway to update the Savannah River Site PSHA using the CEUS-SSC model.

Project is reviewing existing site data, awaiting the CEUS-SSC results.

CEUS-SSC model will be modified with any necessary refinements to local tectonic features, consider multiple attenuation relationships.

Project will serve as a model for adapting CEUS-SSC for site-specific use: Level 2 refinement to Level 3 study.

Completion scheduled December 2011.
The Idaho National Laboratory is completing a review of the Idaho Site PSHA.

Soon DOE expects to receive a recommendation to perform a new PSHA following SSHAC guidance.

This effort is currently managed by the Idaho Operations Office, but is gaining interest from DOE Headquarters.
Facility-Specific Design Work

- Considerable effort is ongoing with seismic design and equipment qualification at several facilities:
  - Waste Treatment Plant at Hanford.
  - Chemistry and Metallurgy Research Replacement at Los Alamos.
  - Uranium Processing Facility and Uranium Down-blending Facilities at Oak Ridge.
Other Site Activities

♦ Pantex and Paducah are due for their 10-year NPH reviews and will likely use CEUS-SSC results to update site seismic hazard analyses.

♦ Oak Ridge will need to perform 10-year review around 2013, will also rely on CEUS-SSC.

♦ A question on WIPP surface facility seismic design recently arose, will review analysis.
Additional projects supporting source Characterization in the CEUS

**New Madrid (NMSZ)**
Paleoliquefaction field studies (Tuttle Assoc.)
1811-1812 Intensity reassessment (USGS)
Liquefaction Susceptibility (USGS)

**Northeast (NESZ)**
Seismic reflection reprocessing (Virginia Tech)

**Charleston (CSZ)**
Seismic reflection reprocessing (Virginia Tech)

**Eastern Tennessee (ETSZ)**
New Paleoliquefaction guidelines (NUREG)
Paleoliquefaction (Univ. of Tenn)
Seismites (speleothems) (USGS)

**National**
Advanced National Seismic System (USGS)
After serving as a leader in seismic hazard characterization and mitigation in 1990s, DOE’s performance slipped.

A renewed focus over last 3-4 years is leading to improvements, learning from past mistakes.

DOE is adopting national consensus standards for seismic hazard characterization and mitigation.

DOE is open to working with other agencies (NRC, USGS) to share information and reduce duplication of efforts.