BEFORE THE
CALIFORNIA ENERGY COMMISSION (CEC)

In the matter of	)	
	)	Docket No. 13-IEP-1J
2013 Integrated Energy	)	
Policy Report	)	Workshop Re: California
(2013 IEPR)	)	Nuclear Power Plant Issues

LEAD COMMISSIONER WORKSHOP
ON
CALIFORNIA NUCLEAR POWER PLANT ISSUES

California Energy Commission
Hearing Room A
1516 9th Street
Sacramento, California

Wednesday, June 19, 2013
9:30 A.M.

Reported by:
Peter Petty

APPEARANCES

COMMISSIONERS PRESENT

Andrew McAllister, Lead Commissioner 2013
Robert B. Weisenmiller

ALSO PRESENT AT DAIS

Michael P. Florio, CPUC

STAFF PRESENT

Suzanne Korosec, IEPR Lead
Joan Walter

PANELISTS AND PRESENTERS

Panel 1

Mark Nelson, Southern California Edison (SCE)
Caroline McAndrews, SCE
Stu Nishenko, Pacific Gas & Electric (PG&E)
Jearl Strickland, PG&E

Panel 2

Clifford Munson, USNRC
Chris Wills, California Geologic Survey and IPRP/IPRG Chair
Jeanne Hardebeck, USGS

Panel 3

David L. Skeen, USNRC
John Geesman, Alliance for Nuclear Responsibility
Peter Lam, DCISC Chairman and Author
Walter Horsting, Business Development International
Kendra Ulrich, Friends of the Earth (FOE)
Rochelle Becker, Alliance for Nuclear Responsibility (A4NR)

Also Present (* by phone)

Public Comment

Ray Lutz, Citizens' Oversight Projects (COPs) dba
Coalition to Decommission San Onofre
Bruce Gibson, Supervisor District Two, County of
San Luis Obispo

Public Comment (Continued)

Ray Lutz, Citizens' Oversight Projects (COPs) dba
Coalition to Decommission San Onofre
Bruce Gibson, Supervisor District Two, County of
San Luis Obispo
Ben Davis, California Nuclear Initiative
David Weisman, A4NR
Martha Sullivan, Coalition to Decommission San Onofre
Barbara George
Donna Gilmore
Bruce Campbell
J. A. Savage, *California Current*

INDEX

	PAGE
Welcome and Introductions	
Commissioner Andrew McAllister, IEPR Lead Commissioner	
Chair Robert B. Weisenmiller, State Liaison Officer to the U.S. NRC	
Commissioner Michel Peter Florio, Public Utilities Commission	
Suzanne Korosec, IEPR Lead	6
Workshop Overview	
Joan Walter, Energy Commission	6
Special Report: Briefing on San Onofre Nuclear Generating Station Retirement Plans	
Mark Nelson, SCE	11
Panel 1 Discussion: Progress in Implementing AB1632 Report/ 2008 IEPR and 2011 IEPR Nuclear Policy Recommendations	
Mark Nelson/Caroline McAndrews, SCE	29
Stu Nishenko/Jearl Strickland, PG&E	35
Panel 2 Discussion: Seismic Hazard Analysis Updates: NRC SSHAC Level 3 Workshop Process; Update on State review of Seismic Research Projects; Uncertainties and Implications for California Nuclear Power Plants	
Clifford Munson, NRC	78
Chris Wills, California Geologic Survey and PRP/IPRG	96
Jeanne Hardebeck, USGS	113

INDEX (Contin.)

	PAGE
Panel 3 Discussion: Update on Fukushima Lessons Learned; Economic Considerations; Consequences of Nuclear Accidents	
David L. Skeen, NRC	135
Lessons Learned from the Fukushima Accident - Status and Path Forward	
Jearl Strickland, PG&E	164
Update on Status and Costs at Diablo Canyon	
John Geesman, Alliance for Nuclear Responsibility Economic Considerations	187
Peter Lam, DCISC Chairman and Author Severe Nuclear Accidents: Causes and Consequences	204
Break	
Special Report	
Walter Horsting, Business Development International Thorium Molten Salt Reactors	222
Panel 4 Discussion: Public Interest Panel Discussion	
Kendra Ulrich/Shaun Burnie, Friends of the Earth (FOE)	230
Rochelle Becker, Alliance for Nuclear Responsibility (A4NR)	239
Public Comments	71, 244
Adjournment	273
Reporter's Certificate	274
Transcriber's Certificate	275

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1 P R O C E E D I N G S

2 JUNE 19, 2013 9:30 A.M.

3 [Meeting already in progress]

4 MS. KOROSEC: Our first speaker is Joan

5 Walter, who is the Energy Commission's Senior

6 Nuclear Policy Analyst.

7 MS. WALTER: Good morning, Commissioners,

8 presenters, and everyone in the audience and

9 everybody listening remotely. I'm Joan Walter,

10 the Nuclear Policy Advisor with the California

11 Energy Commission. I'd like to thank everyone

12 for coming here today to participate in this

13 workshop and to discuss these important issues

14 relating to Nuclear Power in California.

15 Before we begin with our panels, I'd like

16 to provide a little background on the AB 1632

17 Report and the context for today's workshop.

18 As of 2011, California had two operating

19 nuclear power plants, Diablo Canyon located north

20 of Avila Beach in San Luis Obispo County, and San

21 Onofre Nuclear Generating Station, located south

22 of San Clemente in San Diego County. As most of

23 you are aware, just last month Southern

24 California Edison announced plans for the

25 permanent closure of San Onofre. We will have an

1 update from Southern California Edison on their
2 closure plans in our first special report.
3 California has a long history of seismic
4 concerns related to the operation of Diablo
5 Canyon and San Onofre. The state has completed a
6 number of reports that recommend actions to
7 address these concerns. Additionally, as a
8 result of the Fukushima nuclear disaster, new
9 recommendations for enhancing U.S. nuclear power
10 plant safety have been put in place by the
11 Nuclear Regulatory Commission. Panel 1 of this
12 workshop provides an opportunity for the
13 utilities to give us updates on their progress in
14 implementing some of these recommendations.
15 Panel 2 will include updates on seismic
16 hazard analyses, state review of seismic research
17 projects, and presentations on continued seismic
18 uncertainties along the central coast and their
19 implications for Diablo Canyon.
20 Panel 3 will include the status and path
21 forward for Fukushima lessons learned from the
22 NRC, discussions of economic considerations for
23 both internal and external, and a look at the
24 causes and consequences of nuclear accidents.
25 And finally, the last portion of the

1 workshop will provide an opportunity to look at
2 different perspectives on nuclear power such as
3 our second special report on Thorium Molten Salt
4 Reactors, and our final panel made up of
5 representatives of public interest groups with
6 their perspective on issues related to nuclear
7 power.
8 Assembly Bill 1632 was signed into law in
9 2006 and it directed the Energy Commission to
10 assess the potential vulnerability of
11 California's large-based load plants, that is,
12 Diablo Canyon and San Onofre, to a major
13 disruption from a seismic event or a plant aging,
14 and to adopt that assessment as part of the
15 Energy Commission's Integrated Energy Policy
16 Report, or IEPR.
17 The AB 1632 Report was adopted in
18 November of 2008 and the recommendations from the
19 report were incorporated into the 2008 IEPR.
20 Concurrent with the adoption of the AB 1632
21 report, PG&E announced the discovery of a
22 previously unknown fault, the Shoreline Fault
23 less than a mile from Diablo Canyon.
24 PG&E and the NRC have since concluded
25 that Diablo Canyon's design would withstand

1 potential ground motions from this fault,
2 however, the fault's major characteristics are
3 still largely unknown. We will receive more
4 information on this in our second panel from Dr.
5 Jeanne Hardebeck who discovered the shoreline
6 problem.
7 The United States does not currently have
8 a facility for the permanent disposal of the
9 spent nuclear fuel. Because of this, power
10 plants across the country, including Diablo
11 Canyon and San Onofre, have had to store the
12 spent nuclear fuel they've generated at the plant
13 until a permanent repository is approved by the
14 Federal Government.
15 The AB 1632 report identified that the
16 spent fuel pools at San Onofre and Diablo Canyon
17 have been re-racked to increase storage
18 capability by placing the fuel assemblies closer
19 together. While in conformance with NRC
20 Regulations, more densely configured spent fuel
21 pools are considered to have a greater risk than
22 those with a more open racking arrangement.
23 The 2008 IEPR recommended, among other
24 things, that further studies should be completed
25 using advanced technology to help resolve

1 remaining seismic uncertainties and that the
2 utilities should return their spent fuel pools to
3 open racking arrangements as soon as feasible.
4 However, in 2011, both PG&E and Southern
5 California Edison reported that the inventory of
6 spent pool assemblies stored in the pools have
7 not been returned to open racking. For San
8 Onofre, Southern California Edison reported the
9 inventory of the spent fuel pools to be almost
10 double the original design capacity and, for
11 Diablo Canyon, PG&E reported the inventory to be
12 roughly four times the original design capacity.
13 Furthermore, if Diablo Canyon is relicensed, PG&E
14 plans to store the fuel assemblies generated
15 through the licensing period in the spent fuel
16 pools which would maintain close to the 2011
17 inventory level of four times the original design
18 capacity.
19 We will be provided with a lot more
20 information about these important issues from
21 each of our distinguished presenters. So without
22 further delay, let's begin with our special
23 report from Mark Nelson, Director of Integrated
24 Planning and Strategy for Southern California
25 Edison on the status of San Onofre Nuclear

1 Generating Station.

2 MR. NELSON: Good morning, IEPR Lead,

3 Commissioner McAllister, Chairman Weisenmiller,

4 and Commissioner Florio. I have with me Caroline

5 McAndrews, who is director of Strategic Projects

6 for San Onofre, so she is from the site and she

7 can handle the hard questions.

8 My name is Mark Nelson and I am the

9 Director of Integrated Planning for Edison. And

10 now we're going to see if we can use technology

11 and make this thing move.

12 Very good. I think we're in the wrong

13 presentation, though. I guess we can start here,

14 that's fine.

15 MS. KOROSEC: When you say the other

16 presentation, Mark, I'm sorry, which one did you

17 mean?

18 MR. NELSON: The other SCE presentation,

19 please, it would be the briefing on the

20 Retirement Plans. Okay, thanks very much.

21 All right, we've conquered the

22 technology, thank you. So as announced on June

23 7th, we have stopped operations and retired both

24 Unit 2 and Unit 3, we have sent the Certification

25 of Permit Cessation to the NRC, and I'm sure that

1 Chairman Weisenmiller has received that. And
2 planning is underway now for permanent shutdown
3 of the related activities and decommissioning.
4 As you can imagine, it's a long and complex
5 activity and will take some time to get the
6 planning fully understood and get the planning
7 reports to the NRC.
8 Units 2 and 3 ran for about 30 years,
9 obviously with the support of many dedicated
10 employees who we're now going to treat very
11 fairly as we downsize and stop operations at the
12 plant. And it simply became a case where, as our
13 Chairman, Ted Craver said, the continuing
14 uncertainty of getting restarted was so large and
15 we just couldn't overcome that and the odds of a
16 by end of year restart where thought to be 50/50
17 or less, so the decision was made to go ahead and
18 retire the plant.
19 So obviously we will still take nuclear
20 safety as the number one activity on the site as
21 we continue working. The key issues will be
22 decommissioning, reduction in staff, and choosing
23 appropriate staff to continue moving forward with
24 the decommissioning, the storage of used fuel,
25 the seismic issues, and then once-through

1 cooling. And I'd like to talk at the end of this
2 presentation a little bit about issues that
3 Chairman Weisenmiller just brought up in terms of
4 what we do to keep the grid reliable in the short
5 run and in the long run for Southern California.
6 So looking at decommissioning first, it
7 will be a long process, it's expected that the
8 planning will occur and then work will occur on
9 radiological material, which will be put in the
10 dry cask storage. This is all to be funded by
11 the decommissioning trust, the current trust
12 balance is $2.7 billion for SCE. We are
13 continuing to evaluate both the cost of
14 decommissioning and the timing of
15 decommissioning, as well, whether perhaps it can
16 be accelerated.
17 Staffing at the plant is currently at
18 about 1,500 employees and that will be reduced to
19 400, that will obviously not all be done at once,
20 but it will be done across the next year. We
21 will be working through, again, the employee
22 issues and treating the employees fairly. In
23 some cases, we have Union contracts, so we'll
24 have to do the negotiations there, as well. So
25 it will be quite an effort, but again our number

1 one objective with the employees is they've been
2 fair to us, they've been dedicated employees, and
3 we're going to treat them fairly, as well.
4 Looking at the used fuel storage onsite,
5 there are currently about 2,400 assemblies in the
6 fuel pools and wet storage, there are about 800
7 assemblies that are currently already in dry cask
8 storage. So roughly speaking, we're going to
9 have to triple the size of the dry storage in
10 order to eventually get everything out of wet
11 storage. We will be defueling Unit 2 in July,
12 Unit 3 was already defueled, so that activity
13 should be done approximately -- it should take
14 less than a month, so I would assume we would be
15 done toward the end of July. And then, over the
16 next seven to 12 years, and they're in the
17 process of analyzing that, obviously, as part of
18 decommissioning, that fuel would then be moved to
19 canisters and put into ISFSIs, or the bunkers
20 that hold the canisters. In this case, the ISFSI
21 will also need to be built, so, again, we need to
22 roughly speaking triple our current storage.
23 COMMISSIONER MCALLISTER: Just a quick
24 question. Do you know or anticipate where those
25 dry cask storage facilities -- ISFSI, it would be

great to have that spelling, I'm sure the Court Reporter will need that -- but I guess do you sort of have an idea of the long term where those things will likely sit?

MS. MCANDREWS: Currently the location of our interim spent fuel storage assembly units, they are onsite in our north industrial area where the old Unit 1 was, and there is sufficient room to store all of this fuel there, too.

COMMISSIONER MCALLISTER: Okay, that was my next question, great. Thank you.

MR. NELSON: As the CEC is well aware, and the PUC has funded, we've had seismic activity underway. This activity was part of the reliability evaluation that was called for in AB 1632. We're currently evaluating the seismic activities that are underway, but it's unlikely at this point that they would be needed for nuclear NRC 50.54(f) activity, so, again, we're analyzing them. It's likely that those activities would be terminated. We do have an amount of seismic data that's been collected and the question then is of analysis. So we will continue to work through those issues, but, again, we're looking at it very closely and also

1 assessing what the impact of that work and that
2 data would be on used fuel storage. So, again,
3 that work is underway, but at this point we
4 believe at least speculatively that we probably
5 don't need to continue for NRC requirements.
6 The plant was obviously once-through
7 cooled. There was a study underway, the OTC
8 Nuclear Special Study at the State Water
9 Resources Control Board, with the intent of
10 determining whether on a go forward basis, after
11 2022, which was our shutdown date, end of
12 original license, if we would need to find an
13 alternate cooling from once-through cooling. So
14 at this point, since the plant will not be
15 operating, we believe that there's no need for
16 those studies, we will be talking to the State
17 Water Resources Control Board about it.
18 Additionally, the flows have been reduced
19 and at this point only about 25 percent of the
20 prior flow is required for the used fuel cooling,
21 and there may be some need for cooling water
22 during decommissioning, but again, that's an
23 issue that we will work in decommissioning
24 planning, so we'll determine what to do with that
25 and where that goes, and we will be working with

1 the Water Resources Control Board.
2 Moving on to reliability, obviously since
3 the event last January, we have been working hard
4 on short term reliability, we've been working
5 with CAISO, the PUC, the Governor's Office, and
6 we've put in a number of near term fixes, there's
7 only a limited amount of things you can do in the
8 short term. They tend to be centered around
9 Demand Response, they are centered around
10 reconfiguration of transmission, addition of
11 capacitor banks in order to add more reactive
12 power to the system, so, again, there's only a
13 sort of finite amount of short term activity that
14 you can take. Last summer, we didn't have any
15 outages, last summer we had a fairly significant
16 under voltage load shedding scheme, both for SCE
17 and I believe San Diego had a remedial action
18 scheme, and that was in the event that there was,
19 say, a fire under a power line is probably one of
20 the best ways to describe it, more multiple
21 generating plants out. So we didn't have any
22 incidents last year. This summer is a little bit
23 different. We do not have Huntington Beach 3 and
24 4 operating as generators. They will hopefully
25 be operating this summer as synchronous

1 condensers, which means that they consume power
2 rather than provide power, but they do provide
3 reactive power for voltage stability. So again,
4 margins are tight this summer. Under normal
5 conditions, we should get through summer. Under
6 extraordinary conditions, fires, etc., then we're
7 more exposed to potential outages.
8 Looking at the longer term, the service
9 territory for Southern California Edison was
10 largely built to be served by coastal power
11 plants, so as a result the transmission grid
12 tends to run from the coast toward inland, so it
13 was feeding, if you will, essentially coastal to
14 the east. So with the once-through cooling
15 retirements from the Water Resources Control
16 Board policy, most of those retirements in the LA
17 Basin and the LA area would take place in 2020.
18 The Water Resources Control Board has in fact
19 indicated flexibility for system reliability
20 purposes, so we recognize that, but in general we
21 would be looking to retire about 6,500 megawatts.
22 And with SONGS retirement, that puts roughly an
23 8,800 megawatt hole in our resources in the
24 Basin, so it's a significantly different grid
25 than what we had seen before. And there is a

1 fair amount of work going on obviously with the
2 CAISO, in the CPUC's LTTP, and we are currently
3 preparing for solicitations for fossil generation
4 preferred resources as part of this current LTTP.
5 Some challenging issues we may face would
6 be some of the 220 system in the Basin may
7 conceivably need to be upgraded to 500, 500 kV is
8 a bigger, taller footprint, so that is a
9 challenge. Some of the prior coastal units, the
10 once-through cooled units, may face fairly stiff
11 opposition being repowered, so that's a battle
12 that has yet to be seen, but one of the local
13 communities has already attempted but not
14 succeeded, but only by a handful of votes in
15 changing the zoning of the Redondo Generating
16 Station. So, again, we would anticipate that
17 there may be challenges there.
18 And it's interesting, I see it as a non-
19 attainment area, I guess now what I'm hearing is
20 that AQMD has had EPA declare that LA is in
21 attainment for PM10, Federally at least. But in
22 any event, AQMD Rule 1304 would be the operant
23 rule that would allow for repowering of coastal
24 units, and if either additional power is needed,
25 there wouldn't be sort of a path to offsets, or

at least not a well understood one at this point, and it also somewhat limits the location without commercial transactions to the AES sites, the coastal sites, because they are currently the holders of what would be the 1304. So again, there are challenges in the Basin, I think they're reasonably well understood, and we're moving forward on them.

So to solve this, we want to move first to a very aggressive use of preferred resources, and I think this will put us not only in a leadership position, but perhaps in a position of unknowns. As we move forward, we're anticipating using a pilot and we have dubbed it a living pilot because it's not really a pilot where we want to start it, stop it, evaluate it, then move on, it's really a pilot where we want to learn throughout the pilot what does it take to get higher saturations of demand response and energy efficiency, how do you do that? How do you get better customer acceptance? If you put DG, think Solar PV on the lines, what happens at high saturations? How does that interact? How might inverter standards such as IEEE 1547 need to be modified?

1 So there's really just a whole host of
2 issues that we believe that a living pilot can
3 really sort out. At this point, we believe we
4 have authority from the CPUC in the LTTP for up
5 to approximately 400 megawatts of preferred
6 resources beyond what was mandated as the
7 minimums, and we believe that we can focus those
8 megawatts on preferred resources such as this
9 living pilot. So, you know, obviously we don't
10 have funding and we need to come back for
11 additional authority, but we believe we have a
12 unique opportunity at this time.
13 As I said before, we may wind up with new
14 transmission, we may wind up with upgraded
15 transmission. Electrically speaking, San Onofre
16 being at the far south end of our system, and the
17 north end of San Diego system, have a lot of
18 unique ability to pass power between the systems.
19 Potentially, a 500 kV connection between SCE and
20 SDG&E, that's one possibility. There's been a
21 number of discussions about potentially pulling
22 500 kV into San Onofre, which would mean we need
23 to convert the substations there to 500. There
24 will be a number of challenges with that.
25 Obviously, that all sits on leased land, so,

1 again, it's a relatively small footprint site
2 even on the east side of the 5 on what's
3 typically called the Mesa. So, there will be a
4 number of challenges there and, again, not to
5 mention the typical resistance to siting a 500 kV
6 line or high voltage lines.
7 And then some amount of targeted fossil
8 generation for the inertia that it provides, for
9 the ramping that it provides. And also, I view
10 the targeted generation as a good way to backstop
11 our ability to move to even higher levels of
12 preferred resources because if we can determine
13 where targeted generation would need to be, then
14 we can go ahead and think about getting -- not
15 building there, but having, say, AFCs which is a
16 process through the CEC to license, or at least
17 be really site ready so that, in the event we
18 just can't get the preferred resources to
19 materialize, or in the event that we can't get
20 perhaps control of the preferred resources in the
21 short run, we would have the ability to build
22 some amount of fast start, probably peaking
23 equipment, so again, I see the targeted
24 generation as really serving multiple needs, it
25 serves the inertia need, it serves the resource

1 integration need, and it also allows us to go
2 ahead and try to go deeper into the preferred
3 stack.
4 And I think that speaking with panels
5 like this and coming to the various State
6 agencies is going to be increasingly important as
7 we move forward because there will be a host of
8 players in this, and we will need the cooperation
9 of many agencies in order to move forward. The
10 Water Resources Control Board, in the event that
11 reliability doesn't come together and we need
12 some extensions, perhaps, on once-through
13 cooling; CAISO, obviously, we have a lot of work
14 to do with CAISO on how do we use preferred
15 resources, how do they count, what value can you
16 get out of them, you know, we want them to be
17 valuable, so in order to be valuable, we need to
18 work with CAISO and get clear understanding
19 between all as to how they can be used. We need
20 determinations, we'll go through the LTTPs, Track
21 4, and we'll take a look at SONGS out, track the
22 RFO process. I believe we need to get a
23 compliance filing in July 15th, so the first
24 1,000-1,200 megawatts will be moving along.
25 Air permitting, right now we have Rule

1 1304 in the South Coast AQMD, but if generation
2 is needed in other Air Basins, the path may be
3 less clear because they don't have such parallel
4 rules, so emissions offsets may be more
5 challenging. I think local zoning, again, can be
6 another big issue, and whether it's an attempt to
7 change zoning such as Redondo Beach did, or
8 whether it's just direct consumer objection to
9 the re-powering, I think that's a very possible
10 issue to pass through. So any road will require
11 the cooperation of many many agencies, and many
12 many things to come together and, you know, we
13 frequently say that your choices are between
14 generation and transmission, but the reality is
15 you need all the preferred resources, you need
16 all the transmission and all the generation just
17 in the event that some of it can't materialize.
18 So I think you run all of the paths as
19 contingency.
20 Okay, thank you very much and that
21 concludes the report on San Onofre and the road
22 forward as we see it now.
23 CHAIRMAN WEISENMILLER: Mark, I have a
24 couple if I can go first. First, I wanted to say
25 that certainly on behalf of myself and I think

all of our Commissioners, you know, obviously one of the things we're trying to do is increase jobs in the state, so we want to emphasize our sympathy for the ex-San Onofre workers and hope that Edison will treat them properly and fairly and that hopefully all of them will find comparable jobs going forward.

