

CALIFORNIA ENERGY COMMISSION1516 Ninth Street
Sacramento, California 95814Main website: www.energy.ca.gov

In the matter of,) Docket No. 11-IEP-1J
)
 Preparation of the) COMMITTEE WORKSHOP
 2011 Integrated Energy Policy Report) RE: California Nuclear Power Plant
 (2011 IEPR)) Issues

Committee Workshop on California Nuclear Power Plant Issues

DOCKET	
11-IEP-1J	
DATE	<u>July 12 2011</u>
RECD.	<u>July 12 2011</u>

The California Energy Commission's 2011 Integrated Energy Policy Report (IEPR) Committee will conduct a workshop to review California utilities' progress in completing studies and actions recommended by the Energy Commission and directives by the California Public Utilities Commission (CPUC) during ongoing and future plant license renewal evaluations for Diablo Canyon and the San Onofre Nuclear Generating Station (SONGS). The workshop will also discuss uncertainties about seismic and tsunami hazards at Diablo and SONGS along with the environmental, safety, and economic implications of recent events at the Fukushima Daiichi nuclear power plant in Japan.

Chair Robert Weisenmiller is the Presiding Member of the IEPR Committee and Commissioner Karen Douglas is the Associate Member. Vice-Chair Jim Boyd is the State Liaison Officer to the U.S. Nuclear Regulatory Commission and will participate in this workshop. Commissioners and staff from the CPUC may also attend and participate.

TUESDAY, JULY 26, 2011
 Beginning at 10 a.m.
 CALIFORNIA ENERGY COMMISSION
 1516 Ninth Street
 First Floor, Hearing Room A
 Sacramento, California
 (Wheelchair Accessible)

Remote Attendance and Availability of Documents

Internet Webcast - Presentations and audio from the meeting will be broadcast via our WebEx web meeting service. For details on how to participate via WebEx, please see the "Remote Attendance" section toward the end of this notice.

Documents and presentations for this meeting will be available online at:

[www.energy.ca.gov/2011_energy_policy/index.html]

Purpose

The Committee is seeking public comment on issues related to the (1) progress of the California utilities in completing the studies directed by the *2008 IEPR Update* and *2009 IEPR* and the CPUC and determining how these studies can be completed, independently peer reviewed, and made available in a timely manner for consideration during ongoing and future Diablo Canyon's and SONGS' plant license renewal evaluations, (2) major scientific uncertainties regarding the seismic/tsunami hazards and plant vulnerabilities for these facilities, and (3) the implications for these plants from recent events at the Fukushima Daiichi nuclear power plant following the March 11, 2011 earthquake and tsunami. To maximize the value of this effort, a list of "Key Questions" is provided to focus, but not limit, the discussion. Policies and issues discussed in this workshop will be used to inform the development of the Energy Commission's *2011 IEPR* and associated energy policy recommendations.

Background

The Energy Commission prepares an IEPR every two years, with an update in the off years. The IEPR identifies future statewide energy needs, assesses the major energy trends and issues facing the state, and uses these results to recommend energy policies that balance broad public interests to conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety.

As part of the *2008 IEPR Update*, the Energy Commission and its consultant MRW & Associates completed a two-year comprehensive study of the Diablo Canyon Nuclear Plant and SONGS as required by Assembly Bill 1632 (Blakeslee, Chapter 722, Statutes of 2006).¹ This study examined the vulnerability of these plants to a major disruption from an earthquake or plant aging, the impacts from such a disruption, and the costs and impacts of the accumulating waste at these plants. The Energy Commission adopted *An Assessment of California's Nuclear Power Plants: AB 1632 Report* and recommended that Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE) complete additional studies and follow-up actions in subsequent IEPRs.

The Energy Commission is examining the progress utilities have made in completing these follow-up actions and studies, particularly the three-dimensional geophysical seismic imaging studies, and making this information available for consideration during federal and state evaluations of ongoing and future license renewal applications for Diablo Canyon and SONGS. This information is needed to assess the costs and benefits of extending the operating licenses for these plants. SONGS' operating license expires in 2022 and Diablo Canyon's license expires in 2024 (Unit 1) and 2025 (Unit 2).

¹ California Energy Commission, *An Assessment of California's Nuclear Power Plants: AB 1632 Report*, November 2008, [<http://www.energy.ca.gov/2008publications/CEC-100-2008-009/CEC-100-2008-009-CMF.PDF>]

The Energy Commission will also examine some of the major environmental, safety, and economic implications for California's nuclear power plants resulting from recent events at the Fukushima Daiichi Plant in Japan. The Fukushima Daiichi plant was scheduled to shut down in 2011, but was granted a 10-year license extension in February 2011. After the March 11, 2011 earthquake and tsunami, unanticipated problems such as the loss of emergency power and cooling led to severe consequences at the plant and widespread radioactive contamination.

