California Energy Commission

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AB 1632 Study and Workshop Overview

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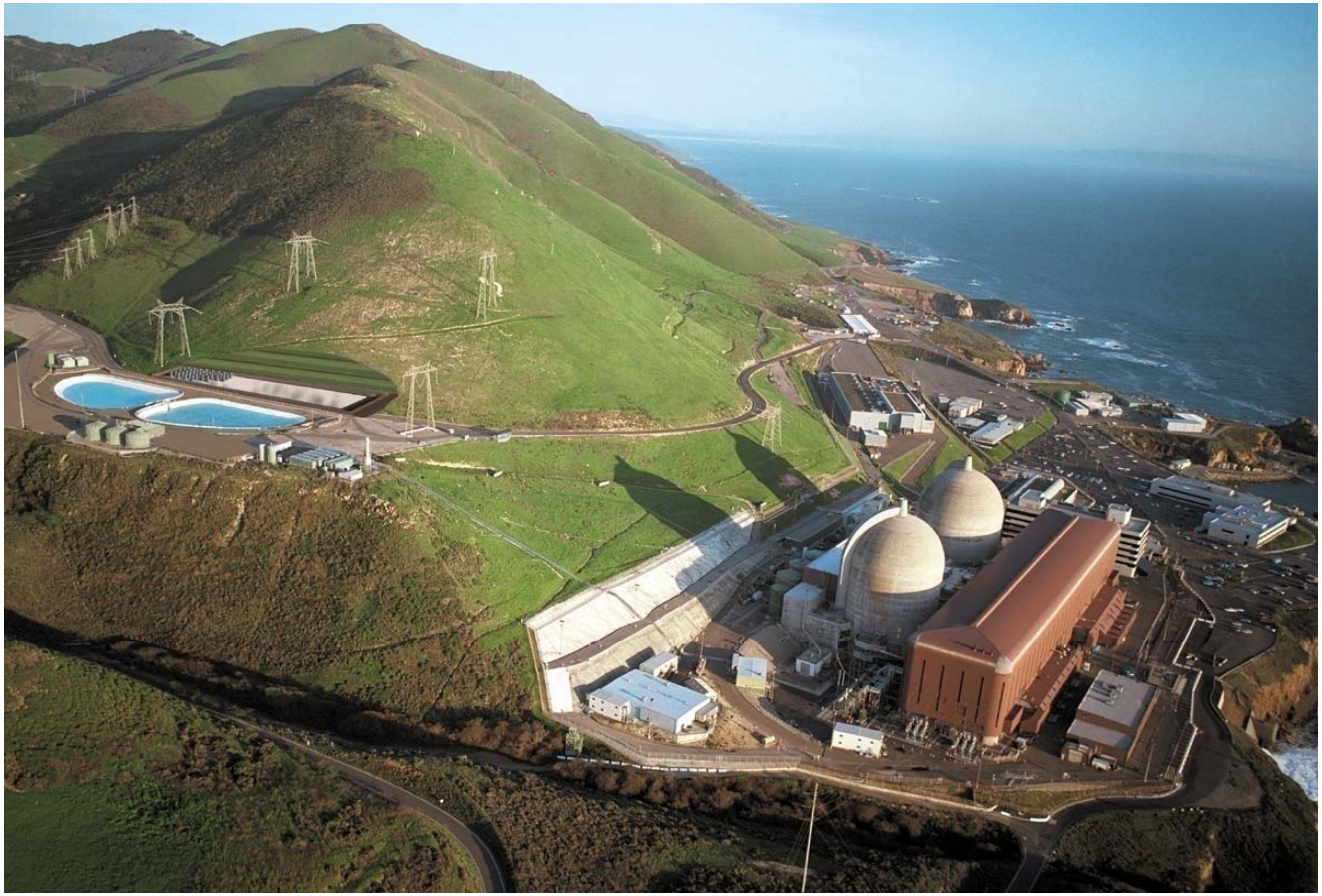
Presentation Overview

- Purpose of Today's Workshop
- Long History of Seismic Concerns at Diablo Canyon and San Onofre
- AB 1632 Study and Recommendations
- Directives to PG&E and SCE to Complete AB 1632 Studies for Use in License Renewal Reviews
- Events at Fukushima Daiichi

Purpose of Workshop

- Review PG&E and SCE's progress in completing studies and actions recommended in the AB 1632 Report/2008 IEPR and 2009 IEPR and directed by the CPUC.
- Discuss uncertainties about seismic and tsunami hazards at Diablo and SONGS; and
- Discuss the implications of recent events in Japan for Diablo Canyon and SONGS.