A couple questions. One is, my recollection is part of your original permit with the Coastal Commission, you did a kelp wreath. What happens, if anything, to that mitigation measure now?

MR. NELSON: It's my understanding that the mitigation needs to go forward for the period of operation, so we'll be -- again, it's my understanding we would be getting, then, a 30-year operation and mitigation.

CHAIRMAN WEISENMILLER: Okay. Next question, I know there's been some speculation about possibly putting a synchronous condenser at San Onofre, or converting one other of those units, I mean, has that been done? What sort of issues are there, or is it just too early to talk?

MR. NELSON: You're absolutely right,

1 there's been a fair amount of discussion about
2 just the need for reactive power in that area.
3 The CAISO approved one or two projects for SDG&E
4 because, again, the plant is actually in SDG&E's
5 territory, so they approved one or two projects
6 that I believe were both synchronous condensers,
7 standalone synchronous condensers, and SVCs, and
8 San Diego is currently working on those projects.
9 We also have been looking at the potential use of
10 SONGS 2, 3, or both as synchronous condensers, so
11 that analysis is still underway. We're in
12 communication with San Diego, I've discussed it
13 with them I guess as recently as last week, so we
14 will certainly work with them to see if that
15 turns out to be a preferred option to the path
16 they're going down now, or perhaps an option that
17 is either parallel, or an option that might be in
18 in addition to it.
19 CHAIRMAN WEISENMILLER: Have any of the
20 other nuclear plants in the U.S. been converted
21 to synchronous condensers?
22 MR. NELSON: Yes, the Zion plant north of
23 Chicago had about a 10-year run as a synchronous
24 condenser, it's recently shut down and they're
25 moving toward full decommissioning.

1 CHAIRMAN WEISENMILLER: Okay. How long
2 does your lease go and how does that affect the
3 ISFSI?
4 MR. NELSON: The current leases, to the
5 best of my recollection, lasted through the
6 license period, so 2022. So the intent, of
7 course, had been that with license renewal that
8 would put us in a position to need to renew those
9 leaseholds and figure out whether it was, again,
10 2042 or some future date beyond that. So that's
11 part of the decommissioning and shutdown planning
12 analysis that's currently underway, that would be
13 what would be next to ask for some sort of lease
14 arrangements.
15 CHAIRMAN WEISENMILLER: Okay. And what
16 percentage of the fuel has long term contracts,
17 or would come from long term contracts?
18 MR. NELSON: I don't know. I can get
19 that information for you, I'm not aware right
20 now.
21 CHAIRMAN WEISENMILLER: Okay. Mike.
22 COMMISSIONER FLORIO: Just one question.
23 You indicated a period of seven to 12 years to
24 move this spent fuel to the dry cask storage.
25 For a given fuel assembly, roughly how long does

it need to sit in the pools before it can be moved to dry cask?

MS. MCANDREWS: So that seven to 12 years is that long leg of the last fuel assembly, so specifically we shut down in January of 2012 up to 12 years for that last fuel assembly to ultimately make it to the ISFSI.

COMMISSIONER FLORIO: But that's somewhat uncertain, depending on the conditions?

MS. MCANDREWS: It depends on the amount of heat that is generated by that spent fuel.

COMMISSIONER FLORIO: Thank you.

COMMISSIONER MCALLISTER: I did want to just point out for the courtesy of the folks that are here, we are actually being filmed, so I just want people -- that's obvious, I guess, but I just want to make sure people were aware. We do actually tend to prefer that folks let us know so we can actually notice that, that it's likely to be filmed, and that didn't happen today, but I wanted to just do it informally here. Obviously at the Commission, these are open public meetings and that's perfectly legit, so our bias is towards openness and transparency, but just out of courtesy, I wanted to let everybody know. So,

1 thanks.

2 MR. NELSON: Okay, I'd like to move on to

3 the current cycle of IEPR discussion. We

4 received a data request with approximately 50

5 items in it. Logically, they can be broken up

6 into three categories, the progress on reporting

7 on the original 1632 report and the '08

8 recommendations, progress from 2011, and then

9 other.

10 Looking forward, we've just talked a

11 little bit about used fuel, we'll obviously be

12 continuing to work on that, to work that issue,

13 but again the short story is by the end of July

14 we hope to have Unit 2 defueled, and then at that

15 point we'll need to work with dry storage and,

16 again, we'll need more ISFSIs.

17 We think that with the retirement of the

18 units, probably most of the IEPR questions

19 probably aren't germane now to the -- they were

20 more targeted toward an operating plant,

21 obviously, so we're in the process of sorting

22 through that, but we think that most of that --

23 most of the questions have probably been answered

24 sufficiently to handle it up to retirement. We

25 anticipate that during retirement you'll probably

1 have new questions. And as we understand
2 retirement and decommissioning better, we'll be
3 in a better position to answer those questions
4 because, again, that will be a different process.
5 We do clearly have experience
6 decommissioning with Unit 1, so we have a model
7 to go by. There's other industry experience, as
8 well, and we want to leverage all of that during
9 the planning process. Things like station
10 blackout, the evacuation for the operating plant,
11 those are issues that we'll be working. Station
12 blackout obviously isn't an issue for an
13 operating plant now, but we still need to deal
14 with power requirements of the used fuel pools.
15 Unit 1 still has some groundwater
16 remediation going on and we'll be working that
17 issue, as well. So, again, moving forward --
18 and, again, I anticipate that you might have some
19 different questions, that are different than they
20 were for the operating plant, but we've submitted
21 our responses. If you have specific questions,
22 we do have some members of the team here that can
23 answer those, as well, from the IEPR questions.
24 COMMISSIONER MCALLISTER: I mean,
25 certainly this conversation has shifted a lot,

1 and many interested parties on what the plan is
2 forward, and I think uncertainty is sort of the
3 name of the game at this point, and certainly
4 looking from the outside in, you know, say if
5 you're a member of the public; but a lot of the
6 kind of critical questions, I mean, obviously
7 there's the technical issue of how you
8 decommission what the various core stakeholders,
9 you know, the Military, SDG&E and Edison, and
10 your discussions with Mitsubishi and all that
11 kind of stuff, I think, will move forward, and
12 we're all kind of on the edge of our seats,
13 interested in how those discussions go. I guess,
14 you know, the Ratepayer impacts of this seem like
15 they're from a public interest perspective, they
16 really are front and center, and it's not my
17 bailiwick here at the Commission, it's really
18 over with Commissioner Florio, the lucky man.
19 So I don't want to poach on that issue between
20 Commissions, but I am interested in sort of
21 hearing the overarching kind of framework about
22 how you're going to approach those issues and
23 what that looks like going forward, and maybe the
24 timeframes if you have some ideas about that.
25 MR. NELSON: So is the question

1 specifically on cost recovery?
2 COMMISSIONER MCALLISTER: Yes.
3 MR. NELSON: And Commissioner Florio
4 obviously can do that or -- but the OII, the
5 Order Instituting Investigation on San Onofre is
6 currently in four phases, Phase 1, I believe, is
7 the recovery of costs for the year 2012. We were
8 in a peculiar ratemaking situation, we didn't
9 have a GRC decision, our 2012 GRC typically would
10 have been expected at the tail end of 2011,
11 instead it was late in 2012, and so all of 2012
12 costs were in a memorandum account, which is the
13 typical ratemaking. So we have had hearings on
14 part of Phase 1, I believe we still need to
15 discuss the replacement power, which would be the
16 ERRA, so there should be hearings on that, as
17 well, that was typically recovered through ERRA,
18 and that's Phase 1. Let's see, I believe that
19 Phase 2 -- I'm drawing a blank here on PUC
20 activity -- I guess I can --
21 COMMISSIONER FLORIO: Continued rate base
22 treatment or not.
23 MR. NELSON: Thank you. Phase 2 is
24 really what we consider the PU Code 455.5, which
25 is the consideration by the Commission as to

1 whether or not the plant is in rate based.
2 That's obviously taken on a different light at
3 this point since we have, in fact, retired the
4 plant. I would think that the discussion there
5 would probably center around the removal of the
6 plant that's already occurred.
7 COMMISSIONER MCALLISTER: The
8 decommissioning charges that we've all been
9 paying, is there a relevant number here for how
10 much has been collected on this, is in the fund
11 there?
12 MR. NELSON: SCE's share, I believe, is -
13 - the collection is $2.7 billion. The overall
14 decommissioning obligation, I believe, based on
15 again estimates, is around $4 billion. The rest
16 of that would be San Diego, Riverside, and
17 Anaheim, who are the other co-owners. So we
18 believe that it's reasonably well funded. We're
19 funded at about 90 percent, I believe.
20 And then the CPUC has two additional
21 phases, one phase has to do with recovery of 2013
22 costs, and the other phase has to do with really
23 a little bit more technical phase, I think, on
24 the analysis of what happened with the steam
25 generators. So I believe that's the process, and

1 then the PUC ultimately, of course, will be
2 working the issue of rate recovery.
3 COMMISSIONER MCALLISTER: Right, and on
4 that final issue, I think, so there's likely to
5 be a phase 5-6, I guess. But the final issue
6 actually has global importance and certainly
7 national importance, I mean, figuring out what
8 happened so the industry can sort of learn from
9 it, that's definitely true.
10 COMMISSIONER FLORIO: And just to add
11 that, you know, in the wake of Edison's
12 announcement, President Peevey encouraged the
13 parties to try to reach settlement on some of
14 these ratemaking issues, certainly a sentiment
15 that I second, and if the parties bring us a
16 settlement, we'll try to process that
17 expeditiously and, if not, this will be a fairly
18 lengthy process. So trying to take it step by
19 step so that parties can focus on a discrete set
20 of issues at one time, rather than one massive
21 proceeding that's hard to keep all the pieces
22 straight.
23 CHAIRMAN WEISENMILLER: So with MHI, do
24 you expect to go to litigation or arbitration?
25 MR. NELSON: I believe it has an

1 arbitration clause, so at this point we're still
2 obviously in negotiations with them.
3 CHAIRMAN WEISENMILLER: Okay.
4 COMMISSIONER MCALLISTER: Great. Thank
5 you very much, Mark.
6 MR. NELSON: Thank you.
7 MS. WALTER: Okay, next we're going to
8 have Stu Nishenko who is the Senior Seismologist
9 in the Geo Sciences Department of Pacific Gas &
10 Electric. He serves as the Technical Manager of
11 the Central Coast California Seismic Imaging
12 Project.
13 DR. NISHENKO: Commissioners
14 Weisenmiller, McAllister, Florio, good morning.
15 And thank you for allowing PG&E the opportunity
16 to report out on the progress that we have made
17 addressing the recommendations in the Energy
18 Commission's AB 1632 report.
19 This morning, I have three basic
20 questions I want to address in my presentation,
21 and there's quite a lot of material here, so I'll
22 try to get through it in a timely fashion, but if
23 we kind of reach the limit, please let me know
24 and we'll terminate this as quickly as possible.
25 So the first question here is seismic

1 hazards at Diablo Canyon, the overall status of
2 ongoing efforts to understand those hazards
3 through a Long Term Seismic Program (LTSP). And
4 we are currently following a Senior Seismic
5 Hazard Analysis Committee, or SSHAC, a Level 3
6 process that is scheduled to be completed in
7 2015.
8 MS. KOROSEC: I can run it for you if you
9 would prefer.
10 DR. NISHENKO: My apologies.
11 MS. KOROSEC: No, no worries. Unfamiliar
12 technology.
13 DR. NISHENKO: Actually, let's go back
14 one. Okay, so this is a flow chart that shows
15 the seismic hazard analysis, SSHAC process
16 update, and the point that I want to make is the
17 role of the information that we're collecting is
18 part of the AB 1632 process, in the box over here
19 on the left-hand side of the slide. So this is
20 information that we basically describe a seismic
21 source characterization, finding basic
22 information about the earthquake sources, their
23 geometry, their rate of activity, things like
24 that, that then get fed into this hazard update
25 process that finally at the end winds up with a

1 probabilistic Seismic Hazard Update. So the work
2 that we're doing is part of AB 1632 is integral
3 to that Seismic Hazard Update. Next slide.
4 The information that we're considering as
5 part of this process includes the original 1988
6 LTSP Tectonic Model and then new data that we've
7 collected as part of the AB 1632 studies
8 including Marine Data, Multi Beam Echo Sounding
9 of the sea floor, low energy Seismic Reflection
10 Surveys of the sea, as well as Onshore Data,
11 we're again doing 2D and 3D Seismic Reflection
12 Surveys on land, geologic mapping, topographic
13 mapping, as well as Potential Field Mapping,
14 looking at variations of gravity and magnetic.
15 So to address the specific requests that we use,
16 three dimensional data; this is an example of the
17 kind of information that we are considering, and
18 I'll have some examples of that later on this
19 morning. Next slide.
20 In terms of ground motion
21 characterization, it's sort of the complementary
22 half to a seismic source characterization, we've
23 been very busy in continuing to develop our next
24 generation ground motion model in terms of adding
25 more information to the database, as well as

1 making updates to the model, itself. In addition
2 to, if you will, empirical updates, we've also
3 been working very closely with scientists from
4 the USGS, Southern California Earthquake Center,
5 and the Pacific Earthquake Engineering Research
6 Center in Berkeley to develop Numerical Models,
7 Dynamic Rupture Models, Finite Fault Simulations,
8 to help fill in the blanks, if you will, what we
9 don't know from observed information from
10 earthquakes. This turns out to be critical to
11 help us understand a question about the
12 intersection of the shoreline in the Hosgri
13 Fault, for instance, and we'll talk about that
14 next. Next slide.
15 So question 2 says, at this point in
16 time, have we found any information to indicate
17 larger than expected hazards at Diablo Canyon,
18 and whether or not the plant was built with
19 sufficient margin to continue operating reliably
20 and safely. At this point, we have not found any
21 evidence to suggest that we have a problem at the
22 plant, but I would just caution you that the
23 report, the SSHAC Level 3 report which will
24 address all this in great detail, is scheduled to
25 be completed in March of 2015. But right now

1 there's nothing on the horizon. Next slide.
2 And so here we're asked to delve into a
3 little more detail about our progress in
4 completing the AB 1632 recommended studies, so
5 that's what I'm going to be addressing for the
6 rest of the presentation. Next slide. And just
7 as a reminder, the 1632 study, which was an
8 assessment of California's nuclear power plants,
9 recommended that both PG&E and Edison update
10 their seismic hazard assessments, and this is the
11 SSHAC process, that we actually initiated prior
12 to the NRC issuing their 50.54(f) requirements
13 after Fukushima in 2011, and also to use 3D
14 geophysical reflection mapping and other advanced
15 techniques to supplement these previous and
16 ongoing programs, so as I showed you before and
17 will show you again, how we're using that
18 information moving forward. Next slide.
19 This is just quickly a summary of the
20 funding history for the project. We began with
21 an initial request of $16.7 million in 2010, and
22 about a year later in September of 2011 reopened
23 that request for additional funds, and now we
24 have a budget of about $64.25 million to cover
25 all the research activities that we had

1 identified. Next slide.

2 Again, as part of the decision to provide

3 that funding, the Public Utilities Commission

4 required that an independent peer review panel be

5 established, and that's comprised of

6 representatives from the California agencies that

7 you see listed here, as well as a number of

8 supervisors from San Luis Obispo County to

9 provide some oversight. Next slide.

10 This is a slide of the seismicity

11 offshore Diablo Canyon, so Diablo Canyon itself

12 is located right about here, this area is called

13 the Irish Hills, and what you see offshore of the

14 plant is the seismicity patterns that we are

15 concerning ourselves with. This is information,

16 by the way, that was provided from Jeanne

17 Hardebeck of the U.S. Geological Survey, and

18 there are two sets of dots, red dots and green

19 dots. I think the red dots are updates of

20 earlier locations that were done in 2010, and

21 using new improved information, the red dots give

22 us relocations as of 2012. The point I wanted to

23 make here is that, with the seismicity, you can

24 clearly see the strands, the two strands of the

25 Hosgri Fault that exists offshore, there's a

1 western strand, and there's another eastern
2 strand that is right here at the edge of the
3 Continental Shelf, but more important it is this
4 lineation, the seismicity that runs close to the
5 shoreline near Diablo Canyon. So this is the
6 seismicity that initially was used to confirm the
7 fact that there is a Shoreline Fault zone
8 offshore of the power plant. And that started a
9 whole series of investigations that were reported
10 on --
11 COMMISSIONER MCALLISTER: Could you point
12 out exactly in this map where Diablo Canyon is?
13 Is it sort of on that open spot half-way up?
14 DR. NISHENKO: It's right about here.
15 COMMISSIONER MCALLISTER: Yeah, there we
16 go, okay. Thank you.
17 DR. NISHENKO: So the proximity of this
18 lineation of seismicity to the plant itself is
19 less than a kilometer, it's probably under about
20 600 or 700 meters. Next slide.
21 We used what we call a seismic source
22 characterization sensitivity study to help us
23 prioritize the kind of information that we needed
24 to improve our seismic hazard study for the area,
25 so basically what we're trying to do here is

1 reduce the uncertainty in some of the basic
2 parameters that we need to know in order to do
3 the seismic hazard assessment and this
4 sensitivity here shows different realizations of
5 the hazard, depending on variations in particular
6 parameters, like variations in the slip rate of
7 the Hosgri Fault, or the dip of the Hosgri Fault,
8 produce a wide variation in what the answer is
9 that you're going to get, so that's a measure of
10 the uncertainty. So we've designed the work that
11 we've done to try to reduce that uncertainty, to
12 get better estimates of the slip rate of the
13 Hosgri, for instance, or the slip rate of the
14 Shoreline Fault, as well as looking at the dips
15 or the geometry of these major fault zones that
16 we've identified in and around the Diablo Canyon
17 area to improve the accuracy of the hazard
18 assessment. Next slide.
19 Okay, this is supposed to be kind of a
20 sequential slide, but the point that I want to
21 make here is that from 2009 to 2011, we've been
22 doing a great deal of work onshore and offshore,
23 it began with sea floor mapping and this
24 potential field mapping looking at the gravity of
25 magnetic field in and around the coastline here

to basically confirm what we saw with the seismicity lineation.

One of the -- and again, to address the requirement that we use 3D seismic studies of the area, we started a program of low energy 3D seismic investigations at the northern section where the shoreline intersects the Hosgri, and also started investigations at the southern end where the Shoreline Fault goes into San Luis Bay, so this is to better understand the geometry of that intersection between these two major fault zones, as well as what is the overall length of the Shoreline Fault zone.

Just to step back a minute, this is a trace of the Hosgri Fault Zone that runs along the edge of the Continental Shelf, and this is the fault zone that is considered to be the principal seismic source for our calculations.

In addition to working offshore, we also decided to initiate a fairly comprehensive program onshore, looking at again the geology of faulting onshore, so this is a fault which runs along the eastern side of the Irish Hills, as well as other faults within the core of the hills, themselves. And I'll show you some

1 examples in a moment. Next slide.
2 In 2012, we continued these
3 investigations and here is where we looked again
4 in more detail in San Luis Bay at the Shoreline
5 Fault Zone. In 2011, we discovered information
6 that was going to, we think, help us constrain
7 this rate emotion on the Shoreline Fault Zone, so
8 we went back in '12 and collected more data to
9 help us with that analysis, and then also
10 extended that analysis to the Hosgri Fault
11 further offshore, looking for information that
12 would give us an independent confirmation about
13 what the rate of fault motion is on the Hosgri.
14 Currently, the only -- the primary source of
15 information we have on the rate emotion to Hosgri
16 is where it comes on shore in San Simeon, so
17 there's a great stretch of this fault where it's
18 underwater and heretofore unavailable for
19 geologic investigation, so we're trying to
20 address that right now.
21 In '11, we spent a lot of time onshore in
22 the central and eastern part of the Irish Hills.
23 In '12, we spent a great deal of time in the area
24 in and around Diablo Canyon itself doing onshore
25 seismic reflection profiling and getting a better

1 idea of the geology in that area. Next slide.
2 This is a comparison, it's a bathymetric
3 mapping of the kind of information that we had in
4 1988 when the original LTSP Model was proposed,
5 and the information that we've got now in 2009
6 when we started doing Multi Beam mapping in
7 cooperation with the Sea Floor Mapping Lab at the
8 University of California Monterey Bay. And you
9 can clearly see between these two images just how
10 far the technology has improved in the last 20
11 years, both in the quality of the imaging and
12 probably the biggest improvement is the advent of
13 Global Positioning Systems, GPS. So all this is
14 basically added to what I call -- it's a
15 revolution in resolution. We can start seeing
16 things now in a lot clearer detail than we could
17 20-30 years ago. So the shoreline -- well, this
18 liniment that you see right here off of the
19 plant, and the plant footprint is located here,
20 this liniment is what we're calling the Shoreline
21 Fault Zone, so you can see how clearly that shows
22 up in the submarine bathymetry compared to what
23 we had 20-30 years ago. So it's probably no
24 wonder that that wasn't fully recognized or
25 appreciated at the time. Next slide.