Over the past few decades, significant concerns have been raised about earthquake and tsunami hazards for Diablo Canyon, SONGS, and the decommissioned Humboldt Bay reactor. These plants are located in the highest seismic risk areas for U.S. nuclear power plants. The Hosgri Fault is located only 3 miles offshore from Diablo Canyon. Its discovery while the plant was under construction resulted in construction costs exceeding the initial \$320 million estimate (1968 dollars) by more than \$5 billion primarily due to required seismic upgrades. In 2008, the U.S. Geological Survey (USGS) discovered a major new offshore fault – the Shoreline Fault – less than a mile from Diablo Canyon. The Energy Commission's 2008 study concluded that important data on seismic and tsunami hazard and plant vulnerabilities at Diablo Canyon and SONGS are incomplete and that advanced three-dimensional geophysical seismic reflection mapping and other advanced technologies used for oil and gas exploration could help resolve questions about the nature of the seismic hazard for both plants.

The 9.0 magnitude earthquake in Japan on March 11 and the resulting tsunami greatly exceeded the Fukushima Daiichi plant's design (7.9 magnitude) earthquake and tsunami predictions. Problems like the loss of spent fuel cooling from the failure of backup emergency power, called a "station blackout," have raised questions about the risk of spent fuel pools overheating and reactor core meltdown at U.S. reactors and the adequacy of emergency measures for dealing with such emergencies. Analyses that are underway on the lessons to be learned from the Fukushima Daiichi plant accident will be important in determining measures and equipment that might be necessary to ensure that U.S. plants are not susceptible to conditions and events similar to those that occurred in Japan. Like the Fukushima plant, California's plants are old plants with significant inventories of spent nuclear fuel located on the coast near major earthquake faults.

Written Comments

Written comments on the meeting topics must be submitted by **5 p.m.** on August 2, 2011. Please include the docket number 11-IEP-1J and indicate "California Nuclear Power Plant Issues" in the subject line or first paragraph of your comments.

All filings in the IEPR proceeding may now be done electronically. Please send your comments in either Microsoft Word format or as a Portable Document File (PDF) by electronic mail to [docket@energy.state.ca.us] and copy the technical lead staff at [bbyron@energy.state.ca.us] or send them on a Compact Disc to:

California Energy Commission
Dockets Office, MS-4
Re: Docket No. 11-IEP-1J
1516 Ninth Street
Sacramento, CA 95814-5512

Please include your name or organization's in the name of the file. Signatures may be indicated on electronic copies by embedding a scanned signature graphic, "Original signed by" or similar words, or a scanned copy of the signature page may be appended to the electronic file.

A hardcopy original may also be submitted to the Dockets Office during the workshop comment window. All written materials relating to this workshop will be filed with the Dockets Office and become part of the public record in this proceeding. Key issues and questions for the workshop are in Attachment A.

Public Participation

The Energy Commission's Public Adviser's Office provides the public assistance in participating in Energy Commission activities. If you want information on how to participate in this forum, please contact the Public Adviser's Office at (916) 654-4489 or toll free at (800) 822-6228, by FAX at (916) 654-4493, or by e-mail at [PublicAdviser@energy.state.ca.us] If you have a disability and require assistance to participate, please contact Lou Quiroz at (916) 654-5146 at least five days in advance.

Please direct all news media inquiries to the Media and Public Communications Office at (916) 654-4989, or by e-mail at [mediaoffice@energy.state.ca.us].

If you have questions on the technical subject matter of this meeting, please contact Barbara Byron, Senior Nuclear Policy Advisor, 916-654-4976 or [bbyron@energy.state.ca.us]. For general questions regarding the IEPR proceeding, please contact Lynette Green, IEPR project manager, at (916) 653-2728 or by e-mail at [lesterno@energy.state.ca.us].

The service list for the 2011 *IEPR* is handled electronically. Notices and documents for this proceeding are posted to the Energy Commission website at [www.energy.ca.gov/2011_energypolicy/index.html]. When new information is posted, an e-mail will be sent to those on the energy policy e-mail list server. We encourage those who are interested in receiving these notices to sign up for the list server at [www.energy.ca.gov/listservers/index.html].