Diablo Canyon Nuclear Power Plant



San Onofre Nuclear Generating Station

Brief History of Seismic Issues for California's Nuclear Plants

- Plant construction at Bodega Bay was halted in 1964, and the Humboldt Bay Nuclear Power Plant was shutdown in 1976 due to seismic concerns.
- Shell Oil Company studies (1971) revealed the Hosgri Fault during construction of Diablo Canyon.
- Largely due to seismic issues, the operating licenses for Diablo Canyon Units 1 and 2 were issued 15 years after the construction permits were issued.

Brief History of Seismic Issues for California Plants (continued)

- In 1976, the USGS recommended that the Hosgri Fault be considered capable of generating an earthquake of magnitude 7.0 to 7.5, and so Diablo Canyon was designed and upgraded for a 7.5 magnitude earthquake.

- NRC made a condition of Diablo Canyon's operating license that: "PG&E shall develop and implement a State-of-the-Art Program to revalidate the seismic design bases used for Diablo Canyon."

- Construction costs at Diablo Canyon exceeded original estimates by about $5 billion due to seismic issues; SONGS' construction costs exceeded original estimates by about $4 billion.

- Kashiwazaki Kawira Nuclear Power Plant (~8000 MW) earthquake incident in Japan in 2007 had implications for coastal nuclear plants.

Assembly Bill 1632

AB 1632, (Blakeslee, Chapter 722, Statutes of 2006), directed the Energy Commission to:

- Assess the potential vulnerability of large baseload plant(Diablo Canyon and San Onofre) to a major disruption from a seismic event or plant aging;
- Adopt this study as part of the *Integrated Energy Policy Report* (IEPR); and
- Perform subsequent seismic updates as new information and understanding emerge.

AB 1632 Study and Reports

- **Study**: A multi-disciplinary research team led by MRW & Associates completed a comprehensive study and report in 2008 entitled *"AB 1632 Assessment of California's Operating Nuclear Plants"*. The Energy Commission then adopted the study and report in the 2008 IEPR.

- **Public Process**: Three public workshops held in 2007 and 2008; written comments by stakeholders on drafts.

- **Independent Assessment**: Data requests sent to plant owners; study team independently reviewed these data and other scientific/government documents.

- **Seismic Vulnerability Advisory Team**: California agencies (CA Geologic Survey, Coastal Commission, Seismic Safety Commission) reviewed assessment.

Shoreline Fault

- Concurrent with adoption of the AB 1632 Report/2008 IEPR, PG&E announced that the USGS had discovered a previously unknown significant offshore fault – the Shoreline Fault -- less than a mile from Diablo Canyon.
- PG&E and the NRC concluded that Diablo Canyon's design could withstand the potential ground motions from the Shoreline Fault; PG&E completed 2011 study.
- The Shoreline Fault's major characteristics are largely unknown, e.g., its length, proximity to the plant, and relationship to the Hosgri Fault.

AB 1632 Report Findings

- Important data on Diablo Canyon's seismic hazard and vulnerabilities are incomplete or outdated.
- PG&E's Long-Term Seismic Program has extensively explored the seismology/geology for Diablo Canyon. SCE has no comparable program for SONGS.
- Data that has become available since SONGS was built has indicated that the site could experience larger and more frequent earthquakes than was originally anticipated when plant designed.
- Recent studies indicate ground motion near a fault could be stronger and more variable than previously thought.

AB 1632 Report Findings

- Major uncertainties for SONGS relate to the earthquake potential of a nearby offshore fault zone (the South Coast Offshore Fault Zone) and the fault that connects faults in Los Angeles and San Diego regions.
- Additional advanced seismic research may help resolve uncertainties and change seismic hazard estimates.
- Spent fuel pools at Diablo Canyon and SONGS have been “re-racked” to increase storage capacity by placing spent fuel assemblies closer.
- Loss-of-coolant event from an earthquake or a terrorist attack in a re-racked pool could cause radiation releases and contamination.