1 But one of the operational issues that we
2 had -- actually, if you can go back a slide -- is
3 the existence of what we call the "White Zone,"
4 you really can't see it here, but there's an area
5 near shore that's impossible to get into with
6 conventional boats that we're using to do this
7 Multi Beam Mapping because of the presence of
8 kelp in the water, shallow rocks, and things like
9 that, we're kind of limited in how far close to
10 shore we could get. So working with the folks at
11 Monterey Bay, they developed -- basically put a
12 sonar head on a jet ski and were able to take the
13 jet ski in and out of the shallow water and allow
14 us to fill in this white zone, so now we have
15 comprehensive bathymetric cover from the shore
16 out to sea, or basically wall to wall coverage of
17 the sea floor. So this is key in that it allows
18 us to basically continue geologic structures that
19 we map onshore to the offshore, and vice versa.
20 Next slide.
21 In addition to that Sea Floor Mapping, we
22 also did what we call Potential Field Mapping,
23 looking at subtle variations in the strength of
24 the earth's magnetic field, as well as the
25 earth's gravity field, to better understand

1 geologic structures in the area. So this is a
2 summary of the helicopter survey we did in 2010
3 across the Shoreline Fault Zone, again, Diablo
4 Canyon is located right here. One of the
5 characteristics early on that was recognized was
6 that fault zone itself seemed to be associated
7 with a series of magnetic highs, probably because
8 of rocks that were entrained inside the fault
9 zone itself, and that gave us a good marker to
10 actually not only trace the continuity of that
11 fault zone, but it also models geometry and its
12 potential depth.
13 The next slide shows the results from a
14 gravity survey which was done earlier by the USGS
15 and we're actually in the process of updating it
16 as we speak to get more gravity data. But here
17 the key point is that there are more information
18 available for us to use to address these
19 problems, to constrain these geometries than just
20 seismic. And this becomes critical down the road
21 because of the fact that our application for
22 doing high energy seismic and the offshore was
23 denied last year, so we are looking at other data
24 like gravity magnetics and old seismic data that
25 was collected in the '70s and '80s to see if we

1 can address these questions without having to go
2 through that and reapply for doing high energy
3 work. Next slide.
4 This is a helicopter shot of the vessel
5 that we're using to do some of the low energy
6 work in San Luis Bay, and this is an again state-
7 of-the-art technology, this is called a P-cable.
8 Back here where you're dragging about 14 separate
9 streamers that are about 15 meters in length
10 behind the boat, the sound source is located
11 here, and what this allows us to do is do these
12 surveys, or what we call "mow the lawn" in a
13 quicker amount of time, a shorter amount of time.
14 When we first started doing this in 2010, we only
15 had four streamers behind the boat, so tripling
16 the number of streamers basically makes it more
17 effective and less time to do. Next slide.
18 All the data that we've collected for the
19 Marine work has been processed in Houston and
20 this is just a flow chart showing how that data
21 was processed and also that each step of that
22 processing had a quality control process, as
23 well. All the work that we're doing under AB
24 1632 is being done to nuclear quality assurance
25 standards, so there's a whole set of procedures

1 that need to be followed and records kept for all
2 this information as collected and processed and
3 interpreted. So this is all being done to the
4 highest standard possible. Next slide.
5 So the first work that we did in 2010 and
6 2011 was off of Point Buchon here in the inset
7 map, and Diablo Canyon is here. So this is the
8 area where the Shoreline Fault was seismicity
9 that was associated with the Shoreline Fault,
10 seems to start intersecting the Hosgri. So we
11 went at first to that area to see what we could
12 learn about the geology and geometry. This is
13 what we call a time section from the 3D survey
14 that we did, so this is basically a horizontal
15 slice through the volume that we collected at a
16 depth of about 115 meters below sea level, or
17 roughly about 50-60 meters below the sea floor.
18 Prior to our doing this work in 2010 and '11,
19 previous surveys in the area had looked with
20 spacing between ship tracks on the order of 800
21 meters. For the 3D survey that we did here,
22 spacing between ship tracks is on the order of
23 12-20 meters, so a dramatic increase in the
24 density of data, the resolution that then allows
25 you to put together literally a 3D volume that

1 you can look at in different orientations, take
2 slices as you see here in different directions,
3 to help you further understand the geologic
4 structure.
5 So in our 2011 report to the NRC, onshore
6 line fault zone, we had identified a number of
7 faults in the area in addition to the Hosgri, a
8 feature in 2011 that we called the North 40 West
9 fault, that using the new data that we collected
10 in '10 and '11, we've now renamed as the Point
11 Buchon Fault, and also come to realize and map
12 greater detail for this fault zone than we knew
13 before. Next slide.
14 This shows an overlay, then, of the
15 seismicity -- again, these red and green dots I
16 showed you in the earlier slide -- on this time
17 slice and, again, to try to understand the
18 correlation between geologic structure and
19 seismicity in this area. One of the things that
20 is difficult is that this Low Energy Seismic
21 Survey, or LESS, only gives you imaging to the
22 top 200 or 300 meters of the sea floor, this
23 doesn't have enough energy to propagate deeper.
24 And the seismicity that we're looking at here is
25 occurring at depths of 3, 4, 10 kilometers below.

1 So necessarily what you see at the surface may
2 not reflect everything that's going on at depth.
3 But, again, it is a step forward. Our original
4 goal was to try to do basically top to bottom
5 mapping from the sea floor down to the depths of
6 the earthquake so we can understand that entire
7 crustal column. Next slide.
8 This is kind of a complicated diagram,
9 but the point being is, as you get into that
10 intersection zone between the shoreline and the
11 Hosgri Fault, the seismicity starts to merge
12 together and a lot of times it's not clear
13 whether you're looking at earthquakes that are
14 happening on the Hosgri Fault, you're looking at
15 earthquakes that are happening on the shoreline,
16 and what their relationship between the two of
17 them are. I think later on this morning, Dr.
18 Hardebeck is going to talk about this a little
19 bit later. But this is a point where a lot of
20 the numerical modeling that we've been doing with
21 the other groups comes into value in that it
22 helps us to start understanding what the
23 mechanical interactions are between these two
24 faults, and hence what kind of earthquakes we
25 could expect if these faults interacted with one

1 another. So this gets to understanding the
2 reality of the situation and how it impacts
3 ground motions at the plant, itself. Next slide.
4 The report for that 2010-2011 survey was
5 completed in 2012 and was transmitted to both the
6 IPRP, as well as the SSHAC study team to inform
7 them in their deliberations and our policy is
8 also being posted on the PG&E website, so we have
9 a policy to provide all the information to the
10 public as part of the transparency, and we'll
11 talk about that in the last slide. This is just
12 one of the reports that we were coming out with
13 in the datasets.
14 This is our boat again, and here we're
15 going to be talking about the southern end of the
16 Shoreline Fault Zone in San Luis Bay. Next
17 slide.
18 When we were doing reconnaissance work in
19 San Luis Bay in the winter of 2011, we uncovered
20 what at the time looked like the ancestral
21 continuation of San Luis Obispo Creek, which is
22 located here on shore as it cut across the
23 Continental Shelf, out into the Santa Maria
24 Basin. So this is a contour map of that buried
25 channel, if you will, stream channel, as it is

1 cutting across the Continental Shelf. What got
2 us excited about this is that a trace of the
3 Shoreline Fault Zone, shown here in red, cuts
4 across that channel. So this is an example of
5 what geologists call a piercing point, where you
6 have a geomorphic feature that's cut by a fault,
7 and then if you can document offsets of that
8 geomorphic feature, and you know it's something
9 about the age, you can come up with a rate of
10 motion. So we went back in 2012 and 2011 to
11 survey this area in much more detail, the inset
12 shows the survey tracks that were done in '11 and
13 '12 using this 3D technology. And this is really
14 where it kind of shines. Next slide.
15 This is just one profile through that
16 buried channel, and you can kind of see how the
17 surface here, the basement surface, has been
18 eroded away and then filled in with sediment, so
19 this is an uninterrupted profile and the next
20 slide shows you an interpretive profile where we
21 have bedrock surface below the channel that was
22 cut in during the low sea level, then later
23 filled in, and then overlying the younger
24 sediments, sea floor surfaces located right here.
25 So in 3D what we can do is put many of these

1 profiles together, stack them up next to one
2 another and come up with this volume. And the
3 next slide, I'll just kind of show you --
4 hopefully this is going to work, what we can do
5 with the volumes. So here is from top to bottom
6 ocean surface, down through the sea floor. Next
7 slide. Rats. Okay, that was the one, another
8 sequential slide, but the whole idea is that
9 basically you can peel away the layers and look
10 at the geologic structure in detail. So if this
11 had worked, what you would have seen is we would
12 peel away the ocean layer, you could see the sea
13 floor, then we identify where that basin surface
14 is, where the hard rock is, peel away the
15 overlying younger sediments, and the next slide
16 then shows the geometry of this channel, these
17 buried Paleochannels as they cut across the
18 Continental Shelf. So here, again, we're looking
19 for places where the fault has offset this
20 channel.
21 And this is basically something called
22 Maximum Similarity, which is basically additional
23 processing that you can do to the data after
24 you've collected it to emphasize more subtle
25 features. And with it, you can kind of see right

1 through here is this is the trace of the
2 Shoreline Fault zone. In fact, what we've
3 managed to do is identify an eastern and a
4 western trace of the Shoreline Fault Zone here in
5 San Luis Bay. So, again, this is all information
6 that's below the sea surface, below the sediment
7 layer, you don't see it on the surface like you
8 did that Bathymetric map that we had offshore
9 Diablo Canyon. Next slide.
10 So in fact, what we found in our surveys
11 is there are a number of channels that cut across
12 the Continental Shelf that also cut across the
13 Shoreline Fault Zone, so we're actively now
14 looking at these channels in detail to see what
15 they can tell us about the rates of offset for
16 that particular fault. Next slide.
17 One of the setbacks, if you will, for the
18 uncertainties that we have is in the age of
19 sediments that are deposited in these channels.
20 But luckily for us, sea level has not remained
21 static over hundreds of thousands of years, and
22 the sea level curve, which goes back 430,000
23 years, shows that there are episodes of low sea
24 level stands, this latest one, too, is associated
25 with the most recent glacial maximum during the

1 Ice Ages, and these are the times when you would
2 expect to have streams cutting across the
3 Continental Shelf. So what it does is it starts
4 to give us ages that we use to bracket some of
5 the rates that we're going to be coming up with,
6 with slip rates for the Hosgri Fault. And
7 obviously one of the longer term areas of
8 concentration is going to be to see if we can get
9 better information, better constraint on those
10 rates. Next slide.
11 As I mentioned before, in addition to
12 work in San Luis Bay, we also looked at the
13 Hosgri Fault itself to see, again, if we could
14 see stream channels that came across the fault
15 that were subsequently offset. And down here
16 near Point Sal, the Santa Maria River, which is
17 one of the largest drainages in the Central Coast
18 of California, cuts across the Hosgri, and this
19 is an area of particular interest and evaluation.
20 Next slide.
21 This again shows you kind of amplitude
22 volumes that we can construct with this data, and
23 the next slide shows you a map view, again,
24 horizontal time slice through the Hosgri Fault,
25 so this is a detail here on the right-hand side

1 of the slide, the Hosgri is located in the center
2 of that image, and you can kind of see these
3 patterns here. These are stream channels that
4 we've identified in both map view and cross
5 section, and our responsibility is to match up
6 the channel on the east side with the channel on
7 the west side. So the next slide shows a kind of
8 interpretation and the colored bands show some of
9 the channels that we've identified, and the red
10 shows just the complexity of the surface trace of
11 the Hosgri Fault in our survey area. So this is
12 one of the things that happens, you know, when
13 you look at things in more detail you find out
14 they're much more complex than you originally
15 thought.
16 The next slide -- go back again, please
17 -- so basically where we are right now is looking
18 at these channels in more detail and just trying
19 to understand the history of the offset of these
20 so we can come up with an estimate of the slip
21 rate for the Hosgri, both in San Luis Bay and
22 then further north in Estero Bay. Next slide.
23 This report is scheduled to be issued in
24 the fourth quarter of this year, 2013, and like
25 the last report we issued, will be distributed to

1 the IPRP, the SSHAC team, and then also posted on
2 our website for interested readers. Next slide.
3 The HESS Survey, just briefly, this is
4 supposed to be the complementary piece to the Low
5 Energy Seismic Survey work that we did. Low
6 energy was much easier to permit and conduct than
7 high energy. The next slide shows just the
8 history of the steps that we went through to try
9 to seek a permit to do this work offshore, and
10 this required coordination with both the State of
11 California, as well as a number of Federal
12 agencies because we were bracketing State and
13 Federal waters to do this. Next slide.
14 Unfortunately, while the State Lands
15 Commission issued us a Geophysical Survey Permit
16 in August of '12, the Coastal Commission decided
17 to deny our development permit application and
18 its result, that work was stopped. And on the
19 Federal side, our Incidental Harassment
20 Authorization was withdrawn. So here in 2013,
21 the final decision on these high energy studies
22 offshore is really pending the review of existing
23 data. This gets back to that other geophysics
24 that I talked about earlier.
25 COMMISSIONER MCALLISTER: What is the

1 issue or issues that kept that from being
2 approved? Or what were the sort of concerns
3 about doing that high energy work?
4 DR. NISHENKO: It's primarily the effects
5 of sound in the sea on the environment, that
6 these were rather loud noises that people were
7 afraid were going to be deleterious to marine
8 mammals and other wildlife in the area.
9 COMMISSIONER MCALLISTER: Okay, thanks.
10 DR. NISHENKO: Next slide. So this is
11 just a review of the work that we've been doing
12 onshore, so this is complementary to the marine
13 work, and here with this idea to develop a top to
14 bottom profile, we used different sources. This
15 is what we called accelerated weight drop, which
16 gives us high resolution imaging, again, to the
17 first couple hundred meters of the crust. And
18 then these Vibroseis trucks which located here,
19 that give us deeper imaging. Again, the idea to
20 image to the depths at which the earthquakes
21 themselves are occurring. Next slide.
22 In 2011, we succeeded in surveying about
23 120 miles of road in and around the Diablo Canyon
24 area here in the Irish Hills. Survey routes are
25 shown with the green lines, and these red dots

1 that you see here was an attempt for us to
2 install high density instruments to record data
3 from these green routes, to construct three-
4 dimensional image of the crust underneath the
5 Irish Hills, again to help us identify faulting
6 in that geometry.
7 In 2012, we concentrated our activities
8 in and around the Diablo Canyon Area. Part of
9 this was in preparation for the offshore surveys
10 that we were expecting to do later on that year,
11 but didn't occur. But nevertheless, we did get a
12 lot of valuable data on land, in and around
13 Diablo Canyon. Next slide.
14 This just shows a detail of one of the
15 seismic lines to north, this is near Montana del
16 Oro, Morro Bay is located right here, and one of
17 the things that you want to do with seismic work
18 is try to tie in what you see in the reflection
19 profiles with well data, it gives you some hard
20 evidence that you can use to interpret the
21 seismic sections that you create. So these are
22 the locations of some available wells that we had
23 in the area, and the next slide shows the cross
24 section through that survey route with the well
25 locations, and then some preliminary

1 interpretations of that seismic data in terms of
2 the geology and the stratigraphy. This is an
3 activity that is currently ongoing now with our
4 seismic interpretation team -- next slide -- and
5 we expect to have the report on that
6 interpretation issued in the second quarter of
7 2014. So by this next summer, the SSHAC group
8 will have all the information on Seismic Source
9 Characterization for their work in developing
10 their Probabilistic Hazard Assessment. Next
11 slide.
12 Our Ocean Bottom Seismometer Program, so
13 recognizing that there was a considerable degree
14 of uncertainty in earthquake locations offshore
15 primarily because all your seismic stations are
16 located onshore, and the directly of maximum
17 uncertainty, if you will, is perpendicular to the
18 coast, we initiated a program to install ocean
19 bottom seismometers offshore in the area near
20 where this intersection of the two faults occurs.
21 So these are pictures of a temporary unit that
22 we're going to be putting down this summer for a
23 couple weeks to just get a better understanding
24 of noise conditions in the area, and then a
25 diagram of a more permanent facility that is

1 going to be located offshore for about 10 years.
2 So the idea is that by installing these offshore,
3 and these are all going to be wired in real time
4 to the plant located here, we'll have the
5 necessary control to improve the earthquake
6 locations in this critical area. Next slide.
7 Finally, as I mentioned before, all the
8 information that we've collected as a part of
9 this project is going to be put into a legacy
10 data archive, so information about earthquake
11 geology, geophysics, all will be available at a
12 PG&E website, and we're also in negotiation with
13 some other organizations to help us manage the
14 great volume of seismic data that we're going to
15 be generating as a result of all this work. But
16 the goal is to make this information available so
17 others can take a look at it, if they want to
18 develop what we call proponent models, or
19 additional models for the SSHAC to consider in
20 their deliberations, everybody will be working
21 off the same page, using the same database. So
22 this is our commitment to provide this
23 information in a public forum. And that is my
24 briefing. Thank you.
25 COMMISSIONER MCALLISTER: Thanks very

1 much. So just a very high level -- this is a lot
2 of information, a lot of effort, a lot of
3 resources, and so one specific question, you
4 know, how on the high energy stuff, I guess a
5 little more description of what that entails,
6 actually, like what you are asking for and maybe
7 your idea of why the Coastal Commission was
8 uncomfortable with it more than sort of generic
9 impacts on mammals, like what are you actually
10 proposing to do? And then a more -- you know,
11 that isn't happening, but lots of things are
12 happening and this has been going on for decades,
13 and I guess more specifically how is this report
14 going to sort of -- what are the then policy
15 questions and potential actions going forward
16 that this improved understanding is presumably
17 going to enable? Is it additional earthquake
18 retrofitting on the plant site itself? Is it
19 contingency planning in other ways? Is it
20 informing the relicensing conditions? What sorts
21 of things are you anticipating that this broader
22 deeper understanding is going to enable? So two
23 questions.
24 DR. NISHENKO: Let me answer question 2
25 first, and then I'll defer to my colleague, Mr.

1 Strickland sitting next to me. The work that
2 we're doing right now really is probably a first
3 major improvement of our understanding of the
4 geology and tectonics of Central California Coast
5 in more than 20 years, and that last episode was,
6 you know, coincident with the LTSP work, and a
7 lot of exploration work that was being done in
8 the 1980's. So we've added a new chapter in our
9 understanding of onshore and offshore geology as
10 a result of this. This is very expensive to
11 conduct and this is not typically what outside of
12 the oil industry you would expect folks to do, so
13 this is giving us an opportunity to have a unique
14 picture of the area that we're concerned with.
15 The impacts of this work, as you asked,
16 on policy decisions and engineering decisions, I
17 think we're really going to wait until SSHAC
18 finishes their deliberations in 2015, and then
19 coordination within the regulatory commission.
20 So the SSHAC group has been empowered to take all
21 this information and analyze it, evaluate it in
22 terms of this seismic hazard assessment, so
23 that's the point where we'll start to see the
24 impact in terms of the engineering safety of the
25 plant.

1 MR. STRICKLAND: My name is Jearl
2 Strickland and I'm the Director of Nuclear
3 Projects for Diablo Canyon. And what we expect
4 is that, as the SSHAC process completes the
5 development of seismic source characterizations
6 and associated ground motion characterizations,
7 that that will then be used as a part of the
8 response to the Nuclear Regulatory Commission's
9 orders 50.54(f) to be able to then create a new
10 seismic spectra for Diablo Canyon, compare it to
11 the existing design basis, and in turn evaluate
12 whether or not there are additional studies that
13 need to be performed to assess the capabilities
14 of a plant. An example would be that if, say, on
15 the low frequency end of the spectra that you
16 determine that you had some responses outside the
17 range of your current spectra, you'd go back and
18 you'd look at what types of equipment components
19 and systems that would be sensitive to that type
20 of motion and, in turn, then evaluate as to
21 whether or not any additional motion would have
22 an impact on the qualification of those
23 components.
24 COMMISSIONER MCALLISTER: Okay, so
25 thanks. That helps me understand. This set of

1 issues is one of these, I mean, nuclear in
2 general you can kind of characterize like this as
3 sort of the probabilities are relatively hard to
4 get one's head around. And so how low
5 probability -- I imagine, you know, the seismic
6 assessments sort of feed into what are sort of
7 the probabilistic approach to what might happen
8 and what the risk of that is, and then what the
9 sort of justifiable investment in remedying any
10 risk, at what level, and all that, so that
11 probabilistic assessment in reducing risk
12 overall, that's really difficult to do. And so
13 it's obvious to you who are in this industry, but
14 I think this is a particularly difficult thing
15 for policy to grapple with and we're talking long
16 term, right? I mean, so 2015 and some number of
17 years to sort of digest, come up with
18 recommendations, base it in the technology as
19 actually the plan, and then come up with
20 something concrete to actually do to the plant if
21 that's necessary. We're talking 2020? What is
22 the timeframe on that whole process to sort of
23 play out?
24 MR. STRICKLAND: The timeline right now
25 would be that by 2017 that we would have to

1 better quantify as to whether or not there were
2 any specific areas in the plant that needed
3 additional assessment or potential modification.
4 COMMISSIONER MCALLISTER: Okay, and then
5 that assessment and then potential modification.
6 Okay. Thanks.
7 MR. STRICKLAND: Did you want Stu to talk
8 about --
9 DR. NISHENKO: Do you want to talk about
10 HESS?
11 COMMISSIONER MCALLISTER: Yeah, so second
12 question.
13 DR. NISHENKO: So on the screen, on the
14 right-hand side are the ship tracks that we had
15 proposed for the HESS study. So these were
16 basically drawn to help us understand the deep
17 geometry of a number of different fault zones in
18 the area, including the Hosgri Fault Zone,
19 Shoreline Fault Zone, and then also additional
20 faulting here in San Luis Bay. So the HESS
21 itself, or the High Energy Survey, would involve
22 firing a series of air guns with a volume of
23 about 3,000, 4,000 cubic inches on a repetitive
24 basis and then recording the echoes of the
25 returns from that on streamers themselves on the

order of four to five kilometers long, right, to get the offset or the imaging at the depths that we needed; again, we want to map where the earthquakes are actually occurring. When we're doing the Low Energy work, our streamers are 50 meters more long because we're imaging very shallow, so the deeper you go the larger the offset.

So there are a number of challenges that that brings up, not only being able to drive a boat with four or five kilometers worth of streamer behind it, so this is a navigational challenge, but also how do you maneuver inside a coastal area than to collect the kind of information that you do.

In addition to these logistical challenges, and these surveys were -- these track charts were drawn to minimize the operational challenge, there were a number of environmental challenges that we came to discover along the way in terms of populations of otters, whale migrations that came up and down the coast, populations of porpoises that lived down here near Point Sal, all of these were considered. The original proposal that we had to do the high

1 energy work was to coincide with the minimum in
2 whale migration activity along the Coast of
3 California, and then through negotiation it got
4 focused to the absolute minimum, you know, the
5 two or three week period where the lowest
6 migration activity would happen. So between
7 August of 2012 and November, there was a series
8 of negotiations where these ship track lines were
9 gradually whittled away until finally when we
10 appeared in front of the Coastal Commission, we
11 were just talking about doing one set of surveys
12 here in Estero Bay. And that was going to be set
13 up as a pilot program to demonstrate that the
14 mitigation activities that we had identified were
15 going to be sufficient and adequate to protect
16 marine wildlife, as well as demonstrate that the
17 experiment design was adequate to image at depth
18 in this particular area. We devoted a
19 considerable amount of resources to developing a
20 comprehensive mitigation program, monitoring
21 animal activity that was going to have over-
22 flights, as well as boats in the water setting up
23 safety radii around the ship to try to keep
24 animals away from getting closer to the vessel
25 where the sound levels were a lot louder. But

1 despite that, it was just ruled to be too
2 environmentally dangerous to proceed forward.
3 COMMISSIONER MCALLISTER: Okay, I
4 appreciate that in depth, I mean, I can kind of
5 imagine why, I mean, it's going to be kind of
6 loud and disruptive in ways that I think others
7 have confronted those same challenges, I mean, in
8 the Military and the sonar issues in there too,
9 and I think some similar characteristics,
10 although a different kind of process, but you
11 certainly would not want to minimize those
12 impacts.
13 DR. NISHENKO: Yeah, and just to add a
14 little bit more, this is a discussion that's
15 happening right now, actually, on the east coast
16 of the United States, too, in terms of
17 exploration on the Continental Shelf in the
18 eastern United States, is the impact on marine
19 life.
20 COMMISSIONER MCALLISTER: So you know, we
21 haven't done any public questions yet. Are we --
22 MS. KOROSEC: We hadn't planned on doing
23 that as part of the panels, we were going to save
24 that for the public comment period; however, we
25 are about five minutes ahead of time if you do

1 want to open it up for people in the room.
2 COMMISSIONER MCALLISTER: I think, yeah,
3 anybody in the room and I don't know how many
4 folks we have listening in, but it would be good
5 to open it up for comment, it looks like we have
6 a couple of interested parties here. Questions,
7 really, not comments.
8 MS. KOROSEC: Yeah, questions
9 particularly. Please.
10 COMMISSIONER MCALLISTER: I'm not sure --
11 you guys -- Lynette or Suzanne, you probably want
12 to manage the flow here. If you would introduce
13 yourself, that would be great.
14 MR. LUTZ: My name is Ray Lutz and I'm
15 with Citizens' Oversight. In the first part of
16 your presentation, you made the statement that
17 nothing to worry about really with Diablo Canyon
18 in terms of seismology concerns and we can go
19 forward with the way we are. Then we had a long
20 presentation about a lot of work that was done to
21 try to figure out what's known about these
22 faults, and it sounds like you don't even really
23 know. But I guess the question is, can you
24 answer this, what is the likelihood that we'll
25 have a devastating earthquake near Diablo Canyon

1 such that there will be an emergency at the plant
2 which will cause an evacuation? Since you said
3 there's no concern, I hope that you've gone
4 through the process of saying there's a certain
5 probability. Have you gotten to that point or
6 not?
7 DR. NISHENKO: That is the role of the
8 SSHAC process in the 50.54(f) reports that we are
9 currently undertaking right now.
10 MR. LUTZ: So would you like to retract
11 the statement that you think that it's safe
12 because you don't really know at this point?
13 DR. NISHENKO: I don't think I said that
14 it was safe in my remarks, I said that as of
15 today we have not uncovered any information that
16 indicates that we're outside of our licensing
17 basis.
18 MR. STRICKLAND: So let me add some
19 information on that. Where Diablo Canyon has a
20 seismic licensing and design basis that we've
21 been designed for and continue to be analyzed
22 for, that seismic design basis has been reviewed
23 by the Nuclear Regulatory Commission and Diablo
24 Canyon has determined to be safely configured and
25 continues to be safely operated.

