

AGENDA

Independent Peer Review Panel meeting

Review of seismic studies at Diablo Canyon

<i>September 15, 2016</i> <i>1:30 pm –3:30 pm</i>	<i>California Public Utilities Commission</i> <i>505 Van Ness Avenue, Golden Gate Room</i> <i>San Francisco</i> <i>Call in number: 1-866-619-6147, Code: 8617394#</i>
--	--

- 1:30 Introductions / Opening Remarks (E. Greene)
- 1:45 Remaining questions from last IPRP meeting (IPRP and PG&E)
- 2:15 Status of seismic hazards analysis with NRC, any remaining uncertainties, and PG&E's plans for further investigation (PG&E)
- 2:45 PG&E Long Term Seismic Program (LTSP) (PG&E)
- 3:00 Next steps for continued IPRP review (IPRP)
- Questions / Discussion*
- 3:30 Adjourn



Long-Term Seismic Program

Pacific Gas and Electric Company Long-Term Seismic Program

California Public Utilities Commission
Independent Peer Review Panel

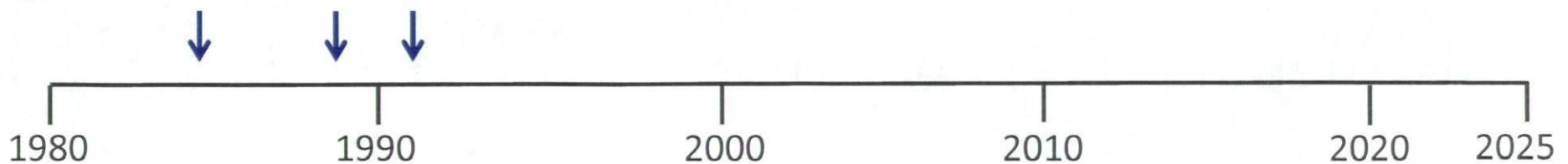
San Francisco, CA
September 15, 2016

Long-Term Seismic Program (LTSP) History

1984: LTSP established to fulfill Facility Operating License Condition DPR-80 that required PG&E develop and implement a program to update the evaluation of the seismic design bases of the Plant.

1988/1991: First LTSP completed. PG&E decided to maintain the LTSP staff of geoscience and engineering experts to keep abreast of new geological, geophysical, seismological, and seismic engineering information that might apply to Diablo Canyon (PG&E DCL 91-091). Recognized benefits of the LTSP include:

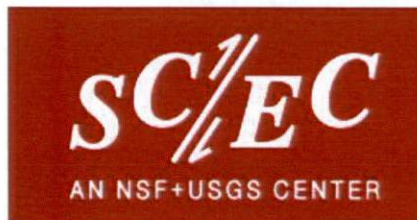
- Maintain an Advanced State of Knowledge of Seismic Issues Affecting DCPD
 - Source Characterization
 - Ground Motion and Site-Specific Response Spectra
- Seismic Margin Analysis
- Develop Framework for the Future



Long-Term Seismic Program (LTSP) History (continued)

1991-Present: LTSP grows to include partnerships with federal, state, local, and academic institutions, including:

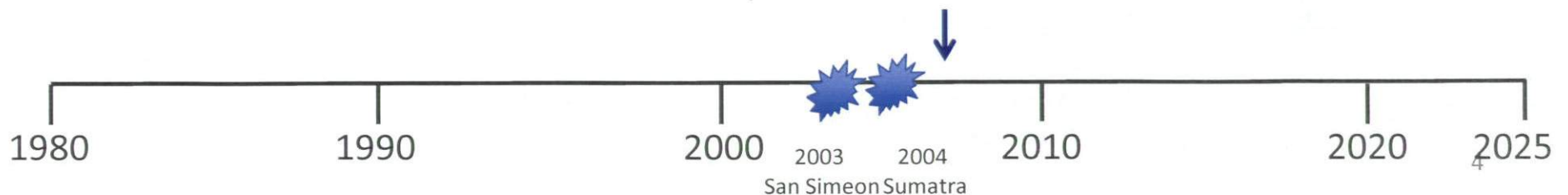
- U.S. Geological Survey (USGS)
- Southern California Earthquake Center (SCEC)
- California State University Monterey Bay Seafloor Mapping Lab (CSUMB)
- Pacific Earthquake Engineering Research Center (PEER), University of California, Berkeley



Long-Term Seismic Program (LTSP) History (continued)

2006: LTSP Update examined new geological, geophysical, and seismological databases to incorporate new scientific information and emerging tectonic concepts to advance the understanding of earthquake hazards in the south-central coastal region.

