

AGENDA

SEISMIC MONITORING ADVISORY COMMITTEE

November 13, 2017 @ 9:30 a.m.
Calpine Geothermal Visitors Center
15500 Central Park Road, Middletown

Call In: 1-888-449-6492; Participant Passcode: 226083

- I. Introductions
- II. Approval of SMAC report to the Board of Supervisors of May 8, 2017 meeting.
- III. Anderson Springs Public Input – Jacquelyn Bartlett
- IV. Cobb Area Public Input – Robert Stark
- V. Middletown Community Input – Linda Diehl Darms
- VI. Update of SE Geysers pipeline operations – Ed Voge
- VII. Summary of Seismic Data from USGS Network - Lind S. Gee
- VIII. Anderson Springs Community Service District – Meriel Medrano
- IX. Cobb Area Water – Ben Murphy
- X. Calpine - Craig Hartline
- XI. Report on LBNL – Kurt Nihei
- XII. Report on DOGGR – Joe Austin
- XIII. Report on US Geothermal – Western Geo Power – Scott Nichols
- XIV. Santa Rosa Geysers Operations – Mike Sherman
- XV. Schedule Next Meeting for Monday, May 14, 2018
- XVII. General Public Input
- XVIII. Adjournment

SEISMIC MONITORING ADVISORY COMMITTEE (SMAC)

Monday, May 8, 2017, 9:30 a.m.
Calpine Geothermal Visitors Center
15500 Central Park Road
Middletown, California

FINAL MINUTES

Meeting called to order by Jan Coppinger, Committee Chair (Lake County Special Districts) at 9:34 a.m. Minutes were recorded by tape recorder and transcribed to Draft Minutes. Coppinger initiated introductions.

Present: Jan Coppinger, Committee Chair (Lake County Special Districts), Craig Hartline (Calpine), Ed Voge (NCPA), Robert Stark (Friends of Cobb Mt.), Joe Austin (DOGGR), Bruce Carlsen (Calpine), Mark Roberts (Lake County Planning Department), Mike Sherman (City of Santa Rosa), Steve Hemphill (NCPA), Meriel Medrano (ASCSD), Linda Diel-Darms (Middletown), Joan Clay (ASCSD), Margaret Lewis (Calpine), Cheryl Engles (AS)

I. November 14, 2016 Meeting Minutes for Approval: Jan Coppinger

Jan Coppinger presented the Draft Minutes for approval. The minutes were approved by consensus.

II. Anderson Springs Report – There was discussion as to whether or not Meriel should represent Anderson Springs as she no longer lives there. Meriel suggested Cheryl give the report as she is living in Anderson Springs. Cheryl reported she has seen an increase in earthquakes and the strength has increased as well. Cheryl stated she was in contact with Craig Hartline and is interested in Craig's work in mitigation of earthquakes and realizes "we're dealing with Mother Nature."

Note: There was discussion regarding the different entities and who they represent. Linda Diel-Darms – Community of Middletown; Meriel Medrano – Middletown Community Service District (Water Co.); Jacqueline – Anderson Springs Community Alliance. Additional discussion was the addition of Cobb Area input and the need of a replacement for Hamilton Hess, which is now Robert Stark.

III. Cobb Area Public Input – Robert Stark reported that Cobb lost 600 homes in the fire and most are preoccupied with putting things back together and this is the reason he did not attend the last meeting. Robert stated there were no specific issues at this time.

IV. General Public Input – No representative

V. Northern California Power Agency (NCPA) Report: Ed Voge

Drake's presentation covered the operations in the South East Geysers pipeline for the period of October 1, 2016 through March 31, 2017. The presentation covered two main areas: 1) Pipeline Operations; 2) Observed Seismicity.

i. Pipeline Operations:

- a. The Southeast Geysers Effluent Pipeline (SEGEP) has been in operation for over 19 years and has delivered almost 54 billion gallons of water at an average rate of 5,233 gpm to The Geysers steam fields for injection.
- b. During the more recent 6 month period from October 1, 2016 to March 31, 2017, the SEGEP Pipeline has been in operation 99.5% of the time. Pipeline delivery rates have averaged 7.5 million gallons per day (MGD) or 5,505 gpm. There was one pipeline outage due to a failed pressure switch and reductions in pump rates due to abundant precipitation.
- c. The SE Geysers water injection totaled 12.04 billion lbs.

- ii. Observed Seismicity / South East Geysers
 - a. The USGS recorded a total of 71 seismic events of magnitude 1.5 and greater within the SE Geysers area recorded by the USGS for the past six months. During this period, there was 1 seismic event in the area equal to or greater than magnitude 3.0. This was an event of magnitude 3.33 and occurred on November 11, 2016. Regarding seismic activity between magnitude 1.5 and 3.0, the Southeast Geysers averaged 11.7 events per month which is slightly up from 7.6 per month for the period of April 1, 2015 through September 30, 2016.
- iii. Seismic Activity in the Geysers Known Geothermal Resource Area
 - a. There have been 377 events of magnitude of 1.5 and greater recorded by USGS for the past 6 months.
 - b. There were 7 events of magnitude 3.0 and greater. The largest event was 5.01 located in the NW Geysers approximately 8.6 miles from Anderson Springs Strong Motion instrument, which occurred December 14, 2016.
 - c. 804 seismic events greater than magnitude 1.5 occurred in 2016. This is a slight increase from 757 events in year 2015.