MR. LUTZ: Apparently because you don't know too much now --

COMMISSIONER MCALLISTER: Not argumentative, please, just questions.

CHAIRMAN WEISENMILLER: Please, we were looking just for questions, not for commentary or argumentative statements.

MR. LUTZ: Okay, second question is, on the Wikipedia site for San Onofre, it states that there is 4,000 plus tons of waste on site and yet other sources say there's 1,400 tons. You have a certain number of assemblies identified in your slide, how many tons of waste exist at the San Onofre plant site?

MS. MCANDREWS: I don't know the exact number; obviously, we know how many fuel assemblies we have, we know what the loading of that in terms of spent fuel, and so there is a number. I don't know how it compares to Wikipedia, and we can provide that information.

MR. LUTZ: Okay, that's the question. Maybe if there's a weight per assembly, we can calculate it and figure it out, but since there is a conflict in the Wikipedia's -- and some people are quoting that, so I want to make sure

1 we get it accurate. Thank you.

2 COMMISSIONER MCALLISTER: Thanks for your

3 questions. Next up.

4 MS. MCANDREWS: Just to maybe add on, we

5 have provided that information in one of our data

6 requests to the CEC.

7 COMMISSIONER MCALLISTER: Great, and

8 those are public, right.

9 MR. GIBSON: Thank you, Commissioner

10 McAllister. I'm Bruce Gibson, I'm the Second

11 District Supervisor for the County of San Luis

12 Obispo and the County's Representative to the

13 IPRP.

14 COMMISSIONER MCALLISTER: Hey, great.

15 Thanks for being with us today.

16 MR. GIBSON: My pleasure. I sit on the

17 IPRP both as an elected official, but also

18 holding a doctorate in Geophysics with a 15-year

19 research career in High Energy Seismic Reflection

20 Surveys. If you would indulge me just a brief

21 amount of technical commentary, I would offer you

22 the chance, I'd be happy to chat with you later

23 about some of the technical issues in the High

24 Energy Survey proposal, in the IPRP, and

25 particularly between Dr. Nishenko and myself, we

1 had a robust conversation and it was my
2 conclusion that the technical details of the
3 proposal were not up to the state-of-the-art, and
4 that means both in terms of their environmental
5 impacts and the quality of the image that might
6 be gained. This has been hashed out in a long
7 series of things, so I won't go into that at this
8 point.
9 But I would like to also offer
10 Commissioners a question that I thought that you
11 might consider, and that is at the nature of the
12 policy question here is an assessment of the risk
13 to this very important facility. It is being
14 conducted under probabilistic seismic hazard
15 analysis and, you know, Dr. Nishenko and others
16 have gone through the stages there. Basically we
17 tried to find out what's the biggest earthquake
18 that might occur within the region, it has to do
19 with the length of faults, the depth of faults,
20 which way they trend, and how fast they move.
21 Out of that, we find that the bigger fault area
22 that we can find, the larger is the potential
23 earthquake. But in a completely counter-
24 intuitive way, if we find a larger magnitude
25 earthquake is possible, the probability of it

occurring is less, and so the overall hazard to the facility goes down. And as a public elected official, I've tried to explain that to folks as recently as this morning over coffee, and it is completely at odds with common sense in a lot of ways. I think it's actually something that this state, certainly my county, wants to discuss further with the NRC, and I'd be interested in Commissioner Weisenmiller's insights into interactions with the NRC as to whether we have the right policy framework, the right methodology, that we're talking about as a policy framework for deciding on risk to this important facility.

COMMISSIONER MCALLISTER: Great, thanks for your question.

CHAIRMAN WEISENMILLER: Thank you. Certainly anything you want to submit in writing, we'd appreciate.

MS. KOROSEC: All right, in the interest of time, I do want to take one question from the online folks, and then I think we'll need to move on to stay on our schedule. The question is from Tam Hunt from the Clean Coalition, it's for Mr. Nelson, he says, "Does SEC currently have a cost

1 estimate for decommissioning?"
2 MR. NELSON: There's actually a cost
3 estimate that's being done right now, as well, an
4 update. But the current estimate is
5 approximately $4 billion for the entire
6 decommissioning process.
7 COMMISSIONER MCALLISTER: All right,
8 thanks very much.
9 MS. KOROSEC: Thank you. And with that,
10 that's the end of this panel, we're due to take a
11 10-minute break before we start our second panel,
12 so if parties can be back here at 11:35? Thank
13 you very much.
14 (Break at 11:23 a.m.)
15 (Reconvene at 11:38 p.m.)
16 MS. KOROSEC: We're going to go ahead and
17 get started now, folks.
18 MS. WALTER: Okay, everybody. As soon as
19 everyone is seated, we're ready to being the next
20 panel and the last panel was the perfect lead-in
21 for a discussion of seismic hazard analysis
22 update. We have Cliff Munson, a Senior Level
23 Advisor from the U.S. NRC, Office of New
24 Reactors, Division of Site Safety and
25 Environmental Analysis, to go over the NRC SSHAC

1 Level 3 process. We have Chris Wills,
2 Supervising Engineering Geologist with the
3 California Geological Survey, to give us an
4 update on the state review of seismic projects,
5 and we have Dr. Jeanne Hardebeck, a Research
6 Geophysicist with the USGS, Earthquake Hazards
7 Team, to give a report on the uncertainties and
8 implications for California nuclear power plants
9 in the Central Coast. So without further ado, we
10 have Cliff Munson.
11 DR. MUNSON: Good morning,
12 Commissioners. My name is Cliff Munson, I'm a
13 seismologist from the NRC. And I'm here this
14 morning to give you an overview of the NRC
15 Fukushima Near Term Task Force recommendations
16 that concern seismic issues.
17 So once the accident occurred in March of
18 2011, the NRC formed a Near Term Task Force and
19 that Near Term Task Force published a report and
20 the NRC issued letters to each of the nuclear
21 power plants in March of 2012, and it specified
22 in those letters the seismic and flooding
23 reevaluations that we wanted to see for each of
24 the nuclear power plants.
25 So let me go over the seismic

1 recommendations. I'm primarily going to talk
2 about recommendation 2.1. Recommendation 2.1,
3 the first step is a seismic hazard evaluation for
4 each of the nuclear power plant sites. That
5 hazard evaluation is done in a probabilistic
6 fashion using our latest methods. Those hazard
7 evaluations are ongoing right now, each of the
8 licensees are performing those hazard
9 evaluations, and those will be submitted to us
10 next year for the Central Eastern U.S. plants,
11 and then in March of 2015 for the three Western
12 U.S. plants.
13 Depending on the outcome of those hazard
14 evaluations, some plants may need to do seismic
15 PREs, Plant Risk Evaluations, and take that
16 hazard information and bring it into the plant,
17 and so those Seismic Risk Evaluations will take
18 three years after the hazard evaluations and
19 then, depending on the outcome of that, the NRC
20 would perform regulatory actions after those.
21 Recommendation 2.2, which hasn't been
22 talked about too much is that the NRC is
23 proposing a rulemaking that this activity would
24 occur every 10 years on a 10-year cycle, as
25 opposed to just doing this once and then waiting

1 until the next Fukushima Daiichi accident. The
2 NRC is proposing that, on a 10-year interval that
3 we take a look at the hazards again and
4 potentially do more evaluations for risk for the
5 plants.
6 Recommendation 2.3 has already taken
7 place and those were seismic inspections of the
8 nuclear power plants where inspectors went into
9 the plants and looked at the condition of the
10 equipment with respect to seismic robustness.
11 And let me talk a little bit more about that one.
12 Excuse me, first, the organization, NRC has a
13 Japan Lessons Learned Directorate, and NRC
14 offices like the Office of New Reactors, which
15 I'm part of, are providing the technical support
16 and those are some of the key players. I know
17 many of you know Dr. Annie Kammerer, who has been
18 out here several times, she is working on
19 Recommendation 2.3 and also with Recommendation
20 2.1, and I'm the overall lead for Recommendation
21 2.1 and 2.3 under Dr. Chokshi.
22 So Recommendation 2.3, I just have one
23 slide on that, the Licensee sent inspectors out
24 into the plant, they looked at about 100 pieces
25 of seismic critical equipment that is needed for

1 the plant, and they looked at this equipment in
2 terms of the condition of the anchorages, the
3 potential for the equipment to interact, knock
4 together during earthquake, the overall condition
5 of the equipment, and they submitted these
6 inspection reports to the NRC in November of last
7 year. So these seismic walkdowns have given us a
8 brief snapshot of the readiness and the ability
9 of the plants to withstand earthquakes at their
10 design basis levels. So that was submitted to
11 the NRC in November of 2012 and we're currently
12 evaluating those walkdown reports.
13 Recommendation 2.1 is divided into two
14 phases, the first phase involves a hazard
15 evaluation which is ongoing, and if necessary a
16 risk evaluation. And then in Phase 2, the NRC
17 will take that information and determine if we
18 need to issue orders, if equipment needs to be
19 upgraded at the plant, how that should take
20 place, and so that will be Phase 2. The thing I
21 want to emphasize is that the hazard evaluations
22 are based on current practices for new reactors,
23 so what that means is in the past nuclear power
24 plants used deterministic kind of maximum
25 scenario-type earthquake to develop their design

1 basis ground motions; for new licensing, we use a
2 probabilistic approach, and I'll talk more about
3 that and discuss how we do that. And then, as I
4 said already, risk evaluations are needed for
5 those plants where the hazard exceeds the design.
6 So Licensees are performing probabilistic
7 seismic hazard analysis, they're following our
8 NRC guidance for 1.208. For the Central Eastern
9 U.S. plants, which are 96 units on 59 sites, we
10 have regional models that cover the entire
11 Central Eastern U.S., and those models were
12 recently developed as SSHAC 3 processes. NRC,
13 together with the Department of Energy and
14 industry, we worked over a three or four-year
15 period to develop these models and those models
16 are going to be implemented by the Licensees of
17 the Central Eastern U.S. nuclear power plants.
18 In the Western U.S., which now are three
19 sites, Palo Verdes, Columbia, and Washington, and
20 Diablo, we don't have a regional study for the
21 Western U.S., so each of those nuclear power
22 plants are performing SSHAC level 3 studies, and
23 then those studies will be used to develop ground
24 motion levels that we will evaluate. So let me
25 talk a little bit more about those.

1 What is the SSHAC process? The SSHAC
2 process is a structured framework for conducting
3 these multiple expert assessments and they're
4 basically model building exercises that are used
5 as inputs to the seismic hazard. These
6 procedures are defined by the Senior Seismic
7 Hazard Analysis Committee and that committee was
8 -- those procedures were developed in the 1990's.
9 The Chairman of that committee was Dr. Bob
10 Budnitz and he's still a consultant to the NRC.
11 And so let me talk a little bit more
12 about those features of the SSHAC process. So it
13 is a comprehensive collection of available data
14 models and methods. They're structured formal
15 workshops with interactions and key participants
16 in those workshops. The objective is to create a
17 model that incorporates a range of views that are
18 present in the broader technical community, and
19 there's a rigorous peer review of the entire
20 process.
21 So this is just an example of a SSHAC
22 Level 3 process. Some of the key issues here,
23 there's three workshops, Workshop 1, Workshop 2
24 and Workshop 3, the key players are the Technical
25 Integration Team, and the Participatory Peer

1 Review Panel. So the Technical Integration Team
2 is tasked with developing the model, either a
3 seismic source model, or a seismic ground motion
4 model, and the Participatory Peer Review Panel
5 follows this process along and to make sure that
6 the SSHAC process is carried out correctly.
7 Resource experts are invited to these
8 workshops, both Workshops 1 and 2, proponent
9 experts, people with specific views about the
10 faulting and different aspects of the earthquakes
11 are invited, and then Workshop 3, which hasn't
12 taken place yet for Diablo Canyon, they'll
13 actually present their preliminary model and get
14 feedback from the experts on their preliminary
15 model. These models are then fed into a PSHA,
16 Probabilistic Seismic Hazard Analysis.
17 This is PG&E's website, they're on
18 Workshop 3, which is upcoming, and they were in
19 collaboration with Southern California Edison and
20 Palo Verdes on the ground motion, so they've
21 already had one workshop on the ground motion,
22 and then the next two are yet to happen.
23 So the NRC is attending each of these
24 workshops. We're sending our staff geologist and
25 seismologists to these workshops. We participate

1 as observers at these workshops, so we don't
2 interactively intervene and disagree or discuss
3 the models, but we participate as observers and
4 our formal evaluation of the SSHAC procedure and
5 the models that come out of it will occur in
6 March of 2015 when they're submitted to us. So
7 over probably a year or more in time, we'll
8 evaluate these hazard models that come out of
9 these SSHAC workshops and determine if they
10 actually follow the SSHAC guidelines. Some of
11 the issues we look at: are all available data
12 models and methods thoroughly considered? Do
13 they adequately cover the models giving them
14 different weights? Do they actually explain that
15 and justify that? And then, do they provide a
16 technical basis for their decisions and document
17 the results?
18 This last bullet -- let me just put it
19 all up there so it's not confusing -- okay, so
20 this is currently each of them, Diablo is
21 performing their seismic source characterization
22 workshops. They're going to come up with a
23 seismic source characterization model that looks
24 at the seismic sources, their magnitudes,
25 locations, geometries, how often the earthquakes

occur, also ground motion model, what's the predicted ground motions from these scenario earthquakes? And what kind of ground motions do we expect to see at the Diablo Canyon site? This is all put together in a PHSA, a Probabilistic Seismic Hazard, and these are developed as Seismic Hazard Curves.

Now, the interesting thing about the Seismic Hazard Curves, on the Y axis is the probability of a ground motion exceedance, and on the X axis is the actual acceleration level. So the ground motion that we're particularly interested in for nuclear power plants has a probability of exceedance of about 1 in 10,000, 1 X 10-4, that's the probability that we're targeting. So we would come over to the Y axis at 10-4, come over and come down, and that's the acceleration level that we're going to consider, that we're going to use to compare to what the plant was designed to. So it's between 10 to the minus 4 and 10 to the minus 5, those are the ground motion levels. Those are 1 in 10,000 and 1 in 100,000, probability of exceedance per year. So those are the ground motion levels that we're targeting, that are the output of this PSHA,

1 which is fed by this SSHAC process.
2 These ground motions are put together as
3 a response spectrum, a ground motion response
4 spectrum and, as I said, that is roughly about a
5 one in 10,000-year ground motion level -- per
6 year ground motion level.
7 So we will take those ground motion
8 response spectra which are the red curves, and
9 will compare them to the plant design basis,
10 okay? That's usually referred to as a Safe
11 Shutdown Earthquake. Now, this is a ground
12 motion level that the plant should be able to
13 withstand and safely shut down key equipment and
14 components. This is not the ground motion level
15 that we expect to see extensive core damage, this
16 is a ground motion level that there's some slight
17 damage, but not enough damage that the equipment
18 can't shut down. It's called a Safe Shutdown
19 Earthquake.
20 The GMRS, that Ground Motion Response
21 Spectra, that 1 in 10,000 year ground motion
22 level, will be compared to the plant design. In
23 this outcome, the plant design are the SSE
24 earthquake exceeds the Ground Motion Response
25 Specter and this Licensee would be done and not

1 have to perform further analysis.

2 In this possible outcome, the plant SSE,

3 there was just a black curve, exceeds this

4 reevaluated ground motion hazard, this ground

5 motion response specter, exceeds it out to 10 Hz

6 right here. At the higher frequencies about 10

7 Hz, the ground motion response specter exceeds

8 the SSE. What that means is that most of the

9 equipment, most of the structures in the nuclear

10 power plants have frequencies -- the important

11 frequencies are between 1 and 10 Hz. Electrical

12 relays and equipment sensitive to really high

13 frequency ground motion shaking would be

14 susceptible to this higher ground motion. So

15 industry is currently performing shake table

16 testing of this higher frequency sensitive

17 equipment, like electrical relays, they're

18 putting them on tables, shaking them at really

19 high frequencies to see what kind of damage, at

20 what levels you start to get damage. So that's

21 ongoing right now.

22 The scenario that we expect to see for

23 Diablo Canyon is Outcome 3. Diablo Canyon will

24 be using their Double Design Earthquake as the

25 SSE for comparison and then this ground motion

1 response specter, this is -- we don't expect it
2 to look exactly like this, but we do expect
3 probably that we will see this Ground Motion
4 Response Specter which is coming from this
5 Probabilistic Hazard Analysis and also coming
6 from this SSHAC process. We do expect that it
7 will exceed the Double Design Earthquake. What
8 that means is that they will need to perform a
9 Plant Risk Evaluation, and let me talk a little
10 bit more about that.
11 So if the two seismic plant evaluations
12 are required, if the hazard exceeds the plant
13 design, if this GMRS exceeds the SSE, first is an
14 expedited plant evaluation where the Licensee
15 will look at a subset of equipment that is needed
16 to handle station blackout, loss of AC power, and
17 to keep the core cool immediately after an
18 earthquake, so that subset of equipment will be
19 looked at in terms of what is the seismic
20 robustness of that equipment, can it handle the
21 ground motion, and they have to evaluate that
22 equipment and then upgrade that equipment if it
23 can't withstand that earthquake ground motion
24 shaking.
25 COMMISSIONER MCALLISTER: Can I just ask

1 a clarification question? So who actually does
2 this research? Universities that you partner
3 with, or with consultants? Or do you have a lab
4 of your own? Or what's --
5 DR. MUNSON: No, these are all done by
6 the Licensees, so --
7 COMMISSIONER MCALLISTER: Oh, okay, so --
8 DR. MUNSON: -- yeah, so PG&E is going
9 to perform this expedited plant evaluation. Now,
10 this is going on while a complete plant risk
11 evaluation, PG&E is performing a complete plant
12 risk evaluation. Now, PG&E has already performed
13 what's called a Seismic PRA, Seismic
14 Probabilistic Risk Assessment, but they will need
15 to update that to account for this new
16 reevaluated ground motion levels that are going
17 to come out of the SSHAC process, that are coming
18 out of this Probabilistic Seismic Hazard.
19 COMMISSIONER MCALLISTER: Okay, but as
20 far as like taking a backup generator, or a
21 relay, or whatever it is and shaking it under
22 these new parameters, who actually does that
23 work?
24 DR. MUNSON: Well, a lot of it is, you
25 know, you can't actually take a huge piece of --

1 COMMISSIONER MCALLISTER: Absolutely, so
2 this is going to be modeling, right?
3 DR. MUNSON: Right, it's modeled. But
4 PG&E is doing this. The Licensees are doing this
5 and actually they'll be doing it at each of the
6 nuclear power plants where the reevaluated hazard
7 exceeds the design level.
8 COMMISSIONER MCALLISTER: Okay.
9 DR. MUNSON: Is there a way to go back,
10 please?
11 COMMISSIONER MCALLISTER: Presumably you
12 provide the specs for that work where you sort of
13 put them --
14 DR. MUNSON: Right, so --
15 COMMISSIONER MCALLISTER: -- what you're
16 expecting them to do exactly, so when they report
17 it back to you, you can evaluate it and make sure
18 that's done right?
19 DR. MUNSON: Yeah, so we've spent the
20 past actually two years working on a document
21 that outlines the specific details of what we're
22 looking for in terms of the hazard, as well as
23 the risk evaluation. The key parameters that we
24 want to see, the documentation that we want to
25 see, and as far as the plant risk evaluations,

1 they involve modeling of the plant systems,
2 looking at different accident scenarios for
3 station blackout, loss of coolant accidents,
4 everything that the earthquake can cause, they
5 use fault trees to determine pathways that lead
6 to either damage, or non-damaged states, and they
7 look at the equipment in terms of its seismic
8 capacity or fragility, this piece of equipment
9 could withstand .5 g, maybe this piece of
10 equipment can withstand 1 g of shaking. And then
11 they put this altogether as a seismic risk
12 quantification number. And so what we do there
13 is we take the seismic hazard curves, we convolve
14 it with the seismic fragility of the plant, and
15 we come up with the seismic core damage
16 frequency. So that will be done by the licensees
17 and this is due to us which is a segue for the
18 next slide.
19 So right now the hazard evaluations are
20 ongoing for the Central and Eastern U.S., they're
21 due in March of 2014 for the Western U.S. because
22 they did not have these regional models that were
23 developed for the Central Eastern U.S. We gave
24 them more time and those will be done in March of
25 2015, so the SSHAC workshops and everything will

1 be done by then. These enhanced interim actions
2 will be then conducted by Central and Eastern
3 U.S. plants, and then by the Western U.S. plants
4 at a later date. Again, this is plants where the
5 new hazard exceeds the design basis, or the
6 reevaluated hazard exceeds the design basis
7 level.
8 Now, also we have these plant risk
9 evaluations which I just talked about, and we're
10 going to group these into higher priority and
11 lower priority. The higher priority risk
12 evaluations are situations where the reevaluated
13 ground motion levels were much higher than the
14 design levels. So those will be higher priority
15 plants and those will be group 1, and those will
16 be completed in the summer of 2017. Now, I have
17 drawn this back here, this line back here, for
18 the risk evaluations because many plants already
19 known that their hazard is going to exceed the
20 design basis and they've already started doing
21 their seismic PRAs, their seismic risk
22 assessments. For example, PG&E is in that group.
23 Then the lower priority groups will extend out to
24 2019, and if we need group 3, it would extend out
25 to 2020. So that kind of gives you a timeline of

1 the activities that are going on for this
2 Recommendation 2.1, which is again a hazard piece
3 and then two risk pieces if necessary. So
4 hopefully that has cleared up some of the
5 questions you may have had on that. So that's my
6 presentation. Thank you.
7 CHAIRMAN WEISENMILLER: Thanks. I've got
8 two brief questions. The first is, does this
9 analysis focus on -- you know, both the walkdown
10 and the risk assessment -- is it focused only on
11 the nuclear components? Or does it include the
12 non-nuclear components at the site?
13 DR. MUNSON: It's primarily focused on
14 the equipment in the nuclear power plant, the
15 equipment needed to mitigate different accident
16 scenarios. So it's primarily seismic category 1
17 equipment, but there are seismic equipment that's
18 not category 1 that is also included as part of
19 that seismic risk evaluation. But primarily it's
20 the important pieces of equipment in the plant
21 that need to be able to withstand seismic
22 shaking.
23 CHAIRMAN WEISENMILLER: Yeah. My
24 impression was you were looking pretty much at
25 safe shutdown, now it may be the plant is out