- Source Characterization: Identification of the Shoreline Fault Zone (w/ USGS and CSUMB). This lineament was not apparent at the time of completion of the original LTSP in 1991.
- Ground Motions: Development of Next Generation Attenuation (NGA) models in 2008 (w/PEER).
- Tsunami Studies: Updated evaluation of circum-Pacific tsunami hazard, including local submarine landslide tsunami hazards



Long-Term Seismic Program (LTSP) History (continued)

2010: LTSP Update initiates a Senior Seismic Hazard Analysis Committee (SSHAC) Level 3 review of DCPD seismic hazard.

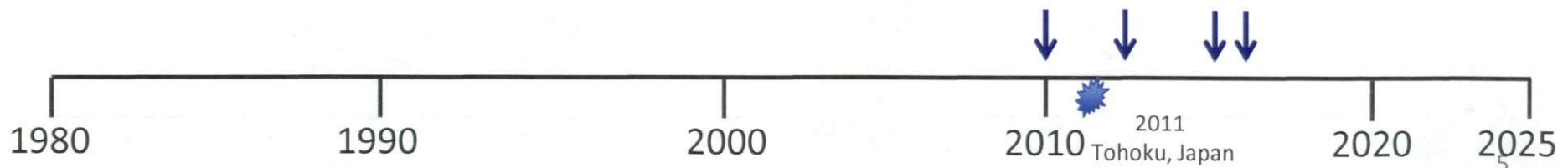
2012: Nuclear Regulatory Commission issues 10 CFR 50.54(f) requirements for review of seismic and flood hazards following 2011 Tohoku, Japan earthquake and tsunami.

SSHAC Level 3 process used updated Seismic Source Characterization (including AB1632) and Ground Motion Characterization models as basic inputs to a site-specific probabilistic seismic hazard analysis (PSHA).

The SSHAC study addressed and reduced uncertainties identified during the original LTSP.

2015: 10 CFR 50.54(f) Hazard Characterization studies completed.

2016: Probabilistic Risk Assessment in progress (planned completion in 2017).



Seismic Studies Separate from the Long-Term Seismic Program

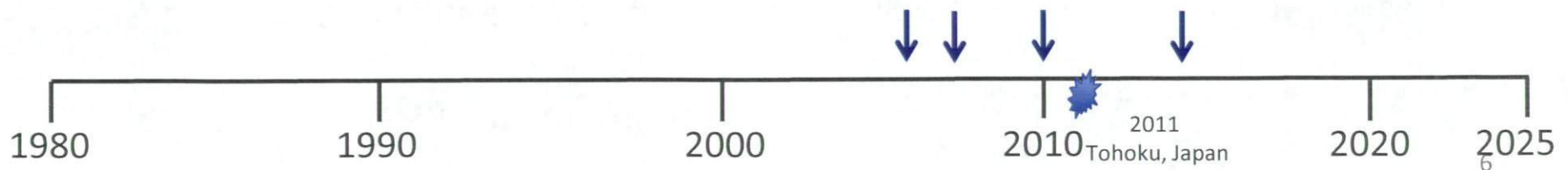
2006: Assembly Bill 1632 passed. Directed the CEC to assess the potential vulnerability of California's largest baseload power plants to a major disruption due to a major seismic event or plant aging.

2008: California Energy Commission issues the AB 1632 Report, which recommended that PG&E use three-dimensional (3D) seismic reflection mapping and other advanced geophysical techniques to explore fault zones near DCP.

2010: CPUC Authorized Funding for Seismic Studies (D.10-08-003 and D.12-09-008)

- Off-Shore 3D Seismic Survey
- On-Shore 2D Seismic Survey
- Ocean Bottom Seismometer (OBS) Array
- Independent Peer Review Panel established

2014: Central Coastal California Seismic Imaging Project (CCCSIP) Report Issued



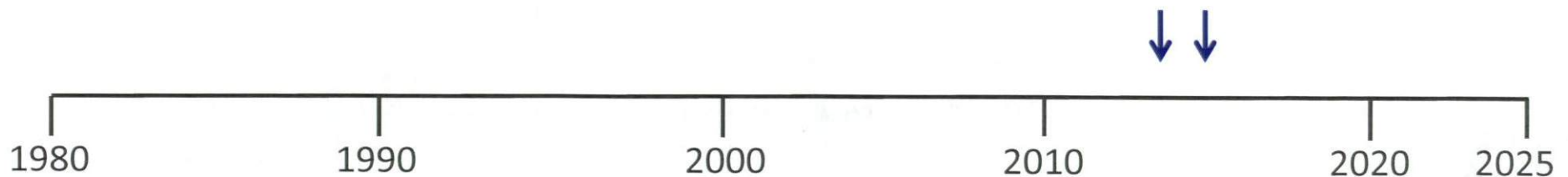
LTSP and AB 1632 Processes Consolidated by California Public Utilities Commission