Remote Attendance

You can participate in this meeting through WebEx, the Energy Commission's online meeting service. Presentations will appear on your computer screen, and you listen to the audio via your telephone. Please be aware that the meeting's WebEx audio and on-screen activity may be recorded.

Computer Log-on with Telephone Audio:

1. Please go to [<https://energy.webex.com>] and enter the unique meeting number: **923 884 546**
2. When prompted, enter your name other information as directed and the meeting password: **meeting@10** (Please note that password is case sensitive.)

Teleconference:

After logging in on the computer, an AUDIO CONFERENCE BOX will offer you the choice of phone connections:

1. TO HAVE WEBEX CALL YOU BACK: Type your area code and phone number and click "Call Me".
2. TO CALL INTO THE TELECONFERENCE: Use the drop-down box to select "I will call in" and follow the on-screen directions.
3. INTERNATIONAL CALLERS: Click on the "Global call-in number" link in part (2) above
4. TO LISTEN OVER THE COMPUTER: If you have the needed equipment and your computer is configured, click on "Use Computer Headset" and then "Call Using Computer" to use VoIP (Internet phone)

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If you have difficulty joining the meeting, please call the WebEx Technical Support number at 1-866-229-3239.

Date: July 12, 2011

ROBERT B. WEISENMILLER
Chair and Presiding Member
Integrated Energy Policy Report Committee

KAREN DOUGLAS
Commissioner and Associate Member
Integrated Energy Policy Report Committee

JAMES D. BOYD
Vice Chair and State Liaison Officer
U.S. Nuclear Regulatory Commission

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ATTACHMENT A

KEY ISSUES AND QUESTIONS FOR THE WORKSHOP

The following questions will provide the framework for discussions at the workshop. Participants may respond to these questions in oral or written comments. Policies and issues discussed in the workshop will inform the development of the Energy Commission's 2011 IEPR and associated energy policy recommendations to the Governor and the Legislature.

1. **Seismic/Tsunami Scenarios and Uncertainties for Diablo Canyon, SONGS and Humboldt Bay**

- a. What is the current understanding of the major onshore and offshore fault systems and the largest magnitude tsunamis, earthquakes, and ground shaking potential calculated at or near Diablo Canyon, SONGS and Humboldt Bay for these facilities in relation to their existing plant or Independent Spent Fuel Storage Installation design?
- b. The Tohoku earthquake and tsunami in Japan on March 11 greatly exceeded Japan's predictions and design for the Fukushima Daiichi plant with catastrophic results. What are the significant areas of uncertainty associated with earthquake/tsunami predictions for Diablo Canyon, SONGS, and Humboldt Bay, and what studies or mitigating activities are underway to address these uncertainties?
- c. A recent USGS study in April 2011 concluded that, "There's no objective evidence for any discontinuities or segmentation of the Shoreline Fault," in contrast to PG&E's conclusion in January 2011 the Shoreline Fault is segmented. An important "unanticipated" phenomenon in relation to the Mw 9.0 earthquake in Japan was that five segments along the subduction zone ruptured together, rather than independently as scientists had earlier predicted. What are the expected consequences of the assumptions regarding segmentation versus non-segmentation of the Shoreline Fault when estimating earthquake potential?

2. **Progress in Completing the AB 1632 Report/2008 IEPR and 2009 IEPR Recommendations for Plant License Renewal Reviews**

- a. What is the status of PG&E and SCE's completion of recommendations in the AB 1632 Report, 2008 IEPR Update and 2009 IEPR including studies and actions related to seismic and tsunami hazards, plant buildings and structures, spent fuel storage, quantifying replacement power options, and reassessing the adequacy of access roads surrounding the plants?
- b. How will PG&E and SCE ensure that these additional seismic analyses reflect the most recent USGS and Uniform California Earthquake Rupture Forecast data base and 2-D imaging study results, that the study plans and findings are provided in a timely manner to the California Geologic Survey (CGS) and the Independent Peer Review Panel (IPRP) for review, and that the study

plans and analyses will take into consideration the CGS' and the IPRP's comments and recommendations?²

- c. How will these studies be provided in a timely manner to the U.S. Nuclear Regulatory Commission (NRC) and California agencies, e.g., the Energy Commission, CPUC, CGS, and the California Coastal Commission (CCC), so that these studies can be considered as part of Diablo Canyon's and SONGS' ongoing and future license renewal cost/benefit evaluations and the CCC's evaluation of consistency of the projects with the Coastal Zone Management Act?
- d. The National Academies in 2006 reported on the risk of fire from overheated spent fuel rods in spent fuel pools. The *2008 IEPR Update* recommended that California's nuclear power plants return their spent fuel pools to less dense arrangements. Fires were reported in the spent fuel pools at Fukushima Daiichi. Nuclear plants are storing spent fuel in pools in configurations at far greater densities than the original plant design. What progress has been made in returning the spent fuel pools to less dense arrangements? If no action has been taken to modify the spent fuel pool racking to a less dense configuration, please explain why.