1 pile after that for the non-nuclear components,
2 but primarily safe shutdown.
3 DR. MUNSON: Right. So this enhanced
4 interim evaluation is looking at equipment needed
5 to handle -- to keep the core cool, to handle
6 station blackout immediately after an earthquake,
7 whereas the risk evaluations are looking at
8 equipment that actually would be needed over a
9 longer term basis, so it's also a more complete
10 risk evaluation of the plant.
11 CHAIRMAN WEISENMILLER: Okay, and is the
12 SSHAC process -- is that a public process?
13 DR. MUNSON: The SSHAC?
14 CHAIRMAN WEISENMILLER: The SSHAC
15 process, yeah.
16 DR. MUNSON: No. The SSHAC process is
17 up to each of the licensees to determine whether
18 they want to make the meetings public or not.
19 The NRC doesn't have any specific guidance or
20 requirements that the SSHAC meetings need to be
21 public meetings. All NRC meetings are public
22 meetings. And when we evaluate the SSHAC work
23 that was done, the SSHAC procedures, those will
24 be public meetings, but the Licensees have the
25 option of whether to make the meetings public or

1 not. Another point is much of the work that is
2 done on this SSHAC model development is done in
3 between the meetings. The SSHAC workshops are a
4 forum for the experts to come and provide their
5 views on the model and the different scenarios
6 for faulting in earthquakes, so there's no NRC
7 requirement that they be made public.
8 CHAIRMAN WEISENMILLER: Thank you.
9 Thanks for being here.
10 COMMISSIONER MCALLISTER: Thank you.
11 MR. WILLS: So I guess we move on. I'm
12 Chris Wills, Supervising Engineer and Geologist
13 at the California Geological Survey, here
14 representing the Independent Peer Review Panel.
15 Most of the genesis of the IPRP, you know much
16 better than I do. It's just a reaction to AB
17 1632 in 2006, and the resulting report done by
18 the Energy Commission which recommended various
19 seismic studies for the nuclear power plants.
20 And a couple of words on this slide which we took
21 from the AB 1632 report to kind of describe the
22 charge of the IPRP, and what we've taken is our
23 mission which says that the operators of the
24 plants could use three-dimensional geophysical
25 seismic reflection mapping and other techniques

1 to reduce the uncertainty and seismic hazards at
2 the plants and then went on to state the
3 supplement PG&E Long Term Seismic Program and
4 help resolve uncertainties surrounding seismic
5 hazard at Diablo Canyon, and then further should
6 prioritize and include further investigations
7 into the seismic setting at SONGS. And so we've
8 taken those as kind of the charge of the IPRP is
9 to review the seismic studies being proposed for
10 both of these plants, comment on the potential
11 for those studies to reduce the seismic hazards.
12 So our focus is a little bit different from the
13 SSHAC process, it's on the new studies that could
14 be done to improve our understanding of seismic
15 hazards, and to focus on those studies that can
16 most reduce the uncertainty of seismic hazards at
17 the plant. And so IPRP is a group of state
18 seismic hazard specialists from the California
19 Geological Survey, Coastal Commission, Energy
20 Commission, Public Utilities Commission, Seismic
21 Safety Commission, Cal EMA, and, as Bruce
22 mentioned, from San Luis Obispo County. So we've
23 met a number of times. And we're working in
24 parallel and with as much knowledge as we can
25 gain of these other programs that are ongoing,

1 both PG&E's studies, they are relicensing
2 applications through NRC, the SSHAC Level 3
3 process you've just heard about, we've been
4 invited to and have been observers at all the
5 SSHAC workshops so far, and then also the
6 development of the Uniform California Earthquake
7 Rupture Forecast Version 3 by the Working Group
8 on California Earthquake Probabilities, that's
9 the Seismic Hazard Model that underpins the
10 National Seismic Hazards Maps, which are prepared
11 every few years by the U.S. Geological Survey and
12 the California Geological Survey participates and
13 provides most of these seismic hazard -- the
14 fault information for California.
15 So all of these things are ongoing and we
16 try to stay aware of all of these and then build
17 on what's going on in these different studies so
18 we can comment on what's going on at Diablo
19 Canyon.
20 We've had a number of public meetings and
21 issued a number of reports. Most of these are
22 kind of reactionary; PG&E will present what they
23 are planning to study and how they're planning to
24 study it, we will write a report saying we think
25 this is a good idea, or you can do something

1 slightly different here, or, okay, have you
2 considered going a little bit farther in this
3 direction? Those reports are issued starting in
4 2011. And then we've transitioned into probably
5 the next couple of reports in which we've done as
6 thorough a survey as we can of what we know about
7 a particular seismic hazard parameter, and then
8 say how well does the existing data constrain
9 that parameter and what can PG&E do to decrease
10 the uncertainty of seismic hazards by better
11 understanding that parameter. Our IPRP report 5
12 issued in March of this year is the first of
13 those, we focused on the Hosgri Fault, say how
14 well do we know this fault, the past studies,
15 what more do we want to know, and then what PG&E
16 could be doing to further work on that. I don't
17 think it actually led to additional work, but it
18 does provide additional encouragement for PG&E to
19 do the kind of studies that Stu described
20 earlier, where they're looking at these channels
21 from below sea levels, across the Hosgri Fault,
22 and you can actually look at trying to get a
23 better idea of the slip rate on the Hosgri, both
24 north and south of the plant. And so those are
25 our reports so far.

1 So what we started out doing is asking
2 PG&E what are you planning to do and why are
3 these various studies important. And so we
4 looked at all the various things around the
5 plant, the various studies they have planned.
6 This is an image that's borrowed from
7 PG&E and all of the images in this presentation
8 are borrowed from somebody, rather than created
9 by the IPRP, although I will note that all of the
10 fault lines on the map are borrowed by PG&E from
11 the California Geological Survey Fault Activity
12 Map of California, except for the pink one, of
13 course, which is Jeanne's. Though they're doing
14 a series of studies on the faults around the
15 plant, the Hosgri Fault is the big player in
16 this, by far the highest contribution to hazard
17 because it's the highest slip rate fault. Other
18 important faults are the Shoreline Fault, other
19 minor faults on the south side of the Irish
20 Hills, and the Los Osos certainly falls on the
21 north side of the Irish Hills. So we're looking
22 at what can we learn about all of these faults
23 and how much difference does it make. And one of
24 the important things on seismic hazard analysis
25 is that you don't want to spend all of your

1 effort trying to better constrain a parameter
2 that doesn't make any difference.
3 And so what we're trying to look at in
4 Seismic Source Characterizations, this is the
5 same image that Stu showed earlier, in which of
6 these parameters does it make a big difference in
7 the Seismic Hazard Analysis. In terms of the top
8 few, it's the slip rate on the Hosgri Fault
9 because that is the highest slip rate fault in
10 the region. The Hosgri Dip is important because
11 if the fault dips towards the plant that's closer
12 to the plant, the hazard is higher; also
13 important is the slip rate on the Hosgri Fault,
14 on the Shoreline Fault, because the slip rate
15 essentially governs how much energy in the
16 system, how much energy can be released in
17 earthquakes by that particular fault.
18 Other parameters that we could focus on
19 are less important as we've tried to focus on the
20 top few. We've also focused more recently on
21 parameters that are not part of the seismic
22 source characterization, but are part of the
23 ground motion characterization in the hazard
24 analysis. And those can be as important as the
25 slip rate.

1 So what we've done in a series of reports
2 is gone through the various parameters and say
3 what can you do to study these, and then what is
4 PG&E currently proposing, and is this something
5 that is very important to have more information
6 of this kind to study. And so in our reports we
7 looked at the slip rate on the Hosgri Fault, how
8 can you study it, commented on whether this is
9 the right way to study this parameter. In
10 general, we've agreed with PG&E's approach, at
11 least the various seismic hazard parameters, and
12 in terms of these things which you can use, the
13 low energy 3D seismic surveys, of the type Stu
14 presented earlier, we think these are a key type
15 of study that we recommend more of to better
16 constrain these parameters, both the slip rate on
17 the Hosgri, the slip rate on the shoreline, and
18 then also at the south end, the extension of the
19 shoreline towards shore on the east.
20 Just to give a couple of examples, I
21 think, from PG&E's studies, and you saw a couple
22 earlier in Stu's presentation, they've been doing
23 an extensive survey off of Point Buchon of the
24 intersection of the fault, and they're able to
25 draw these really impressive 3D volumes of the

1 shallow part of the earth's crust and you can see
2 the folds and faults that are expressed within
3 those layered sedimentary rocks, and then to be
4 able to trace those faults through -- in this
5 survey volume, they've been able to trace from
6 the Shoreline Fault up through the now Point
7 Buchon Fault as that extends very close to the
8 Hosgri Fault, and so to be able to show the near
9 surface, at least, extent of these faults is very
10 valuable information. And as you go to other
11 places, you can actually look at the slip rate,
12 use the same to look at the slip rate, as Stu
13 described earlier, so these are all very
14 important types of investigations, and the types
15 of investigation that the IPRP has gone on record
16 to say this is the right thing to do, we need
17 more of this kind of information.
18 Other types of information can also come
19 from either 2D or high energy 3D on land surveys,
20 also things that Stu described earlier. The on-
21 land surveys of the Los Osos Fault and other
22 thrust faults in the Irish Hills are critical to
23 understanding both the slip rate and the geometry
24 of those faults, the potential for any other
25 previously unrecognized thrust faults in the

1 subsurface beneath the Irish Hills is something
2 that needs to be investigated, needs to be
3 particularly understood, and so this is the right
4 kind of investigation to do that. As Stu pointed
5 out, there's a whole series of investigations
6 they've done throughout the Irish Hills, those
7 are studies that they've been interpreting since
8 they did those originally in 2011-2012. We are
9 hopeful that they will give a very good 3D image
10 of the layers of sedimentary rock, bedrock, and
11 where the faults are within that whole pile of
12 geological material underneath the plant, and be
13 able to give us a better handle on how active
14 those faults are.
15 I would point out there are a whole
16 series of investigations, and this was also
17 mentioned, that things were best investigated by
18 the high energy 3D seismic, and that includes the
19 dip of the Hosgri Fault as it extends to depth in
20 the seismogenic depths, how the Hosgri and
21 Shoreline Faults interact at seismogenic depths,
22 and then other details in the geometry of the
23 Shoreline Fault, all were targets of the high
24 energy 3D seismic. I would point out also that
25 there was initial proposals for investigating the

1 step over zone between the Hosgri and San Simeon
2 in which we looked at that and said that's
3 probably not worth pursuing that investigation,
4 the potential impacts outweigh the potential
5 change in the seismic hazard evaluation. So in
6 advance of the State Lands Commission and Coastal
7 Commission, we had looked at these and said you
8 probably don't need to pursue this one leg of it,
9 but the other ones we were supportive of getting
10 additional information on these parameters. But
11 as you've heard, the Coastal Commission decided
12 the impacts of that kind of study was too great,
13 and they denied the permit. Just to give you
14 that same geometry of the different studies that
15 were proposed at the Shoreline and the Hosgri
16 Fault and some of the other faults, the Los Osos
17 Fault which comes into San Luis Bay, those are
18 all things that, you know, there's no such thing
19 as bad data about where the fault is and how they
20 interact, but those were probably lower priority
21 than the things like the slip rate studies that
22 are ongoing, but these are thing that would have
23 helped constrain some of those parameters.
24 Just a couple words about the San Onofre
25 research projects that were ongoing, and I guess

1 some of them will get wrapped up in some way.
2 There's a whole series of projects they had very
3 neatly laid out in a phased approach to
4 understand, the seismic hazards at San Onofre;
5 what it comes down, this is an image from one of
6 our UCERF Workshops from John Shaw at Harvard.
7 There is a Newport - Inglewood Fault Zone
8 offshore and there's Oceanside blind thrusts
9 offshore, it makes a really big difference to the
10 hazard zone in California, which one of those is
11 the master fault. And then to put it in a little
12 simpler two-dimensional diagram, we note there's
13 thrust faults offshore, they formed some of them
14 from relatively recent sediments, we know in a
15 near offshore there's a slight slip fault. We
16 don't know what happens when those things get to
17 seismogenic depths because either the Newport -
18 Inglewood could continue all the way through the
19 crust as a vertical fault and cut off these
20 thrust faults, or the thrust faults could
21 continue into the seismogenic depths and cut off
22 the bottom part of the Newport - Inglewood. If
23 that's the case, then the lower side of that
24 thrust fault is beneath the coastline and beneath
25 a lot of people, besides a nuclear power plant

1 that's about to be closed -- is being closed.
2 There are other ways to study this
3 besides the high energy seismic being proposed.
4 These are detailed on-land, you know, a geologist
5 looking at the dirt very closely, studies by Tom
6 Rockwell and others, that he's been continuing
7 this work which is published in '92, and if that
8 thrust fault continues underneath the shoreline,
9 it should deform these marine terraced platforms
10 that were eroded 100,000 or 200,000 years ago,
11 and if you don't see that deformation of those
12 surfaces, then that thrust fault isn't very
13 important because it's not moving very fast, if
14 at all. So there's other studies like this that
15 were ongoing. It would be nice for implications
16 overall, Southern California seismic hazard, to
17 see some of these continue, but I suspect that
18 the continued support from SCE for these is going
19 to be minimal, at best.
20 So just to sum all of that up, the IPRP
21 for Diablo Canyon has been reviewing these
22 seismic study plans to ensure that studies will
23 result in increased understanding or decreased
24 uncertainties in seismic hazard. And we've been
25 putting reports together saying these are the

1 kinds of studies we'd like to see more of, or
2 trying to direct PG&E to make the most bang for
3 our buck, the most impacts in terms of seismic
4 hazard.
5 And then we've started on an IPRG report
6 for San Onofre, we actually never got that
7 activated through an Interagency Agreement from
8 PUC, but we've done one report and attended a
9 couple of meetings and they had some detailed
10 studies that at this point are probably not going
11 to happen.
12 COMMISSIONER MCALLISTER: But what's
13 your view of, just on the San Onofre studies,
14 what's your view of what subset of the originally
15 proposed studies might still be needed just
16 because of the long term issues there for
17 storage?
18 MR. WILLS: I don't know anything about
19 the vulnerability or the design of storage
20 facilities.
21 COMMISSIONER MCALLISTER: But presumably
22 there's going to be something there for the next
23 however long?
24 MR. WILLS: Presumably there's going to
25 be something there for a long time. If you can

do your models to say whether -- if you presume that the Oceanside blind thrust is the master fault and that's closest to the plant, and you put as high a slip rate as you can allow on it, and then you calculate your ground shaking from that, then you basically look at the worst end of the parameters and compare that to your design for your storage, rather than for your existing plant, I suspect the storage facilities maybe can comment, that's going to be a more resilient kind of a structure than an operating plant.

COMMISSIONER MCALLISTER: So you might have an initial study just to put a bound on the possibilities and see if you need --

MR. WILLS: Yeah, I think you could look at the sensitivity of the seismic hazard analysis to some of these parameters that you don't know very well, which is the kind of thing we're doing already, and say, you know, does this exceed the design parameters for your storage facilities, rather than for your plant.

COMMISSIONER MCALLISTER: Thanks.

MR. WILLS: Any other questions?

CHAIRMAN WEISENMILLER: Actually, I guess the general question, in terms of looking

1 back at the process PG&E has gone through, what
2 would be your takeaway in terms of lessons
3 learned?
4 MR. WILLS: I think -- the process
5 they've gone through in terms of the
6 investigation process? Or the other permitting
7 process?
8 CHAIRMAN WEISENMILLER: Yeah,
9 investigation and permitting.
10 MR. WILLIS: In general, I think they've
11 been pretty good in focusing on what is important
12 for understanding the seismic hazards of the
13 plant. I think when AB 1632 was enacted, there
14 wasn't a very good understanding on how much
15 effect some of the information you would get from
16 a high energy seismic survey, how much effect
17 that would have on seismic hazard analysis at the
18 plant. I don't think there was that feedback in
19 terms of both the Energy Commission report and
20 the original legislation didn't have that
21 feedback from the people who did seismic hazard
22 analysis, saying what are we going to learn from
23 this and how much is this going to change our
24 knowledge of seismic hazards at the plant, and so
25 I think that's kind of the key takeaway.

The investigations that have been done to date, I think, are focusing on the right things which are predominantly slip rate on the faults, and those are things you learn from the low energy seismic of the near surface expression of the faults.

COMMISSIONER MCALLISTER: Just one other, and this is more general. You seem like the guy on the panel today that could maybe answer this. It's a more general question, so a lot of resources have gone into this, and I'm kind of just wondering how much new technology was developed or deployed, or new methods were used in this process? I mean, was it pretty much lifted from the oil and gas industry and those kinds of geomorphic -- those kinds of investigations? Or was this really a new thing that created new knowledge that has some value potentially in some other area?

MR. WILLS: I'm not really familiar with how the process is -- a lot of the high energy seismic is the techniques that are used in the oil industry. I'm not sure who else uses or has used -- and maybe Stu can give some more insight on this -- the 3D low energy of the very near

1 surface materials is not something you would ever
2 do for gas exploration, it's something that is
3 applicable and is stunningly useful for fault
4 evaluations in the near surface, and so this kind
5 of a really detailed survey of the near surface
6 sediments as they interact with faults is
7 something that is new and I don't think seen
8 before.
9 COMMISSIONER MCALLISTER: Thanks. And
10 just the reason I asked, if this does have some
11 value for emergency planning, for looking at our
12 urban areas somehow, or understanding broader
13 impacts of seismic activity, then there could at
14 least be some upside to this investment, right?
15 MR. WILLS: All of these. And just a
16 little bit more background, I've been very
17 involved in the development of the UCERF, Uniform
18 California Earthquake Rupture Forecast, a member
19 of the working group on California Earthquake
20 Probabilities, currently a member of the Advisory
21 Panel for the National Seismic Hazard Maps, and
22 all of this kind of information, anything we know
23 about fault activity does get folded into that.
24 And those seismic evaluations that are done for
25 all the State of California and nationwide

1 underpin the Building Code. And so this
2 information gets used for ordinary buildings and
3 is very broadly applicable beyond these plants.
4 COMMISSIONER MCALLISTER: Great. Thanks
5 for that. Thank you very much for being here.
6 That was helpful. So let's move on to the next
7 speaker.
8 DR. HARDEBECK: Thank you for having me
9 here today to talk. I'm just going to present a
10 fairly brief overview of the faults in the
11 vicinity of Diablo Canyon Nuclear Power Plant,
12 talk about what we know about these faults, how
13 we know what we know, and particularly what are
14 the big things that we don't know currently about
15 the faults that are, of course, big sources of
16 uncertainty.
17 So when we do Probabilistic Seismic
18 Hazard Assessment -- and this is primarily what
19 the USGS does when we and our partners produce
20 products like the UCERF Map, is that we're
21 looking at the probability of an earthquake
22 occurring in a particular place during a
23 particular timeframe where the probability of
24 some level of ground shaking occurring in a
25 particular place during some particular

1 timeframe. And this is also the sort of
2 probabilistic assessment that one might do at a
3 particular site like a power plant site.
4 There's a lot of ingredients that go
5 into these types of maps and we of course need to
6 know about the faults, and there's two basic kind
7 of ingredients that we need that have to do with
8 the faults, one is that we need to know the fault
9 geometry, we need to know where they're located,
10 how long they are, what's their strike and dip,
11 and the rake, what direction they're moving, and
12 we need to understand how they connect to other
13 faults. The second thing we need to know about
14 the faults is how fast are they moving because
15 the faster moving fault is of course more likely
16 to produce an earthquake than a slower moving
17 fault, and there's a number of ways that we can
18 get to this idea of how fast a fault is moving.
19 So I'm going to then focus today just on
20 what we know both about the geometry and the slip
21 rate of faults in the vicinity of Diablo Canyon.
22 And this is a map, there's really four and
23 possibly just a couple more faults that we really
24 need to understand to understand the seismic
25 hazard near Diablo Canyon. The most important

1 fault in the region is the Hosgri Fault, which is
2 part of the San Andreas Plate Boundary System in
3 California, and the other faults are much smaller
4 local faults.
5 So I'm going to break these faults down
6 into two systems and talk about them separately.
7 The first system is going to be the Strike-slip
8 fault system, and this is the Hosgri Fault and
9 the Shoreline Fault, and these are faults that
10 are near-vertical and the two sides of the fault
11 move horizontally relative to each other. And
12 so, as I said, of course, the Hosgri Fault goes
13 off both sides of this map, it's a fairly large
14 fault, and the Shoreline Fault is here along the
15 coast near Diablo Canyon.
16 So what we know and don't know about
17 these faults, their geometry, we actually have a
18 pretty good handle on their geometry. It's not
19 perfect, there are some small uncertainty in
20 everything we know, of course, but we know the
21 geometry of these faults actually pretty well.
22 We know that they're both near-vertical and we
23 know that they both move in a strike-slip sense.
24 We've seen that they appear to join at depths, we
25 see this primarily in earthquake locations, the

1 locations of small earthquakes that are occurring
2 at depths of two to 10 kilometers in the crust,
3 the depths at which large earthquakes also occur,
4 so this makes us think that it's possible to at
5 least consider whether they could rupture
6 together.
7 Currently, the southern end of the
8 Shoreline Fault is unknown and we don't know how
9 it then connects to any other faults south of the
10 Shoreline Fault. In terms of the slip rate,
11 there is an estimate of the slip rate of 1-3
12 millimeters a year from geologic observations
13 where the fault goes onshore near the City of San
14 Simeon. Unfortunately, that's a ways away from
15 the power plant and we don't know the exact slip
16 rate of the Hosgri Fault directly offshore of
17 this power plant, but we can expect it to be
18 fairly similar to this range of estimates from
19 San Simeon.
20 On the other hand, while we have some
21 estimate of the Hosgri slip rate, we really don't
22 have a very good handle on the Shoreline slip
23 rate at all.
24 So just to go through some of the ways
25 that we know what we know about the geometry of

these faults, you've seen a number of examples today already of seismic surveys, so I'm not going to go through the seismic survey sort of data, but I'm going to show some other data that we have been working with.

When we have a fault and we have different kinds of rock on another side of the fault, sometimes these rocks have differences both in their magnetic properties and also in how dense they are, and these differences can cause small fluctuations in the earth's magnetic field and in its gravity field. And we can measure these fluctuations, and this is an example of fluctuations in the earth's magnetic field, and use them to back out models of what the faults must look like at depth in order to produce these patterns.

And this is work done by some colleagues of mine at the USGS where they found that, to fit the gravity and magnetic data, the Hosgri Fault needs to be near-vertical or possibly very slightly dipping at seismogenic depths.