2014: General Rate Case Decision 14-08-032 transferred costs associated with the LTSP to the Diablo Canyon Seismic Studies Balancing Account (DCSSBA) for recovery and review in the annual Energy Resource Recovery Account (ERRA) compliance proceedings.

”to assure the proper integration of the AB1632 seismic studies with the LTSP and the NRC-directed Senior Seismic Hazards Analysis Committee (SSHAC) process”

2014: AB1632 studies authorized in D.10-08-003 and D.12-09-008 completed (CCCSIP)

2015: NRC-ordered SSHAC Hazard Characterization reports completed (10 CFR 50.54 (f))



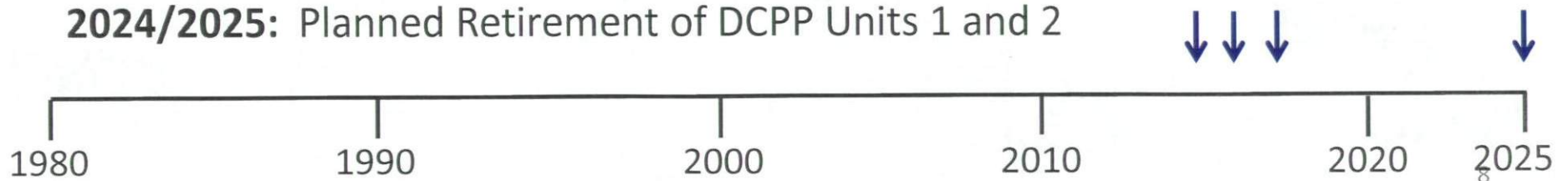
2015: New Legislation Continues Independent Peer Review Panel (IPRP) - Assembly Bill 361 (Monning) continues IPRP engagement
“...continue, until August 26, 2025, an independent peer review panel to conduct an independent review of enhanced seismic studies and surveys of the Diablo Canyon Units 1 and 2 power plant, including the surrounding areas of the facility and areas of nuclear waste storage”

2016: PG&E and Parties Announce Joint Proposal to Retire Diablo Canyon at end of Current Operating Licenses (under review by CPUC)