2008 IEPR Recommendations

- PG&E and SCE should complete updated seismic and tsunami hazard/vulnerability studies.
- Three-dimensional seismic reflection mapping and other advanced techniques are needed to supplement seismic research at Diablo Canyon and San Onofre.
- PG&E and SCE should assess the implications of evolving seismic standards since the plants were built.
- PG&E and SCE should reassess the adequacy of emergency plans and access roads to the plants following a major seismic event.
- Spent fuel pools should be returned to open racking arrangements as soon as feasible.

2009 IEPR Recommendations

- PG&E and SCE should complete the AB 1632-recommended studies and make the findings available for consideration by the CEC, and to the CPUC and the NRC during their plant license renewal reviews.

- PG&E and SCE should not file license renewal applications with the NRC without prior approval from the CPUC.

California Officials Have Directed Utilities to Complete AB 1632 Studies

- The CEC and the CPUC in 2009 directed the utilities to complete the AB 1632 Report recommended studies and that the study findings can be included in plant license renewal reviews.
- In late 2009, PG&E filed for Diablo Canyon's license renewal before completing these studies.
- The California Coastal Commission (CCC) informed PG&E (Dec. 2009) and the NRC (March 2010) that results from the AB 1632 seismic studies are needed to complete the CCC's federal consistency review for Diablo Canyon's license renewal and review PG&E's application for a coastal development permit.

California Officials Want Advanced Seismic Studies for Diablo Canyon

- Local, state and federal California officials have called for the utilities' completing the advanced seismic studies. They include: California State Senator Sam Blakeslee, Congresswoman Lois Capps, the California Energy Commission, the CPUC, the California Coastal Commission, and the County Boards of Supervisors for Santa Barbara and San Luis Obispo.

- All have called for PG&E to complete advanced seismic studies for Diablo Canyon and that findings from these studies be considered during license renewal reviews.

Funding Status for Seismic Studies

- CPUC in 2010 approved ratepayer funds ($16.7 million) for PG&E's advanced seismic studies for Diablo Canyon and established an Independent Peer Review Panel to review the study's plans and findings.

- The panel includes scientists including geologists and seismologists from the CA Geologic Survey, the CA Seismic Safety Commission, the CA Coastal Commission, Cal EMA, the Energy Commission, and the CPUC.

- SCE has applied to the CPUC for funds for advanced seismic studies.

Events at Fukushima Daiichi

- The Great East Japan Earthquake (9.0 magnitude) and the following 45-foot high tsunami in March 2011 exceeded the Fukushima Daiichi Nuclear Power Plant's design.
- Japanese workers responded heroically to the nuclear accident at Fukushima.
- Cooling was lost to Units 1, 2, and 3, resulting in damage to the spent fuel. Units 1, 2, 3 and 4 had explosions, damaging primary and secondary containment. These units have yet to achieve a stable, cold shutdown condition.
- These events have greatly increased the importance of completing California plants' advanced seismic hazard/vulnerability studies.

Summary

- For decades, seismic issues have been a major concern for Diablo Canyon, San Onofre and Humboldt Bay.
- Advanced seismic hazard/vulnerability studies for these plants are important in light of recent events at Fukushima Daiichi, major seismic uncertainties for these sites, and new seismic information available since these plants were licensed.
- California federal, state and local officials have called for the utilities completing these advanced seismic studies and have them independently peer reviewed and made part of plant license renewal reviews. In addition, PG&E and SCE should implement the other AB 1632 Report recommendations, including reassessing the adequacy of emergency plans and addressing spent fuel pool concerns.

Conclusion

- An old Japanese saying----
  “Onko-chishin” or “Learn a lesson from the past.”
  温故知新

To Request Further Information

- To obtain copies of the Energy Commission's reports on nuclear power in California (2005, 2007) and the 2005, 2007, 2008 and 2009 Integrated Energy Policy Reports or the AB 1632 assessment reports please visit our web sites at:

  www.energy.state.ca.gov/nuclear/index.html

  www.energy.state.ca.gov/ab1632/index.html

- For questions, contact: bbyron@energy.state.ca.us