Other colleagues at the USGS have also looked at the Shoreline Fault Zone, this is magnetic data along the Shoreline Fault that was

1 referred to earlier today as having some
2 interesting magnetic signals along the fault,
3 there's actually a fairly sharp magnetic signal
4 in a number of places along the fault; this
5 strongly implies that the Shoreline Fault is a
6 vertical fault, or very near-vertical.
7 We also have information from
8 earthquakes. These are the small earthquakes
9 that align along the Shoreline Fault, this is
10 part of the Hosgri Fault. We can see
11 unfortunately that this line of earthquakes kind
12 of peters out down here just south of Point San
13 Luis and there's no further earthquakes on the
14 Shoreline Fault to the south of here. We do see
15 a continuation of that magnetic anomaly implying
16 that the Shoreline Fault does continue further to
17 the south than what we can see with the
18 earthquakes, but at this point it's really
19 unclear where exactly the southern end is and how
20 it may interact with any other faults.
21 Looking at the small earthquakes, we can
22 try to use these small earthquakes to tell us
23 something about the fault geometry at the depths
24 where earthquakes occur, so this is from some
25 work of my own where I've been using a published

1 peer reviewed objective technique to take the
2 locations of earthquakes and try to back out
3 where the fault plans are that these earthquakes
4 are occurring on. And in this map here, the red
5 plane and the red earthquakes are the Shoreline
6 Fault, and the blue plane and the blue
7 earthquakes are the Hosgri Fault. And we can see
8 from this technique, again, that the Shoreline
9 Fault is one continuous fault, it's not broken up
10 into any segments that would be barriers to
11 earthquake rupture, and we also see that it
12 reaches all the way to its intersection with the
13 Hosgri Fault. We see that it's near-vertical.
14 We also see that the Hosgri Fault offshore of the
15 plant is near-vertical to dipping somewhat
16 towards the plant, but not very shallowly, near-
17 vertical, but dipping somewhat towards the plant.
18 And for those of you who are familiar with focal
19 mechanism studies, I'm not going to go into the
20 details of that today, we see a very similar
21 thing if we look at the focal mechanisms of the
22 earthquakes occurring along these faults.
23 The fact that the Shoreline Fault and
24 the Hosgri Fault appear to connect at the depths
25 at which earthquake occurs brings up the question

1 of whether or not multi-fault earthquakes could
2 occur. So we've seen in a number of other places
3 around the world, we've seen large strike slip
4 earthquakes that have taken place on a number of
5 faults that connected during the earthquake, or
6 where the earthquake jumped between faults during
7 the seismic rupture.
8 So because we've seen this in a number
9 of places around the world, it seems reasonable
10 to assume that at any connected fault system we
11 should be considering that multi-fault
12 earthquakes could occur, unless we have some
13 evidence to the contrary.
14 So a hypothetical earthquake is what if
15 an earthquake occurred along the northern part of
16 the Hosgri Fault, north of its intersection with
17 the Shoreline Fault and along the Shoreline Fault
18 itself. There's been some debate about whether
19 this sort of earthquake could occur and it
20 basically centers on this idea. If you have an
21 earthquake that starts up here and is rupturing
22 south along the Hosgri Fault, when it reaches the
23 juncture of these two faults, it has a choice,
24 does it continue growing on the Hosgri Fault, or
25 does it sort of take an exit and go off onto the

1 Shoreline Fault? And there's been some modeling
2 studies that suggest that, in this particular
3 configuration, this earthquake would almost
4 certainly continue to go on the Hosgri Fault;
5 however, the work that's been done to date, the
6 modeling work that's been done to date that
7 suggests this, is actually fairly simple work
8 that includes some very simplifying assumptions
9 about the fault structure, about the stresses
10 acting on faults, and about how the strength of
11 faults evolves during an earthquake. So I think
12 this is a question that's really still sort of --
13 the jury is still sort of out on this question
14 until we have some more sophisticated modeling
15 and some more comprehensive look at whether or
16 not this could happen.
17 One thing that should not be
18 controversial, though, is what would happen if an
19 earthquake started on the shoreline fault and was
20 moving north. If it had the energy to continue,
21 it really has nowhere else to go except to
22 continue north on the Hosgri Fault, so to me this
23 seems like a very plausible scenario that an
24 earthquake could begin on the Shoreline Fault and
25 continue north on the Hosgri Fault.

1 So when we talk about these hypothetical
2 earthquakes, we can also put some possible
3 magnitudes on them and some possible maximum
4 magnitudes for earthquakes simply because the
5 length of an earthquake scales with the magnitude
6 of the earthquake. If an earthquake occurred
7 just on the Shoreline Fault, defined by its
8 seismicity, the largest possible earthquake would
9 be a 6.7. If the Shoreline Fault extended south
10 all the way to the coast, this would be about a
11 6.8. So you can see just from these estimates
12 that the actual location of the southern end of
13 the shoreline fault is not a hugely critical
14 uncertainty for the estimate of seismic hazard
15 due to this fault; however, knowing what happens
16 to the southern part of the Shoreline Fault and
17 whether it connects with other faults to the
18 south may give us some idea of whether we could
19 expect connecting multi-fault earthquakes to the
20 south, and would also inform our idea of how all
21 these faults in the area interact together.
22 Just a rupture of the Hosgri Fault would
23 be about a magnitude 7.5, and if this
24 hypothetical earthquake did occur on the
25 Shoreline plus Hosgri Fault, this would be a

magnitude 7.2. So this hypothetical earthquake that we're talking about of Shoreline and Hosgri ruptured together does not make sort of the largest earthquake we might see, it's only an important hypothetical earthquake to consider just because it comes so close to the plant.

There are only very weak bounds on the slip rate of the Shoreline Fault. If we just look at the rate of small earthquakes that have occurred, we can sort of extrapolate out sort of a lower bound for how often these magnitude 6.7 earthquakes might occur, and we can also put an upper bound just by assuming this is slipping no faster than the Hosgri Fault. This gives us a huge range of recurrence times for this magnitude 6.7 earthquake, anywhere from 1,000 years to 67,000 years, which is sort of an unexceptionally wide range for doing a very good seismic hazard assessment. So this is why these studies to actually find offset features on the Shoreline Fault and get dates for them is such an important key thing that needs to be done.

So you've already seen examples of some of these offset channels along the Shoreline Fault. I'll just point out another interesting

1 geological features that colleagues of mine
2 discovered along the Hosgri Fault near its
3 intersection with the Shoreline Fault, there is a
4 basin and an uplifted area with what looks like a
5 second strand of the Hosgri Fault, set off of the
6 main strand, and they hypothesize that this
7 structure really shows the movement of the
8 Shoreline Fault since it's been in its current
9 configuration with the Hosgri Fault, as the two
10 sides of the Shoreline Fault move relative to
11 each other, this block gets kind of pushed into
12 the Hosgri Fault and eventually it cuts through
13 this block, leaving this basin in an uplift, and
14 so this is a direct result of the motion of the
15 Shoreline Fault, and this is perhaps something
16 also that, if it could be dated, could give us an
17 idea of the slip rate of the Shoreline Fault.
18 So just to turn my attention, then,
19 briefly to the rest of the faults in the area
20 which make up a reverse fault system, a reverse
21 fault is one where one side of the fault is
22 moving up and over the other side of the fault,
23 and in the Diablo Canyon area, what's happening
24 is that this Irish Hills block is being uplifted,
25 so it's the top block, or the hanging wall, we

1 call it, on these reverse faults. We're pretty
2 sure that the Los Osos Fault is the fault that's
3 responsible for the uplift of the Irish Hills on
4 the northeastern side, and at this point I think
5 we're not very sure exactly what the fault
6 configuration on the southwestern side of the
7 Irish Hills really looks like, but the Shoreline
8 Fault is probably not contributing very much to
9 the uplift of the Irish Hills, there's the San
10 Luis Bay Fault that is not a fully understood
11 structure, and there may be other structures, as
12 well.
13 So just to summarize that, we have some
14 idea of the geometry of the Los Osos Fault, but
15 it's not that well constrained, and we need to
16 know more about other structures. On the
17 positive side about the uplift of the Irish
18 Hills, there's actually pretty good geologic
19 observations giving us the uplift rate of the
20 Irish Hills, and if we just understood more about
21 the geometry of the faults that were causing this
22 uplift, it would be pretty easy to get slip rates
23 for those faults.
24 So just to give you an idea of what this
25 Irish Hills problem really looks like, here's

1 four slides from Bill Lettis' talk at the last
2 SSHAC Source Characterization Workshop that I
3 grabbed out, that these are four different
4 scenarios for what a cross section through the
5 Irish Hills near the power plant might look like,
6 that on the northwestern side here, we have the
7 Los Osos Fault, and we're not really sure if it's
8 a dip, and we're not really sure if it extends
9 all the way beneath the power plant, or whether
10 it may be cut off by other structures, or whether
11 its deep so stipulated that it does not quite
12 reach being directly under the power plant.
13 There's also a number of different
14 scenarios from what may be going on in the
15 southwestern side, whether the San Luis Bay Fault
16 is a major fault cutting through, or maybe it's
17 just sort of a small fault connected in some way
18 to the Shoreline Fault, it's been hypothesized
19 that there's this San Luis Range Fault dipping
20 directly under the power plant, and there may be
21 situations where most of the activity is actually
22 going on in a nearly vertical fault.
23 So this is a big uncertainty not just in
24 our understanding of how this fault system around
25 Diablo Canyon actually works, it can have direct

implications for hazard at the plant because these different scenarios have faults coming either fairly close to the power plant, or actually not very close to the power plant, and how close these faults come to the power plant is going to have a fairly large effect on how they contribute to the hazard.

So my work is working with small earthquakes and just to show you that it's very difficult to really figure out where the faults are under the Irish Hills from the small earthquakes, this is just a couple of cross sections across the Irish Hills, and you can see that this is kind of a mess, so this is the thing that we need to continue working on.

So I'm just going to sum up by kind of highlighting what I think are the kind of three biggest unknowns at this point about the fault system around Diablo Canyon. I think the biggest unknown at this point is really the fault geometry beneath the Irish Hills, and to better understand what this fault geometry is like, there's a number of different things we can do, and I think we need to be kind of throwing all of this at it, various sorts of imaging, the seismic

imaging using these gravity and magnetic fields, further geologic work, and further work on these small earthquakes that may give us some idea of what the fault system looks like at depth.

The slip rate of the shoreline fault is also a very important unknown and this is why those offset geological features that have been imagined with the shallow seismic imaging are important, and hopefully they'll give us some better estimates of the slip rate on the shoreline fault. One thing that comes up sometimes when we talk about slip rate of faults is that on land we can often get a slip rate for the fault just by putting GPS units on either side of the fault and watching how fast they move relative to each other, and there is actually ocean bottom GPS technology. Unfortunately, it's quite expensive and, given the relatively low slip rates of the faults in this region, it would take a very long time to actually get an answer using that technology. And so I think my big third unknown is really the southern end of the Shoreline Fault and, as I said, that maybe doesn't tie immediately into uncertainty of seismic hazard at Diablo Canyon, but it may also

1 help us kind of fill in how all these faults
2 interact with each other and give us a better
3 idea of basically how this fault system works,
4 which in the end should give us a better handle
5 on the seismic hazard. Thank you.
6 COMMISSIONER MCALLISTER: Thank you very
7 much. That was fascinating. So I guess you
8 started to answer the question I was going to
9 ask, which is sort of, in order to understand the
10 uncertainty in the secondary faults better, how
11 much of the work could be done on the land versus
12 in the ocean? I mean, I think that's a pretty
13 critical point just from the get it done
14 perspective.
15 DR. HARDEBECK: Yeah, I mean, I think
16 this issue of the faults under the Irish Hills,
17 there is an extension of the Los Osos Fault
18 offshore, and there may be things we need to
19 understand in the near shore near the Shoreline
20 Fault, but I think a lot of that could be
21 addressed through on-land studies.
22 COMMISSIONER MCALLISTER: Great. And
23 then I guess just trying to get a sense of the
24 relative uncertainties here, in your view
25 overall, where are the biggest uncertainties,

1 seismic uncertainties, with respect to just what
2 the risk is to the plant? Is the critical
3 frontier here the secondary faults going inland?
4 Or sort of how does those stack up relatively?
5 DR. HARDEBECK: So a probabilistic
6 seismic hazard tends to up weight the importance
7 of the biggest, fastest moving faults. So in
8 that sense, when other people at this workshop
9 today have shown what they refer to as the
10 tornado diagram where you see various sources of
11 uncertainty in the width of the uncertainty, the
12 Hosgri Fault always kind of migrates to the top
13 of that because it's this high slip rate fault in
14 the region, even though its geometry and its slip
15 rate are actually pretty well known relative to
16 how much we know about these secondary faults.
17 So in purely the sense of trying to drive down
18 the uncertainty at Diablo Canyon, a better
19 understanding of the Hosgri Fault is going to
20 have numerically an impact. But I think there's
21 also, when making those tornado diagrams, there's
22 some assumptions there about, for instance, Los
23 Osos Fault and just vary the depth without
24 getting into kind of I think larger questions of,
25 well, or maybe it's cut off, maybe there's

1 another fault under there that hasn't actually
2 even been included in the Seismic Hazard
3 Assessment because we don't know about it, or
4 it's not something that's accepted by the
5 community, so --
6 COMMISSIONER MCALLISTER: So that
7 tornado actually might be fatter or sort of from
8 an uncertainty perspective, like if you were to
9 draw the potential air bands around those slices
10 of it, it might actually widen, or at least the
11 uncertainty bands would be wider?
12 DR. HARDEBECK: I would think so, I mean,
13 I haven't quantitatively done this exercise, but
14 I think if you took into account kind of the
15 range of views of what might be under the Irish
16 Hills, and hypothetically what could be there
17 that we haven't seen, it could become a larger
18 tornado. So I think even though looking at the
19 tornado diagram, it really just looks like we
20 need to hammer the Hosgri Fault I think is really
21 really important, to make sure that at least
22 we're modeling the right faults for the Irish
23 Hills and that we have some handle that there's
24 no things there that we're not --
25 COMMISSIONER MCALLISTER: Great. Thank

1 you very much. Now, Mr. Wills, did you want to
2 add something to that?
3 MR. WILLS: Yeah. I was nodding my head
4 at what Jeanne was saying, and that is the key
5 thing we need to know from the on-land seismic
6 surveys that PG&E is doing, is not just where is
7 the Los Osos Fault and how does it extend to
8 depth, but is there something else down there,
9 too, and are there other models for how the hills
10 themselves are being uplifted on various faults,
11 are there other models that we need to consider.
12 And so the tornado diagram shows the range of
13 parameters being considered on the faults that
14 are in the model and the question, of course, is
15 are there faults that are not in the model. And
16 this is the right kind of study that PG&E has
17 actually done the survey and they're processing
18 the data, and we need to see those results.
19 COMMISSIONER MCALLISTER: Okay, great.
20 Thank you. So any other questions?
21 CHAIRMAN WEISENMILLER: Yeah, just
22 following up. So looking at your major sources
23 of uncertainty, how much in potential further
24 work, how much of this work is actually in PG&E's
25 plans?

DR. HARDEBECK: Maybe somebody from PG&E can speak to that.

CHAIRMAN WEISENMILLER: Because --

MR. WILLS: We've reviewed the plans that PG&E has for addressing all of these significant issues on seismic source characterization, and we've commented on many of their plans to drive down the uncertainty by better understanding these parameters. And they have very well developed plans for using 3D shallow, 3D seismic for slip rate studies, and that's well along. And we've encouraged that. And then the on-land seismic surveys have been done and we're very hopeful that we'll get some good 3D models from that.

CHAIRMAN WEISENMILLER: So in terms of what your sense is of when we're going to have some of these issues resolved in terms of timing?

MR. WILLS: Yeah, I think they're -- what did you say, Stu? Second quarter of next year we'll have that report on the 3D Seismic -- or on the on-land seismic from the Hills.

CHAIRMAN WEISENMILLER: I suspect the three of us will be back here next year roughly this time, so looking forward to that and seeing

1 if, along with the known uncertainties, whether
2 there are any unknown uncertainties that pop up?
3 COMMISSIONER MCALLISTER: Well, you all
4 have been incredibly informative and I think, not
5 being an expert in this field, I am a little
6 saturated, I don't know about the audience, but I
7 don't want to come up with questions just for the
8 sake of coming up with questions and would
9 probably rather just break 10 minutes early
10 before lunch and get back, say 10 minutes of two,
11 I think, and that would put us more in line with
12 traditional lunch, right?
13 MS. KOROSEC: Right. Thank you. Thank
14 you very much, everyone.
15 COMMISSIONER MCALLISTER: Thank you very
16 much and we'll see you all in the afternoon.
17 (Break at 12:49 p.m.)
18 (Reconvene at 1:53 p.m.)
19 MS. KOROSEC: Our panel discussion is an
20 Update on Fukushima and Lessons Learned, and our
21 first panelist is David Skeen.
22 MR. SKEEN: Well, thank you. And good
23 afternoon, Commissioners. I'm pleased to be here
24 this afternoon to provide an overview of the
25 Nuclear Regulatory Commission's efforts to learn

1 from the accident at Fukushima Daiichi Nuclear
2 Plant that occurred on March 11th of 2011
3 following the great Tohoku earthquake and
4 tsunami.
5 I have been directly involved in the
6 NRC's response to the accident for the past two
7 years, overseeing the regulatory actions approved
8 by the Commission to enhance safety at the U.S.
9 Nuclear Power Plants. Immediately following the
10 accident, I served as one of the On-Shift Reactor
11 Safety Team Directors in our Incident Response
12 Center as we monitored the accident 24 hours a
13 day for the first two months, and also provided
14 support to the U.S. Embassy in Japan to assure
15 the safety of U.S. citizens in Japan, as well as
16 providing technical support when we were
17 requested by the Government of Japan over the
18 next nine months following the accident.
19 I have visited Fukushima site twice,
20 once with Chairman Jaczko about nine months after
21 the event, and in this past December I went with
22 Chairman MacFarlane for a visit again. We've
23 been keeping track of what's gone on with the
24 site over in Japan since the accident occurred.
25 After the situation at the site was

1 stabilized, I was selected to direct the special
2 project group that was created by the Commission
3 to learn from the Fukushima accident, and
4 implement the safety improvements at the U.S.
5 plants. We've been working over the last two
6 years to develop regulatory actions designed to
7 improve the capability of U.S. Nuclear Power
8 Plants to withstand natural phenomena such as
9 large earthquakes and floods that could lead to a
10 prolonged loss of off-site power at all the
11 nuclear power plants. Today I hope to focus the
12 discussion on the more significant actions we're
13 taking to enhance safety.
14 Shortly after the event, the Commission
15 stood up a task force of senior regulators, there
16 were about six senior managers that were mostly
17 Deputy Office Director level that had an average
18 of 25 years of regulatory experience behind them.
19 The Commission asked this task force to take what
20 we had learned over the first few weeks from the
21 event and develop a report to see if there were
22 any recommendations they could give to the
23 Commission to enhance safety at U.S. plants. The
24 task force was given 90 days to develop the
25 report, which they did, and issued the report in

1 July of 2011 to the Commission.
2 Once the Commission received the report,
3 they asked the broader group of the staff to take
4 a look at it and try to prioritize the
5 recommendations that they had gotten from the
6 report. The task force concluded in the report
7 that there was no imminent risk from the
8 continued operation of nuclear power plants in
9 the United States mainly because the type of
10 event that occurred at Fukushima was not as
11 likely to occur in the United States and, in
12 addition, there were mitigating measures that
13 we'd put in place following the terrorist attacks
14 of 9-11 in 2001 that, if could have been applied,
15 could have prevented such an accident in Japan.
16 However, given that the, the task force still
17 developed several recommendations where they
18 thought it would be worthwhile to try to enhance
19 safety at our U.S. plants.
20 So subsequent to the task force report,
21 the NRC prioritized the recommendations into
22 three tiers. We developed this proposal and sent
23 it to the Commission and they approved our
24 recommendations to go forward in a phased
25 approach, and so of course Tier 1 were those

1 things that we thought as a staff we could start
2 on right away and go forward to try to implement
3 those at the plants. The Tier 2 items that we
4 developed were things that either couldn't be
5 initiated right away until some of the Tier 1
6 activities were completed because they would
7 inform the Tier 2 activities, or because it took
8 several of the same resources that we would need
9 to do the Tier 1 activities, and we thought that
10 the Tier 1 activities should go first.
11 The third tier, or the Tier 3 items, and
12 these are items that are going to take longer
13 term research, it's going to take again maybe
14 some results from the Tier 1 or Tier 2 activities
15 before we can really decide what to do, and so we
16 put it in a logical order that we thought was
17 worthwhile. And the Commission agreed with that.
18 So I'll spend the bulk of my time here to talk
19 about the Tier 1 activities since those are the
20 ones that are being implemented at the plants
21 today.
22 So this slide shows a summary of the
23 Tier 1 activities, and they fall into basically
24 three categories, the first category is
25 Regulatory Orders that we issued back in March of

1 2012. The Orders that we issued are requirements
2 that the NRC issues to our Licensees, and each
3 Licensee is required to comply with the orders.
4 The second category is a Request for Information.
5 The requests that we send out are questions that
6 we ask the Licensees to answer so that we can
7 determine whether we need to modify the nuclear
8 plant license for a given site.
9 The third category that we're working on
10 are rulemakings, and our rulemaking effort is the
11 process that we use to revise our current
12 regulations, or to issue new regulations when
13 necessary, and so I'll describe each of these
14 items that you see on this slide in more detail
15 in the next few slides.
16 So the first order is the mitigating
17 strategies order to try to cope with external
18 events. Early on in the event, one of the
19 biggest contributors, we thought, to the accident
20 was the loss of power, the fact that they lost
21 all of their off-site power, as well as all of
22 their onsite emergency power, contributed greatly
23 to the fact that it led to the site deteriorating
24 rather quickly. We wanted to be sure that we
25 could enhance the capability of the U.S. plants

1 to cope with the loss of electrical power, to try
2 to prevent the core damage during a severe
3 natural event.
4 So the first order that I'm talking
5 about here, we required a three-phase approach to
6 maintain or restore core cooling and to try to
7 preserve containment and the spent fuel cooling
8 at the nuclear power plants. So instead of
9 giving a rigid time of how long each of these
10 phases must last, it's a performance-based
11 approach that each Licensee, for their condition,
12 has to tell us how their plant works, what is the
13 timeframes that these phases will be. So in the
14 initial phase, we expect the licensees to be able
15 to survive on installed equipment, equipment that
16 is already in the site, and in some period of
17 time, typically six to eight hours, but each
18 Licensee would have to tell us what that time is
19 going to be for their site.
20 Once they get to the transition phase,
21 this is the portable equipment sometimes referred
22 to as the flex approach that you may have heard
23 about that the industry has talked about several
24 times, which allows the use of portable equipment
25 that you have onsite and you can bring to bear

1 quickly to install, to make up for the loss of
2 offsite power, and that's additional generators,
3 or pumps, or hoses that you can hook up so that
4 you have temporary ways to restore core cooling,
5 or preserve the containment. In the final phase,
6 we allow for offsite support, this is the Calvary
7 coming over the hill, this is bringing more
8 pieces of equipment, larger pieces of equipment
9 to bear, more people to the site, and the way
10 that the industry has designed this, there's
11 going to be two regional support centers
12 throughout the country, one will be based in
13 Memphis, Tennessee, and one in Phoenix, Arizona.
14 Each of these sites can provide equipment to any
15 site in the country within 24 hours, that's the
16 design, that's how it's supposed to work. We're
17 still working through that to see how that's
18 going to happen, but that is the purpose. And so
19 once the offsite support comes, then they're
20 supposed to be able to last indefinitely, for as
21 long as it takes to get power back, if that's
22 weeks or months, then so be it.
23 The next order of issues was to beef up
24 our containment vending systems. For plants that
25 are similar to those of Fukushima, and these are