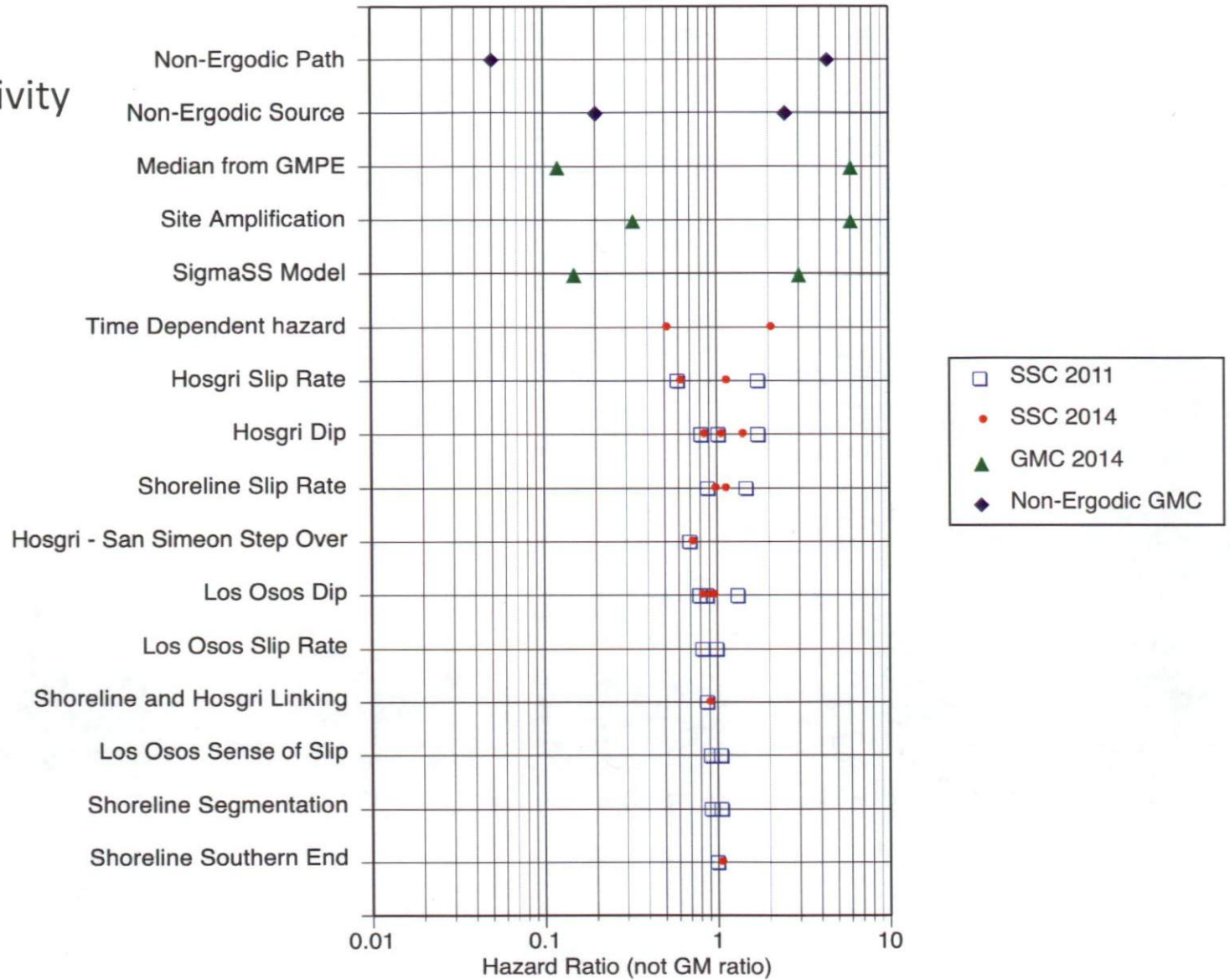
2016: NRC issues Independent Assessment of updated Seismic Hazard Characterization

2017: Pending General Rate Case Decision would maintain Diablo Canyon Seismic Studies Balancing Account