3. Implications of Events at the Fukushima Daiichi Plant for California's Operating Nuclear Plants

- a. Should older nuclear power plants, particularly in high seismic hazard areas, be held to more stringent standards during plant license renewal reviews than are applied to new reactors, based on insights from the Fukushima Daiichi plant disaster?
- b. Extreme events have been considered so highly unlikely at U.S. nuclear plants that they are covered by voluntary "severe accident management guidelines" to plant operators rather than mandatory actions. NRC plant inspections in March revealed failures at some plants to keep these emergency guidelines and training up-to-date. Are current federal rules for "beyond design basis events" adequate or should they be changed?
- c. How is the possibility of extreme events affecting multiple reactors at a single site or multiple threats to nuclear plants, such as a fire and an earthquake, or flooding and an earthquake, that cut off power for a plant's emergency equipment and spent fuel cooling handled at Diablo Canyon and SONGS?
- d. How do the original seismic and tsunami design requirements and expected ground motions for Fukushima Daiichi compare with the observed shaking and tsunami impacts following the Tohoku earthquake and tsunami? In light of the findings about the Tohoku Earthquake event, what studies are

² The CPUC established and provided funding for the Independent Peer Review Panel in 2010 to review PG&E's advanced seismic study plans and research findings for Diablo Canyon. The IPRP consists of senior technical staff from the California Geologic Survey, California Coastal Commission, California Seismic Safety Commission and the California Energy Commission.

- underway at Diablo Canyon, SONGS and Humboldt Bay to validate the data and parameters for the predicted seismic/tsunami hazards for these California plants?
- e. The Fukushima Daiichi crisis was significantly worsened by having multiple damaged reactors in close proximity in the same area, radiation levels too high to allow workers safe access to crucial equipment, hydrogen explosions, inability to assess real-time reactor and spent fuel pool conditions, and losing emergency diesel generators and batteries and spent fuel cooling. What should be done or has been done to avoid and mitigate similar conditions and problems at Diablo Canyon and SONGS?
 - f. What are some of the likely major environmental, safety and economic implications for Diablo Canyon, SONGS, and Humboldt Bay from the lessons learned reviews following events in Japan by the NRC, International Atomic Energy Agency, Institute of Nuclear Power Operations and others? For example, what are the likely impacts on spent fuel pool management, preparing for beyond design basis threats, the estimated costs for new and existing nuclear power plants, license renewal reviews, plans for providing back-up emergency power and water cooling for reactor cores and spent fuel pools, and protection from hydrogen explosions?
 - g. What are the areas of uncertainty regarding the condition of the spent fuel and packaging after decades of storage at a reactor site before being transported offsite to a storage or disposal facility? What are the intergenerational equity considerations (net risks and benefits) of extended spent fuel storage at reactor sites, e.g., decades or up to 100 years, prior to transport offsite for storage or permanent disposal?
 - h. What are some of the recommendations to reduce the likelihood of and mitigate potential station blackouts (loss of offsite power and onsite emergency power) and loss of cooling lasting longer than plant design assumptions? The practice of providing four- and eight-hour batteries assumes that outside power can be promptly restored. Please describe the plans and preparation for an extended station blackout and/or loss of emergency cooling, regardless of the initiating event, at Diablo Canyon and SONGS.
 - i. The Kashiwazaki-Kariwa plant in Japan was badly damaged in 2007 and four years later, three of the seven reactors remain offline with cumulative energy replacement costs estimated to be in the billions of dollars. Most, if not all, of the six reactors at the Fukushima Daiichi plant will never resume operation. What are the California utilities' plans for replacement power if there are any significant long-term outages at Diablo Canyon and SONGS?
 - j. Tokyo Electric Power likely will face billions of dollars in compensation and mitigation costs following the Fukushima nuclear plant accident. If a similar crisis were to occur at Diablo Canyon or SONGS, what is the available liability coverage in the U.S. and who likely would be ultimately responsible for covering these costs?

- k. Given NRC's recommended evacuation zone of a 50-mile radius surrounding the Fukushima Daiichi plant, are current emergency plans and emergency planning zones, adequate for Diablo Canyon and SONGS?