1 the GE boiling water reactors that we have in
2 this country, and specifies to the Mark-I and
3 Mark II containment designs, these are some of
4 the smaller containment designs that we have, and
5 so we thought that it was important that we
6 ensure that they could vent.
7 One of the problems we had at Fukushima
8 as we watched that event was they could not vent
9 their containments, and when they did finally
10 vent them, we think that actually contributed to
11 the vent once they did vent. So we want to make
12 sure that our BWRs in our country are prepared
13 for that.
14 COMMISSIONER MCALLISTER: How many of
15 those are there in the --
16 MR. SKEEN: I think there's a total of
17 31 between the Mark-I and Mark II plants in this
18 country, which is about a third of the fleet.
19 You do notice that none of this is applicable to
20 the California plants because both of the plants
21 were PWR designs. So, again, we want to make
22 sure that you can vent to try to control
23 containment pressure by removing the heat from
24 the containment, and it may also prevent the core
25 damage if you can keep the hydrogen and the heat

1 from the containment. And also it's required to
2 work after a loss of power.
3 One of the problems they had was trying
4 to open some of these vents at the Fukushima vent
5 and we heard stories that they sent operators
6 into the torus room, which is around the bottom
7 of the reactor building, and one worker that they
8 sent in was trying to open the valve that
9 switches on top of the torus and his boot was
10 melting to the top of the torus at the time, so
11 that was not effective. And then in another
12 case, they tried to send a team of operators
13 around to the other side where the vent valve
14 was, but the radiation was too high, and their
15 dosimeters stopped them about half way around,
16 and it's about 180 degrees from where the
17 equipment hatch was that they went into, and so
18 they had to turn back, they couldn't get to the
19 vent valve to open it. So, again, we want to
20 make sure in this country that we're able to
21 operate the valves and so the licensees are
22 implementing it now at the Mark-I and Mark II
23 containment.
24 The next one is spent fuel
25 instrumentation. During the first few days of

1 the event, we were disturbed when Unit 4 of the
2 site actually exploded, and we were trying to
3 figure out how that could happen because it was
4 defueled at the time, it was in a refueling
5 outage and there was no fuel in the reactor, all
6 the fuel was in the spent fuel pool. And so at
7 first the only way we thought that could have
8 happened is if perhaps they had lost the
9 inventory in the spent fuel pool, maybe a zirc
10 fire, maybe some hydrogen had been generated
11 which caused an explosion. We later found out
12 that it was not any problem with the fuel itself
13 in the spent fuel pool, but it was connection, a
14 cross connect between the ventilation system
15 between unit 3 and unit 4 that allowed the
16 hydrogen to get into the unit 4, and a spark
17 occurred and the unit exploded. But we didn't
18 know that at the time. As a result, we spent
19 many hours in our operations center working with
20 the embassy and with the Japanese trying to
21 understand did we need to get more water into the
22 fuel pools, what was the issue that was going on.
23 So, again, lesson learned from Fukushima was we
24 don't want to be in that position, we want to
25 know what the inventory is in the pool at all

1 times so that if there is an accident occurring,
2 I'm not wasting time diverting resources or
3 effort to try to fill a pool that doesn't need to
4 be filled. So as a result --
5 COMMISSIONER MCALLISTER: Some of the
6 pools did need to be filled, though, right? Or
7 was that just the acting story at the time?
8 MR. SKEEN: No, let me clarify. There
9 is boil-off, right?
10 COMMISSIONER MCALLISTER: Yeah.
11 MR. SKEEN: But most spent fuel pool
12 events are slow moving events unless you make
13 such a big leak in the pool that you lose
14 inventory and then you uncover the fuel. Usually
15 there's several hours before a spent fuel pool
16 would boil off to the point that it would start
17 uncovering the fuel. And so we did see some of
18 that. You saw some steaming coming out of the
19 units and that kind of thing. And so, yes, there
20 was a need to actually put some water in there
21 and they were doing that with -- they called them
22 giraffes at the time, it's the large kind of like
23 fire equipment that goes up high and that they
24 can put the water down over the top. I think you
25 probably saw some video of a plane trying to drop

1 water over the Unit 4 spent fuel pool at one
2 time. So, yes, there was a need to do it, but it
3 probably wasn't such a need that maybe we
4 diverted resources from working on more
5 significant issues at the time, trying to worry
6 about putting water in there.
7 So, again, the thinking behind the order
8 here in the United States is we want our
9 Licensees to know all the time what the level of
10 the pool is, even if you have a station blackout,
11 have some kind of instrumentation that will tell
12 you the pool level so you know if it's a problem
13 that you have to deal with, or it's a lesser
14 problem that I can put resources on something
15 else and I don't have to worry about the fuel
16 pool at the time. So that was the thought behind
17 that.
18 So lets' talk about the Requests for
19 Information for just a minute. So to ensure that
20 the plants were adequately protected from seismic
21 and flooding events, we asked all of the
22 licensees to perform inspections, which we call
23 "walk downs," at each of their sites and report
24 the results back to us. And as you heard Dr.
25 Munson talk about this morning, this was against

1 your current design basis and it was just to go
2 out and see -- the thinking was do these walk
3 downs quickly to see if there's anything that you
4 can identify, maybe some conduit seals missing if
5 it's a flooding issue, maybe there's some bolts
6 missing, or maybe there's some seismic restraints
7 that aren't in place, those kind of things, just
8 to give us some confidence because we knew these
9 longer term evaluations were going to take time,
10 so we wanted to be sure that at least you're
11 ready for your design bases type of events.
12 So Licensees did that, they gave us
13 their reports back in the fall of this year,
14 we've been reviewing those reports. In addition,
15 we had our inspectors, our own resident
16 inspectors perform some of the walk downs
17 themselves, and they've written inspection
18 reports and we're getting those in, as well, at
19 all the sites. And we're actually performing
20 some audits this summer. I think we're
21 performing eight flooding audits and I believe
22 it's six seismic audits, just to go out and see
23 how did the licensees do with performing the walk
24 downs, did they follow the guidance that we
25 worked together to try to explain how to do it.

1 So those are ongoing now and we expect all those
2 to be done by the end of this summer. I think
3 the last one happens in August, so over the next
4 few months we should get the results back from
5 that.
6 So that was the first Request for
7 Information. The second was and, again, Dr.
8 Munson touched on this briefly, to use more up to
9 date information. We've learned a lot about
10 plate tectonics in the 30 or 40 years since the
11 plants were designed, so to take some of this
12 information that we've learned and that we're
13 using a new reactor licensing, and apply that to
14 the existing plants. So, again, as Dr. Munson
15 said, these take time. Seismic PRAs are not
16 something that you do overnight, it's resource
17 intensive and the computer modeling that you have
18 to do takes some time to build those models and
19 do that actual analysis. So we knew that was
20 going to take some time, but still we requested
21 Licensees to go off and do that, give us the
22 results, and that will help us determine is there
23 something we need to do on a generic basis, or on
24 a plant specific case-by-case basis, to have
25 licensees enhance their protection against

1 seismic or flooding issues. So, again, that's
2 ongoing now and all the Licensees are working to
3 do that.
4 So finally, the third Request that we
5 sent out, the last piece that we learned from
6 Fukushima was some of the operators, once they
7 lost all the power, they also lost all their
8 communications. They were having to send
9 auxiliary operators from the control room out to
10 the field to try to do something, and they
11 couldn't report back immediately, or they had to
12 run back to the control room and try to tell the
13 control room, "I can't do this," or "here's
14 what's happening," and so, again, we wanted to
15 make sure if this situation occurs here you have
16 good communications between the control room and
17 folks that can go out into the field to actually
18 perform some of the functions that they need to
19 perform during an emergency.
20 The other thing that we learned from
21 Fukushima was the staffing. We never thought
22 before that you could have multiple reactors at a
23 site, get in trouble at the same time. We always
24 considered a severe accident happened to one
25 reactor at a site, but not the others. And you

1 actually counted on some of the other reactors to
2 help the one that's in distress. Fukushima
3 changed our mind on that. So, again, we asked
4 Licensees to go out and say, "Suppose you have an
5 event that affects multiple units, do you have
6 appropriate staffing that could address an event
7 like that?" And usually it's the thing that's
8 going to happen at 2:00 on a Saturday morning
9 when you're at minimum shift, right?
10 COMMISSIONER MCALLISTER: So a question
11 -- I just rather than write them down, I like to
12 sort of hit them when we're talking about it --
13 MR. SKEEN: Sure, that's fine.
14 COMMISSIONER MCALLISTER: So it's hard,
15 you know, safety has to be our first concern, we
16 know that, it really is, and I think that's the
17 appropriate priority and it should be well above
18 the other priorities.
19 MR. SKEEN: Yes, sir.
20 COMMISSIONER MCALLISTER: But at the
21 same time, you know, we have to work through the
22 whole system and look at the rates over at the
23 PUC, and look at sort of the workability of the
24 whole system and, you know, as we layer on back-
25 up systems, requirements, and all the necessary

1 facilitation of making safety first, to making
2 sure that when things happen we can deal with
3 them effectively, does the NRC actually look at
4 -- certainly the individual PUCs that are
5 regulating the Purchase Agreements and the
6 operators and everything, sort of the market
7 context in any given plant's case, are going to
8 be looking at this at that plant's level; but I
9 guess I'm wondering if there's any sort of meta-
10 consideration of how a lot of these additional
11 needs that we're learning about and trying to put
12 into place actually affect the overall viability
13 of keeping some of these plants going, and sort
14 of future plants that are going to have to be
15 built with these lessons in mind. And it would
16 be good to sort of -- I'd like to kind of lift
17 the discussion a little bit to that level to sort
18 of at least get it on the radar screen a little
19 bit.
20 MR. SKEEN: Yeah, it's a great question.
21 Let me give you some high level thoughts on that.
22 Certainly, things that the NRC feels is needed
23 for adequate protection of public health and
24 safety, we don't consider cost there, we say if
25 it's an adequate protection issue, that we think

1 that's necessary, then we require it and whatever
2 the cost is, the Licensees have to bear, that's
3 just part of it. The orders that we issued,
4 protection orders, we said you need to fix your
5 vent systems, you need to be able to cope with
6 long term station blackout events for a prolonged
7 period of time, that's adequate protection issues
8 now. So, that, they have to do. Anything else
9 where we're talking about the Requests for
10 Information, we need to talk about that. The NRC
11 would have to make a finding that it's okay to
12 back fit a plant, that we need to back fit the
13 plant to do it. And we had to do back fit
14 analysis, we have to determine -- that's when
15 costs comes into play -- what's the cost of the
16 fix, is it too onerous to perform, is there an
17 alternative way to do it, licensees are certainly
18 welcome to give us an alternative to something if
19 it's not an adequate protection issue. So I
20 would tell you that we are thinking about cost in
21 that way. I would also say we've had in the last
22 two years, I think we've had over 85 public
23 meetings on the orders, the 50.54(f) letters, the
24 rulemakings that we've done, so we've gotten
25 input all along the way from industry. In fact,

1 there is a -- we have a steering committee over
2 us in the NRC that is all the Office Directors in
3 the Program Offices. The industry has put
4 together their own steering committee and they
5 meet on a regular basis, it's about quarterly
6 that they meet, to talk about the issues that
7 we're dealing with. And so we're not doing this
8 in the blind, it's not the staff is just out here
9 saying "this is what you've got to do." We're
10 discussing all along the way. When we issued our
11 orders, we met and talked for several public
12 meetings about what guidance -- okay, now that
13 you've issued an order, what does that really
14 mean? What is it that Licensees are supposed to
15 do? So we wanted to make sure everybody had a
16 good understanding going forward that this is
17 what we're looking for. So I would say that
18 we've walked down this path together in a public
19 way to try to understand, to make sure that we're
20 not going overboard in certain areas and, in
21 fact, that's one of the things, why they
22 developed my group in the first place, and why
23 they wanted to make sure we had a steering
24 committee over us to say what are the real
25 lessons learned from Fukushima. We learned from

1 Three Mile Island when we had that event, that we
2 had a 10-year plan of things to do, and a lot of
3 things we never did, and it was because a lot of
4 issues got brought in that probably were not
5 germane to the Three Mile Island accident itself,
6 and probably could have been done in some of our
7 other normal generic processes, it could have
8 been worked through. So it was very important to
9 the Commission that we try to stay focused, and
10 that's why they split my group off and say "you
11 guys focus on just Fukushima issues" and move
12 forward that way. So I hope that gives you a
13 little bit of flavor that we are thinking --
14 COMMISSIONER MCALLISTER: Yeah, thanks.
15 I appreciate that.
16 MR. SKEEN: All right, so let's move on.
17 So our rulemaking activities. We undertook three
18 rulemakings that the Commission wanted us to do,
19 the first was we started out with a station
20 blackout rule and we have a station blackout rule
21 in place now that we put in place in the '80s.
22 That rule was meant to cope with a grid centered
23 event. If you lost the grid for some period of
24 time, could you cope with that event and be okay?
25 It turns out we need to go much further than

1 that. We assume probably about an eight-hour
2 event is what you had to work with, with the loss
3 of grid in most cases. So we started out with a
4 rulemaking that was just going to update that and
5 say, no, you have to be able to last for a
6 prolonged period of time, and maybe not
7 necessarily a grid centered event. As we were
8 working through that and trying to develop the
9 basis for that rulemaking, we thought more and
10 more about where we came out with the order, the
11 Mitigation Strategies Order that says you have to
12 include this portable equipment, you should be
13 able to do all these different things.
14 So it turns out it became more of not
15 just updating our original station blackout rule,
16 but incorporating this Mitigating Strategies
17 piece that we've issued in this order. So it's
18 going to kind of combine what we want to do with
19 a prolonged loss of offsite power and also make
20 the requirements from the order that we're
21 putting in place for being able to handle
22 external events into one rulemaking. So we're
23 kind of combining that. And, of course, the
24 final rule on that is due by 2016. I think the
25 Proposed Rule comes out either late this year or

1 early next year, and then our rulemaking process
2 does take three to four years, that's because we
3 have so much public engagement on a rulemaking.
4 We want to make sure we hear everybody's views
5 before we put that in stone and put it in our
6 regulations. So that's normal. We do a proposed
7 rule, that goes to the Commission, they have to
8 approve that proposed rule, then it goes out, we
9 get public comment on that, we take those public
10 comments and feed them in, and then give the
11 Commission a final rule, and then they vote on
12 that and it becomes the law of the land for us.
13 So, again, that's the first rule that we work on.
14 The second rule that came about and,
15 again, this was something that we weren't sure of
16 as we watched the Japanese event unfold, how well
17 our emergency procedures would really work under
18 extreme events. We thought the licensees do a
19 pretty good job with the emergency operating
20 procedures that we have in place, and those are
21 required, but once we got beyond that into more
22 after you've had core damage, and we get into
23 what we call Severe Accident Management
24 Guidelines, or even beyond that after 9-11, we
25 talk about the Extensive Damage Management

1 Guidelines, we weren't sure how those all fit
2 together and there was really no requirements on
3 those as far as regulations. So the Commission
4 determined that we should pursue that and, to
5 make sure that there's smooth transition between
6 the three phases as I go from my emergency
7 procedures into SAMGs into EDMGs, and so that
8 that was a smooth transition and that the
9 Licensees could perform those. So we're working
10 on that rulemaking, as well and, again, that is
11 due to be final by the end of 2016.
12 The third rule that I want to talk about
13 is now called the Filtering and Confinement
14 Strategies Rulemaking, and when we issued the
15 original order for the vents at the BWR Mark-Is
16 and IIs, that was must to make sure that the
17 vents were reliable and would work before core
18 damage occurred. And as we thought about it, the
19 Commission directed us to think about, well, what
20 if you have had core damage, and now you have
21 radiation and high temperatures and other things
22 in these areas? And so we went back, we've
23 revised the order that was just issued here a few
24 weeks ago, to say not only do you have to have
25 these reliable vents that you can operate, but

1 you have to be able to operate not only under
2 station blackout conditions when you have no
3 power, but also if there's already been core
4 damage and it now may be a high radiation fuel,
5 so does that mean you need more shielding? Do
6 you need some reach rods to go through some walls
7 so that you can operate valves remotely, or
8 another backup power supply to some of the
9 valves, that kind of thing. So they told us to
10 go off and revise that order and, in addition,
11 look at additional strategies. The staff had
12 recommended, the one option we thought that the
13 Mark-Is and IIs should have, is a filter system
14 so that in addition to the suppression pool that
15 filters release, you would put an additional tank
16 of water or filter off your drywell vent or wet
17 well vent, so that would give you additional
18 scrubbing. The Commission determined that that
19 might be one answer, but the industry also
20 proposed an alternative to that that said suppose
21 I have confinement strategies that say I'll never
22 need to use the drywell vent if I can beef up my
23 containment sprays, I can do other things to keep
24 the radiation inside the containment itself? I
25 may not need a filter. And so they have told us

1 to go off and work on a rulemaking that would
2 give those options, and so we're just starting
3 down that path. We owe the Commission a
4 regulatory basis, it takes us about a year to
5 develop a regulatory basis so, again, we have to
6 do some technical work, we have public meetings,
7 we talk with stakeholders to understand what are
8 the ramifications, and then we'll develop the
9 proposed rule, and then we'll do the final rule.
10 And because of that, that rule is going to take
11 us out to 2017 before that one is done, so that's
12 our rulemaking activities.
13 So just a quick -- this is just a good
14 little chart to show you what our thinking
15 process was as we developed this. What we did
16 was take the accident at Fukushima, we had the
17 recommendations from the task force, they thought
18 about this, in addition we got a lot of help from
19 other people. There were several international
20 studies down not only in Japan, but from IEA,
21 Europe did their own study of lessons learned
22 from Fukushima, Congress had some good thoughts
23 for us in our appropriations language, our own
24 advisory committee on reactor safeguards had some
25 thoughts on what they thought might be

1 recommendations we should look at --
2 COMMISSIONER MCALLISTER: Quick
3 question. Did that review also include sort of
4 the regulatory structure issues, you know, in
5 Fukushima's case, I think in retrospect, the sort
6 of right checks and balances, I think, weren't in
7 place, and there's been a lot of sort of scrutiny
8 on that and we have clearly a different system
9 here, so I think -- I guess my question is, do we
10 know what issues is our system already adequately
11 equipped from a regulatory perspective to
12 mitigate, or to get a good result on, to have
13 adequate oversight? And are there any that sort
14 of slip administratively or process-wise, or sort
15 of a regulatory structure wise slip through the
16 cracks, potentially?
17 MR. SKEEN: Yeah, that's a good
18 question. I would say we haven't found any from
19 the studies that we've looked at. And you're
20 exactly right, each country does regulation a
21 little bit differently, right? We're different
22 from the European countries, different from the
23 Russians or the Chinese or the Indians, for the
24 Koreans, the Japanese, but you have to take those
25 cultural and regulatory differences into account

1 when you look at the way that the accident
2 unfolded and what happened in Japan. And so we
3 think we've applied the right criteria to that.
4 We haven't seen any gaps in the way we do our
5 regulation at this point, that's not to mean that
6 we won't find something, but we haven't seen --
7 in any of the reports that we've seen, there
8 wasn't anything that we felt, "Oh, that's really
9 a hole in our regulatory structure that we need
10 to fix." So at this point, I would say we
11 haven't identified that.
12 COMMISSIONER MCALLISTER: Thank you.
13 MR. SKEEN: So again, we looked at that,
14 we took all the near term task force
15 recommendations, as well as these other
16 recommendations we got from a lot of folks, that
17 resulted in the orders and the Requests for
18 Information and rulemaking that we did, and now
19 it's turning to the implementation piece by the
20 Licensees. So, again, we will use our inspection
21 procedures, our normal way of doing business when
22 we have licensees make modifications to their
23 plants, and verify that they do it the way that
24 we want them to do it.
25 I think we have a good plan in place, it

1 will take a while to get all the implementation
2 by all these different actions that were taken,
3 but again, we'll follow it up with inspection and
4 verify that whatever it is we've asked them to do
5 gets done.
6 So probably of most interest to this
7 group is the California plans, themselves.
8 Certainly at Diablo Canyon, I think you heard Dr.
9 Munson talk about this morning that the seismic
10 and flooding reevaluations are due by March of
11 2015. I think also Diablo Canyon themselves were
12 talking about that this morning.
13 The NRC orders for the spent fuel pool
14 implementation and the strategies to mitigate the
15 prolonged loss of offsite power, those are also
16 to be fully implemented at Unit 1 at Diablo
17 Canyon by the fall of 2015 and in Unit 2 by the
18 spring of 2016, and that mainly goes with the
19 refuel outages that they have. We tied them to
20 the refuel outages because, in most cases you
21 have to come in the first outage and do your
22 measurements, figure out what it is you're going
23 to do, go off and fabricate things, and put them
24 in in the next outage in most cases. So that's
25 why that worked out that way.

1 And in San Onofre, I used to have a
2 schedule here for San Onofre, but after the last
3 few weeks, I replaced it with this sentence that
4 certainly that's an open question now. We know
5 how to do these things, we've done it in the
6 past, we know how to decommission sites. We have
7 a few other units right now, the Crystal River
8 Unit and the Kiwanis Unit are both shutting down,
9 I would say, prematurely before their licenses
10 are done. And it's a little bit trickier just in
11 the fact that usually when our plant is going to
12 decommission, they send us a decommissioning plan
13 five years before they're going to decommission,
14 but we can work through those. I mean, so I
15 heard this morning you guys had a lot of
16 questions, and that's the kind of questions that
17 would be figured out in that five-year before any
18 decommissioning plan, but because we don't have
19 that opportunity we'll deal with it on a quicker
20 scale, we won't take the five years to go through
21 this.
22 But again, we'll meet with the licensee
23 in a public way and we'll figure out exactly what
24 we need to do with San Onofre. So with that, I
25 just wanted to leave -- if anybody needs to find

more information on what my group does, or what we're doing about the lessons learned at the NRC, there is our website if you go there and look for the link that says "Spotlight Section," under that there's one that's called "Japan Lessons Learned," and you could probably learn more than you ever wanted to know about what the NRC is doing about lessons learned. So with that, I would thank you for your attention and I look forward to any questions that you might have.

COMMISSIONER MCALLISTER: Great. Thank you very much. I think I've kind of got my questions answered for the moment, so I think let's move on to the other speakers. So, Mr. Strickland.

MR. STRICKLAND: Great. Thank you. I'm Jearl Strickland. I'm the Director on Nuclear Projects for PG&E's Diablo Canyon. My discussion today is really a presentation that follows on and builds on with information that was just provided by Mr. Skeen in that I won't focus on what the Regulations require, but really give you more of an insight as to what we as a utility have implemented to be able to address these Regulations.