2024/2025: Planned Retirement of DCP Units 1 and 2



Hazard Sensitivity 5 Hz, PSA=2g

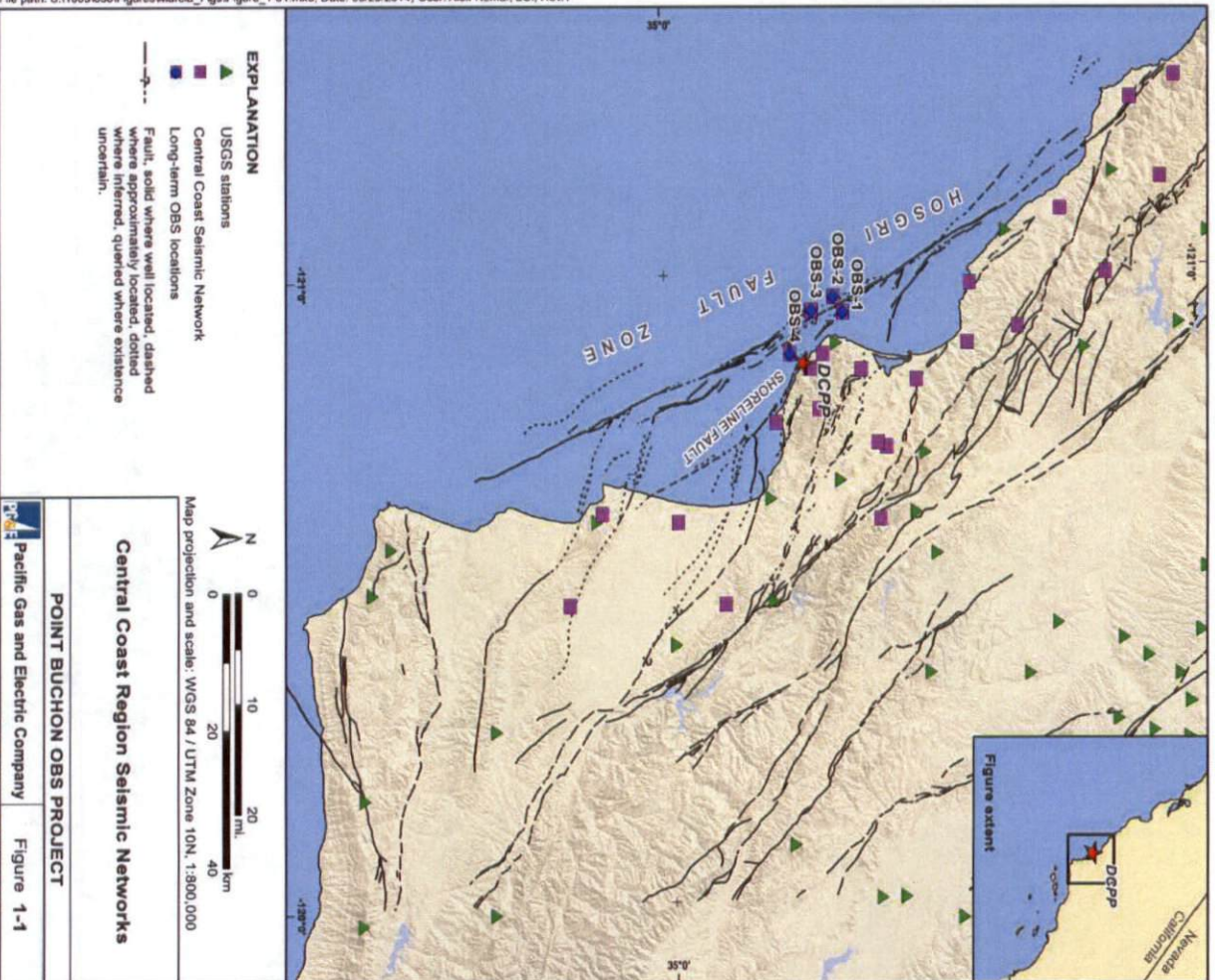


LTSP Tasks for 2016

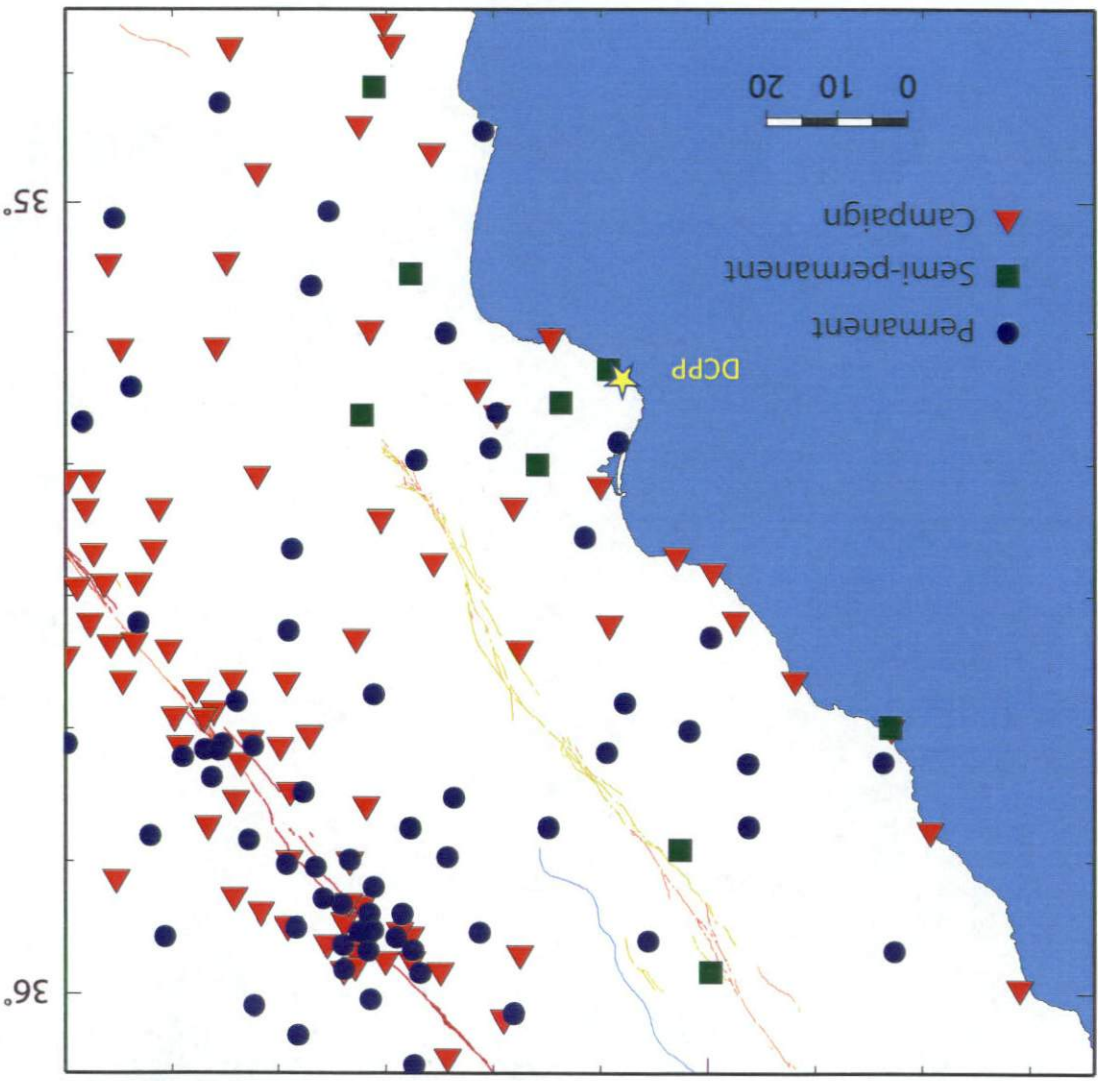
TOPIC	TASK	DURATION	
SEISMIC / GEODETIC NETWORK	Seismic Station Maintenance	on-going	consultant
	OBS Data Management	on-going	consultant
	Integration of CCSN seismic data into NSCN (USGS)	on-going	USGS
	GPS Survey in central coastal CA	every 2 years	USGS
SEISMIC SOURCE CHARACTERIZATION	Development of an alternative model to explain the uplift on the Irish Hills	1 year	consultant
	Fault studies	2 years	consultant