VI. Seismic Data from USGS Network – No presence

VII. Calpine Corporation: Craig Hartline

- i. Current Status of Seismic Monitoring Networks
 - a. LBNL Seismic Monitoring Network – Fully functional.
 - b. USGA/Northern California Seismic Network – Fully functional.
 - c. Community Strong Motion Stations
 - 1) ADS2 Anderson Springs – This sensor was returned to service by the USGS and is fully functional.
 - 2) COB Cobb – Extreme weather and medical issues delayed LBNL contractor Ramsey Haught's reinstallation. Will relocate existing LBNL seismic monitoring site ACR to COB site on Hamilton Hess property.
 - 3) ADSP Anderson Springs – Site determination required additional consideration in a community devastated by the Valley Fire. It was agreed that Anderson Springs community members should assist with the site determination. Properties of McWilliams, Moulton and Engels were suggested by Jeff Gospe on April 19, 2017. Site selection criteria was discussed, along with the surface geology, and a mention that the majority of hotline callers have their residences on landslide deposits. Monitoring station locations were shown as well as a possible site on 11071 Van Dorn Reservoir Road (Engels site).
Note: It was asked whether or not there was a difference from the Van Dorn Reservoir location to where it was before – The answer was the monitor would be at a higher elevation and the landowner chose not to allow the relocation of the instrument.
- ii. Seismicity Hotline
 - a. From October 1, 2016 to March 31, 2017, there were 7 calls on the community hotline. Three calls were for one event in December.
Note: Clay voiced a concern regarding the small amount of calls which is due to the low population there now. She felt even though there were not very many people in Anderson Springs, there is a need to keep the line open to take calls. Calpine stated the community line is still open and checked each weekday.
- iii. Operations
 - a. Hartline presented a slide with the following information: 325 active steam wells; and 52 active water injection wells with water sources of power plant condensate, fresh water during peak precipitation and treated waste water.

- iv. Induced Seismicity
 - a. Hartline presented a slide explaining induced seismicity.
- v. Field-Wide Seismicity Analysis
 - a. October 1, 2016 to March 31, 2017 - ≥ 2.0 -98; ≥ 2.5 -24; ≥ 3.0 -7; ≥ 3.5 -3; ≥ 4.0 -2; ≥ 5.0 -1.
- vi. Yearly Field-wide Water Injection and Seismicity.
 - a. Water injection vs. Magnitude 1.5 showing a slight increase at 842 events from 791.
 - b. Magnitude 2.0 and greater is showing an increase of 218 events from 209 events during the past reporting period.
 - c. Magnitude 2.5 and greater showed 48 events which is a slight increase from 67 events.
 - d. Magnitude 3.0 and greater is 14 events, an increase from last year of 7.
- vii. Monthly Field-wide Water Injection and Seismicity – Hartline explained the events of ≥ 4.0 have decreased to less than one (0.9) event per year from January 1, 2000.
- viii. Hartline discussed the Magnitude 5.01 event of December 14, 2016
- ix. Seismicity and Faults / Fracture Zones and Induced Seismicity Relationships – Hartline presented a 3D visualization and 3D structural model. The point being to show the tools being used to better understand the seismicity of The Geysers and how to help with the injection programs.
 - a. Three Dimensional Structural Model Building Goal – Improved reservoir management and induced seismicity mitigation through a refined understanding of fluid flow pates, fluid boundaries, reservoir heterogeneity and reservoir compartmentalization.
- x. Additional Seismic Monitoring and Research
 - a. Funding Opportunities with the CEC 16-301 with grant approval – Hartline presented a schedule of the project.
 - b. Seismic research collaboration with Zizmos for early detection and warning system

Note: There was discussion regarding profitability due to drought. Mike Sherman stated all had to cut back due to the drought.

VIII. Report on LBNL - No presence - Coppinger stated Ernie Majer will be presenting a final report from a five-year study that they've been doing on seismicity. It will be presented to Lake County BOS, May 23, 2017 at 10:00 a.m.

IX. Report on US Geothermal – Western Geo Power – No presence

X. Report by Lind Gee Seismic Data: No presence

XI. Report on DOGGR: Joe Austin – Joe complimented the presentations and information provided by Craig Hartline.

X. Report on Coordination with Santa Rosa: Mike Sherman stated the coordination with Calpine is good. The pipeline is healthy and good, strong flows.

Note: Coppinger requested from the body to contact her if there are any requests to add to the agenda.

Next meeting: The next SMAC meeting will be **November 13, 2017** at the Calpine Geothermal Visitors Center. Meeting was adjourned by Chair Coppinger at 11:15 a.m.

Meeting Agenda and Full Presentations are available online at:
<http://www.geysers.com/smac.aspx>