Central Coast Seismic Network

File path: S:\1005\050\Figures\Marcia_Figs\Figure_1-01.mxd; Date: 05/29/2014; User: Alex Remar, LCI; Rev: 1



Central California GPS Array



USGS science for a changing world

USGS Home Contact USGS Search USGS

Earthquake Hazards Program Home About Us Contact Us

EARTHQUAKES HAZARDS DATA & PRODUCTS LEARN MONITORING RESEARCH

Search

LTSP Tasks for 2016 (continued)

TOPIC	TASK	DURATION	
GROUND MOTION CHARACTERIZATION (GLOBAL MODELS)	Validation of SCEC kinematic broadband platform (BBP) with 13 additional Earthquakes	2 years	SCEC
	Validation of Variability of FAS and PSA from SCEC BBP	3 years	UC Davis
	Development/Validation of Dynamic Rupture Platform	3 years	SCEC
	Development/Validation of Dynamic Rupture Platform	3 years	USGS
	IT Support for SCEC BBP	5 years	SCEC
	Develop New Kappa scaling models	3 years	PEER
	Implementing Directivity into PSHA	1 year	PEER
	Update Empirical ground motion Dataset with new GM data and meta data	on-going	PEER

LTSP Tasks for 2016 (continued)

TOPIC	TASK	DURATION	
GROUND MOTION CHARACTERIZATION (NON-ERGODIC GMPES)	Development of GMPE using Continuous Regionalization	2 years	PEER
	Development of Spatial Correlation Models for CA Path Effects	2 years	PEER
	Development of a path effects terms for GMPE for central coastal CA (post-doc)	3 years	USGS
	Create 50 Station Temporary Array in central coastal CA	5 years	SCEC
	Build New 3D Crustal Model for central CA	5 years	SCEC
	Build New 3D Crustal Model for central CA	5 years	USGS
	Run 3D Simulations for Path Effects central CA	5 years	SCEC
	Testing 3D Simulations in the LA Region	1 year	consultant
	Development of new methods and data for constraining Path Effects, (SCEC Core Research Program)	3 years	SCEC
HAZARD METHODOLOGY	Add Capability for Fully Non-Ergodic Ground Motion models to the hazard code	1 year	consultant
	Hazard Code Verification , comparing 13 codes	1 year	PEER
TESTING HAZARD	Add Constraints on Hazard near DCPD from Precarious Rocks	2 years	consultant
LTSP RESEARCH PLANNING	Support for Documentation and continuity	ongoing	consultant

Next Steps/Questions

- December 2016: NRC Report on SSHAC anticipated
- Q12017: IPRP Meeting to Review NRC Results
- Q22017: SLO-area IPRP meeting??