1 There we go, success. At Diablo, it's
2 usually a 40-hour course to be able to figure out
3 how to use the remote. I always like to start
4 with a photo of our plant site, it's quite
5 different than most of the facilities that the
6 Nuclear Regulatory Commission deals with in that
7 it's a very complex site with different
8 elevations. One of the things that is striking
9 is that, when you look at the Fukushima Daiichi
10 Plant, it was on the coast at approximately 20
11 feet above sea level, and so very limited height-
12 wise protection for the safety-related equipment.
13 For ours, the power block itself is situated 85
14 feet above sea level with the most vulnerable
15 aspect of the plant being the auxiliary saltwater
16 pumps that are located down at our intake
17 structure and have vents that provide ventilation
18 protection that extend 45 feet above sea level.
19 We also have our dry cask storage facility and
20 two water reservoirs that contain a total of five
21 million gallons of additional make-up water that
22 are about 310 feet above sea level, so we're
23 protected quite substantially by elevations
24 alone.
25 So although the system structures and

1 related components performed very well during the
2 Fukushima Daiichi event, one of the important
3 lessons learned was that the plants are
4 vulnerable to the natural phenomena such as
5 flooding and, in turn, other plants can be
6 significantly vulnerable to tornadoes,
7 hurricanes, and so forth.
8 We also found that there's a great
9 potential that both units can be affected. As
10 Mr. Skeen had noted earlier, that the previous
11 paradigm was that you would assume that only one
12 unit was involved in any event, and that today
13 we're looking at the fact that you had to
14 consider multiple units involved at the same
15 time.
16 Also it was important to understand that
17 we needed to maintain fuel cooling during a loss
18 of power or station blackout event, not only in
19 the spent fuel pools, but also for fuel that was
20 still in the reactor core. Also, the importance
21 of being able to monitor spent fuel pool
22 conditions in that level and spent fuel pools
23 really is an important aspect in that you don't
24 want to have the limited resources that may be on
25 shift at Saturday at midnight focused on trying

1 to split their time between responding to events
2 within the power block itself, and also dealing
3 with questions of spent fuel pools.
4 And also, lastly, with the need to have
5 very robust emergency response capabilities in
6 that we need to be able to have the strategies in
7 place ahead of time, we need to have had
8 appropriate evaluations of staffing and
9 understand what staffing minimums are required at
10 all points in time and operation, and then what
11 members of staff are responsible for providing
12 what functions during an event. And then
13 communication capabilities, that it was very
14 critical that you have the ability to be able to
15 effectively communicate not only externally, but
16 to be able to communicate within the plant
17 itself, to be able to dispatch crews and be able
18 to validate the conditions of specific portions
19 of equipment.
20 So for PG&E, one of the first steps that
21 we did was that we established a dedicated team
22 and assigned director-level oversight to be able
23 to support first the evaluations of the orders
24 and recommendations for the Nuclear Regulatory
25 Commission, and then from there to be able to

1 form a team of critical individuals to be able to
2 implement the actions required by those orders.
3 Our response is substantially different
4 than many of the other plants that we benchmark
5 in that we have a dedicated team of approximately
6 16 people with three of the individuals being
7 past senior reactor operators, so provides a team
8 that's not distracted by day to day operation of
9 the plant and can focus our attentions on being
10 able to appropriately address the orders and
11 recommendations.
12 We also have a strategic partnership
13 with a number of other utilities that we call the
14 STARS Plants. With that, then, we're able to
15 benchmark each other, we're able to also be able
16 to share specific information, we're also able to
17 leverage then the economy of being able to buy
18 more as a fleet to whereby specifying similar
19 equipment, we're able to be able to use that
20 leverage to be able to get better deals with the
21 various vendors. We've also partnered with
22 Westinghouse as part of this STARS organization
23 whereby they're performing a lot of the detailed
24 analysis for what you'll see as flex equipment in
25 a few slides, to be able to then make sure that

1 there's consistent approaches between the various
2 plants, and it also helps then when it comes time
3 to be able to respond to the Nuclear Regulatory
4 Commission with updates on where we are within
5 the performance of the requirements in these
6 orders. By having the industry be able to
7 develop templates that can describe effectively
8 in concise terms makes it easier for the
9 Regulatory Commission to perform detailed
10 effective reviews.
11 We've also teamed with a number of
12 external consulting firms that have expertise in
13 specific areas such as seismic hazard
14 evaluations, tsunami evaluations, and they're
15 listed there as just a few of the organizations.
16 So I'm not going to walk through each
17 one of these. These are the orders and
18 recommendations that were addressed just in the
19 prior presentation; but what I am going to do is
20 step through each one of these and give you a
21 little bit of information as to where we are in
22 the process.
23 So flooding evaluations. As some of the
24 key components of us performing a flooding
25 evaluation is that we have to be able to re-do

1 our maximum precipitation evaluations that were
2 originally developed as part of the licensing of
3 the plant. We're just about finished with that
4 form of evaluation, and have found that with our
5 plant being termed more of a dry plant that we're
6 within the bounds of what is assumed in the
7 original evaluations during initial licensing.
8 For the Tsunami evaluations, as a
9 utility we actually as part of our long term
10 seismic program started reevaluating our tsunami
11 hazard back in the 2005-2006 timeframe, so what
12 we've done as part of the efforts with these new
13 orders is that we've taken that information that
14 was generated in 2005-2006 and used that as a
15 starting point to re-characterize our tsunami
16 hazard. We've contracted with two different
17 organizations to remodel the tsunami hazard, in
18 turn to evaluate the types of data that are
19 available to make sure that we've characterized
20 each of the types of surface landslides that can
21 take place within the ocean on the Continental
22 Shelf and other areas to make sure that we do
23 have bounding assumptions for our tsunami. From
24 there, we'll use the new modeling to be able to
25 validate the tsunami hazards within the confines

1 of what our license currently requires. This
2 work, as noted earlier, is required to be
3 completed by March of 2015, and we're well along
4 in that process and should be complete ahead of
5 time.
6 Flooding walkdowns. The guidance
7 required that we do a detailed assessment of the
8 potential impact on flooding to the plant from
9 external events. What we did was we developed a
10 set of procedures and guidelines for how to
11 effectively put together documentation packages
12 first, and what material that you need -- do you
13 need to be able to assess the various aspects of
14 the plant? So with that, that was calculations,
15 design drawings, other details that were
16 appropriate for being able to assess the plant.
17 We trained teams, we then put the teams out in
18 the field with walkdown packages. The Nuclear
19 Regulatory Commission Site Residence Inspector
20 joined us in a number of these walkdowns, and we
21 did detailed assessments of each of the specific
22 areas that have a tendency to be impacted by
23 flooding.
24 The types of issues that we found were
25 really in the lines of some corrosion on various

1 components that were exposed to saltwater
2 environment and two drains that were plugged.
3 Outside of that, we were in very good shape and
4 had no substantial issues that were reported to
5 the Nuclear Regulatory Commission.
6 Seismic Evaluations. We've spoken a lot
7 today about the SSHAC process, so you have a good
8 oversight as to what's involved with that. So
9 our schedule is that we are to complete that re-
10 characterization of our seismic source and ground
11 motions by March of 2015. I don't know if it was
12 clearly noted earlier that, even though this was
13 a requirement of these orders and
14 recommendations, that PG&E had started the
15 process substantially before that, and that was
16 part of our long term seismic program. The
17 actions to date are that we've made good progress
18 and that we will be able to complete the re-
19 characterization of our seismic ground motion in
20 accordance with the due date of March 2015.
21 Seismic walkdowns. In this morning's
22 presentation, you were told that each of the
23 plants were required to select at least 100 of
24 the critical components within the plant to
25 walkdown. With us, our package included over 250

1 of our critical components. And it ends up being
2 a lot more involved than just simply saying
3 evaluate 250 safe-related components, in that we
4 would develop a package that looked at a specific
5 area and look at what we call two-over-one
6 constraints to where if you have other pieces of
7 non safe-related equipment that could potentially
8 impact the safe-related component, then you have
9 to expand that search and look at all of those
10 components too. So what we did is we ended up
11 breaking up the plant into specific areas and
12 then looked at all components within those
13 specific areas. And that involved pulling design
14 change packages that were issued in the past for
15 those areas, all the design drawings, design
16 calculations, and had detailed packages that we
17 were able to provide each of the walkdown teams.
18 It's the first time ever in the plant that we
19 actually took iPads and configured them with all
20 the data in hand with checklists and so forth, so
21 that the walkdown teams --
22 COMMISSIONER MCALLISTER: You didn't do
23 that back in the '80s?
24 MR. STRICKLAND: Yeah, wish we could
25 have.

1 COMMISSIONER MCALLISTER: I guess I had
2 one question on that. So you get a handle on the
3 components and then, you know, this is a complex
4 system we've got, so then when you integrate
5 those, that can play sort of from a reliability
6 perspective in all sorts of different directions,
7 and I guess what's the next step there to kind of
8 appreciate the system impacts of the sum total of
9 all those individual issues?
10 MR. STRICKLAND: That's a good point.
11 So with that, it was critical to be able to
12 review each one of these safe-related components
13 as an individual component, initially, and then
14 how it impacts and overall system if you find a
15 specific issue. With our walkdowns, outside of
16 finding a number of areas of corrosion that
17 needed to be addressed and so forth, the one item
18 that we found that was unexpected was that we had
19 one of our electrical cabinets that didn't have
20 all the anchorage in place that our design
21 drawings required, and so with that that meant
22 that the next steps were to be able to re-analyze
23 the cabinet for the anchorage that was there, and
24 be able to validate that and continue to maintain
25 its operability in that configuration, and in

1 turn it then gave us the time to be able to go in
2 and add the missing anchor bolt that was supposed
3 to be part of the system.
4 So our walkdowns for the bulk of the
5 plant were completed as required by the timeline
6 by the Nuclear Regulatory Commission with the
7 report issued on November 21st of last year.
8 There were specific areas that we weren't able to
9 address that you can only access during refueling
10 outages, so in our refueling outage that we
11 completed in the February-March timeframe, we
12 completed the inspections in those areas and
13 found no additional issues and, in turn, will
14 complete the last phase with our next refueling
15 outage.
16 This one ends up being a little more
17 interesting, our Flex Program Requirements. As
18 part of the response, we need to be able to
19 provide a diverse and flexible means to prevent
20 fuel damage while maintaining containment
21 function for a beyond design base external event.
22 So with this, what we're looking at is a loss of
23 AC power and then a loss of being able to provide
24 water to our ultimate heat sink, so that means
25 you lose your aux saltwater systems and draft

1 water from the ocean and so forth to cool the
2 units. So under this scenario, then we had to
3 provide a flexible means to be able to repower
4 electrical components that are critical and also
5 to be able to provide coolant power to the plant.
6 And so the initial response with this is that we
7 would have extra portable equipment in a
8 configuration that the NRC requires as the N+1,
9 which means you've got two units, you have three
10 sets of equipment, then in turn I can then store
11 at various locations around the plant so that, if
12 under a beyond design base event I lose one set
13 of equipment, I still have two sets of equipment
14 to be able to help with the plant. Part of the
15 design of this process is to develop not only
16 primary connection points for this portable
17 equipment, but to have secondary connection
18 points in case there's been damage in the plant
19 for these beyond design base events, that would
20 preclude me from using my primary connections.
21 Also as part of the program, we're
22 developing training programs, maintenance
23 programs, and appropriate staffing to be able to
24 make sure that this equipment really is available
25 when and if it ever was called upon to be used.

COMMISSIONER MCALLISTER: So for example, so a few weeks ago I went to San Onofre and on their plan was to basically install plug and play at the site perimeter facility so that presumably, you know, from Phoenix you could truck in within 24 hours and get a power plant to the road outside the facility and plug it in. Is that what you're talking about as far as the off-site access?

MR. STRICKLAND: That is for the electrical side.

COMMISSIONER MCALLISTER: Right.

MR. STRICKLAND: Part of our strategies are, though, that when it comes -- with us being what I considered a stranded plant in that, with the remoteness, on the coast, with the potential for loss of freeway access, access road, and so forth, it becomes critical for us to be able to be self reliant as much as possible, so the configuration of the portable equipment that we're putting into play will be available onsite for all cases except for generation, and so we're working with the Regional Response Center that was noted earlier to be able to help define sizes of generation to be able to have it sized in a

1 package that it can be brought in by helicopter.
2 So what that means is that they have to be able
3 to design it to be able to function in parallel
4 instead of just one large generation unit, and so
5 they have to be able to strain a series of
6 smaller units to get --
7 COMMISSIONER MCALLISTER: So you could
8 have a busbar with a bunch of plugs on it,
9 basically, or something like that.
10 MR. STRICKLAND: In simple terms.
11 COMMISSIONER MCALLISTER: Yeah, okay.
12 MR. STRICKLAND: Yes.
13 COMMISSIONER MCALLISTER: I'm being
14 reductionist, but you know, you get the idea.
15 Thank you.
16 MR. STRICKLAND: Sure. So again, coping
17 strategies, well, we're going to be able to
18 maintain core cooling and heat removal, we'll
19 maintain our containment integrity, we'll
20 maintain reactor coolant system inventory control
21 and maintain reactivity control, and then
22 maintain spent fuel pool cooling. And we've got
23 a number of scenarios to be able to maintain
24 cooling of spent fuel pools.
25 The Electrical Support Strategies, we've

1 got a number of 120 volt vital DC buses for
2 instrumentation and we have the ability to be
3 able to define what loads are not required during
4 a beyond design base event, and so the first step
5 would be to strip those non-vital loads off our
6 batteries, and being able to use that type
7 scenario, we can survive for 24 hours without
8 having to have external power provided to the
9 plant, so I guess that's adequate time to be able
10 to bring our emergency response organization into
11 full staffing and in turn to be able to then move
12 emergency equipment into place. We're also
13 looking at being able to locally repower
14 instrumentation using smaller portable diesel
15 generators that we've already procured and have
16 onsite, controlling lighting for control room and
17 other vital areas, and then controlling
18 ventilation, or reestablishing ventilation for
19 battery rooms and control rooms.
20 Spent Fuel Pool Instrumentation. We've
21 already entered into a contractual arrangement
22 with Westinghouse. They've got a system that
23 they call a Guided Wave, and in turn they're
24 going through the design process for our site
25 specific application. They're using that same

1 design at many other plants, so we're not going
2 to be different than most facilities. The plans
3 right now are that we will complete the design
4 details this year and early next year with plans
5 to have the system installed in 2014 and 2015.
6 For our emergency planning for
7 communications and staffing, what we've done as a
8 first step was that we looked at the ability to
9 be able to communicate externally and internally,
10 and found that under a stranded plant event-type
11 scenario that we did have some areas that we
12 could improve. With that, then, we've procured
13 three communication trailers that are configured
14 to be able to communicate with the rest of PG&E's
15 service territory and also then communicate
16 elsewhere using satellite type systems. We've
17 also purchased a series of satellite phones that
18 we call footballs, small cases that we're able to
19 have stationed at various points in the plant and
20 it enables operators in the control room to be
21 able to take the transponder for the satellite
22 phone and be able to run it out of the control
23 room and set it outside and to be able to then
24 have direct communication. We also have a number
25 of other hand-held radio systems that we're

1 putting into place as additional backup to be
2 able to give the operation's crews the ability to
3 communicate within the plant.
4 For the staffing, we've been utilizing
5 our simulator onsite to be able to run various
6 scenarios that look at what happens if we have a
7 beyond design based event. And with that, we're
8 able to validate that we have appropriate
9 staffing at 12:00 on Saturday morning that, you
10 know, when you don't have the ability to be able
11 to pull people in immediately, and so with that
12 we've recently sent a report back to the Nuclear
13 Regulatory Commission noting the types of staff
14 that we have and validating that, yes, we do have
15 the right resources in place. With that, too,
16 then we'll be continuing to update our procedures
17 and our policies internally to be able to
18 potentially add additional staffing as minimums
19 on shift to be able to add additional defensive
20 depth for ourselves.
21 I was asked to give you some insight on
22 cost, and so with this slide it just simply
23 provides a high level overview that, if you look
24 at it for Tier 1 projects, which are the only
25 projects that we have in play at this point in

1 time, we're looking at a cost of approximately
2 $47.1 million for capital improvements. In
3 addition, for the expense-type projects that fall
4 under studies for both seismic and tsunami and
5 some of our other emergency planning staffing,
6 we're projected to spend approximately $17.1
7 million. This is really in line with what we're
8 seeing other plants spend at this point in that
9 publication was just issued I think last week,
10 that noted that the typical power plant will
11 spend between $30 million and $40 million per
12 unit, so we're right in line with that.
13 Then the Tier 2 and Tier 3, those are
14 projections going forward and we had to put
15 values within our rate case submittal to be able
16 to recognize a potential for modifications to
17 plant vents, or other actions coming out of the
18 Tier 2 and Tier 3, and those are simply
19 placeholders at this point in time with no
20 specific plans to expend that money.
21 So in summary, the last points I want to
22 make with this is that nuclear safety continues
23 to be the top priority for Diablo Canyon, that
24 above and beyond all aspects that safety will be
25 number one, that cost, just not the constraint,

1 that we are committed to continue to learn from
2 the Fukushima Daiichi event, and that in turn we
3 take the issues there very seriously and we
4 believe that we've been on the forefront of the
5 utilities for being able to implement change,
6 that we've established a dedicated team to
7 implement our regulatory requirements, and the
8 team is working very effectively. The
9 partnership with STARS and Westinghouse has been
10 effective, and that we're committed to complete
11 the plant assessments, equipment procurement, and
12 plant improvements within the timelines required
13 by the Nuclear Regulatory Commission.
14 So with that, I can entertain your
15 questions.
16 CHAIRMAN WEISENMILLER: I've got a
17 couple. I mean, one of the things which we
18 noticed in 205 was obviously in terms of spent
19 fuel pools are fairly densely packed.
20 MR. STRICKLAND: Yes.
21 CHAIRMAN WEISENMILLER: And at that
22 point we had some concerns and were certainly
23 encouraging people to unpack them, particularly
24 now with the interim fuel storage. So we don't
25 see much progress going forward in that area, so

one was just to see how that fits into PG&E's safety commitment.

MR. STRICKLAND: So my first point would be that both storage mechanisms, wet and dry are safe, that I spent approximately 11 years developing the dry cask storage program for Diablo, so I know it very well. Currently we have 23 casks with 32 fuel assemblies each that have been loaded with fuel from wet storage placed into dry storage. We have plans to perform a loading campaign starting within the next few weeks to move another six cask loads of fuel into dry cask storage. From there, we have a program that next year we will expand the storage capabilities of our independent spent fuel storage installation. When we first licensed it with the nuclear regulatory commission and permitted it with the State of California, we sized it to be able to accommodate all the fuel discharged from the 40-year license life, but we didn't construct it to that size. We constructed it to be able to hold 38 casks instead of the 138 of the license and the permits. So today we're in a position to where we need to take the steps to expand the storage

1 facility, so the design documents have been
2 completed, we're currently out to bid, and the
3 intent is that next spring, spring of 2014, that
4 we'll add the additional five foundations that
5 will add capability of about another 100 storage
6 locations for the facility. And at that point,
7 that will enable us to be able to reevaluate our
8 current schedules and programs for continuing to
9 move fuel from wet storage to dry storage.
10 CHAIRMAN WEISENMILLER: Okay, next
11 question. Obviously we've talked a lot about
12 this sort of implications of the Japanese
13 accident. One of the other changes that is
14 affecting all of us at this stage is foreign
15 governments trying to -- basically the cyber
16 security stuff. Foreign governments have
17 certainly penetrated any number of our
18 institutions, you know, fairly sophisticated
19 entities, and at least my impression is that one
20 of the things they're looking at is our
21 infrastructure and, you know, particularly a
22 nuclear infrastructure, so trying to understand
23 where the NRC is on that, or PG&E is, in trying
24 to deal with the cyber security threats.
25 MR. STRICKLAND: It's a very important

1 topic and that we have a very dedicated team now
2 that deals with nothing but cyber security, and
3 it's -- actually, it's two teams -- we have a
4 team that is in the corporate office that looks
5 at the overall infrastructure for PG&E, and then
6 a team at Diablo that then interfaces with the
7 corporate team. What we're looking at is that
8 there's a number of different types of components
9 within the plant, and I won't get into specifics,
10 but components within the plant that would have
11 the potential to be impacted by somebody with a
12 memory stick, a jump drive, or some other device.
13 And so we've gone through an exhaustive process
14 of identifying components that may be at risk,
15 and in turn implement a program to be able to
16 then provide additional safety features and
17 safeguards. And it's a first step in the
18 process. This will continue to be an ongoing
19 evolution as we continue to see different
20 potential options that people that want to
21 attempt to access plant systems and components,
22 that we need to be able to be in a place to
23 understand those new threats and be able to
24 address them.
25 COMMISSIONER MCALLISTER: Okay, thank

1 you very much. Let's move on to our next
2 speaker, Commissioner Geesman, welcome.
3 MR. GEESMAN: Good afternoon,
4 Commissioners. I think I was invited here
5 probably more because of the period I spent
6 between my two assignments at the Energy
7 Commission. As you know, I was the Executive
8 Director from '79 to '83. Before I came back as
9 a member of the Commission in 2002, I spent 19
10 years in the Bond markets as an Investment
11 Banker, and I think the perspective that you were
12 looking for from me today was focused on the
13 business environment for these plants, in
14 addition to my current role, where for the last
15 year and a half my firm has provided legal
16 representation to the Alliance for Nuclear
17 Responsibility before State agencies.
18 Full disclosure: when I left the
19 Commission in '83, I worked originally for a firm
20 called FirstBoston which later became Credit
21 Suisse; they put out a very important report in
22 the securities markets the beginning of this
23 year, pointing to the economic dilemma some of
24 these aging nuclear plants face in today's
25 electricity markets. And to sum that up, it's

1 what you read about in terms of the very low
2 price for natural gas and the radically changed
3 assumptions in the United States for the long
4 term persistence of that low price of natural
5 gas.
6 According to Credit Suisse, they're
7 looking at sustained cost inflation in the
8 nuclear plants of three to five percent a year,
9 and that creates negative cash margins for most
10 operating plants during off-peak periods. And in
11 Credit Suisse's definition, off-peak was 50
12 percent of all dispatch hours.
13 UBS came out with a similar report, also
14 beginning of the year, a little more precisely
15 focused on merchant plants, and here I think you
16 get a pretty quick appreciation of the context
17 which Ted Craver faced at San Onofre. UBS's
18 problem with merchant plants was focused on
19 competitive market prices between $31 and $55 a
20 megawatt hour. Well, even if SONGS 2 and 3 had
21 operated at 90 percent capacity in 2012, they
22 would have produced electricity at $57 a megawatt
23 hour. That's because of the need for a regulated
24 plant to fully account for its authorized revenue
25 requirement. And as a consequence, you step down

1 from that both units operating at 90 percent
2 capacity to Unit 2 successfully operating alone
3 at 90 percent capacity, and you end up with a
4 cost of $114 per megawatt hour. Now, we all know
5 Unit 2 wasn't able to operate during 2012 after
6 January 31st, but the repair plant for coming
7 back at a 70 percent output level, assuming a 90
8 percent capacity factor during that period of
9 trial operation, you had $163.00 per megawatt
10 hour. So from a commercial operations
11 standpoint, this repair strategy never really had
12 much of a future, especially if you're trying to
13 amortize all of your repair replacement costs
14 during the nine years left on the San Onofre
15 license.
16 COMMISSIONER MCALLISTER: Just real
17 quickly, so those numbers would include in the
18 amortization sort of built into whatever power
19 production would have been produced?
20 MR. GEESMAN: No, those --
21 COMMISSIONER MCALLISTER: Oh, so those
22 would be in addition?
23 MR. GEESMAN: Purely a revenue
24 requirement, no projection for cost inflation.
25 Now, importantly, 2012 gas prices -- 2013 gas

1 prices have come up as much as by 100 percent in
2 some markets. As you see in this slide, that's
3 not fully reflected in the competitive price of
4 power. According to EIA, on a weighted average
5 basis, that means in those hours where the trades
6 were the greatest, the SP15 cost of 35 bucks a
7 megawatt hour in 2012, remember, that's compared
8 to a perfect San Onofre at 57 bucks; in 2013
9 through the end of last month, you see prices
10 have come up, but they haven't doubled, natural
11 gas prices have doubled between 2012 and 2013,
12 electricity prices in either market region of
13 California have not come up quite as much. Based
14 on plats, if you look at 2012, assuming both
15 units operating at 90 percent capacity factor, in
16 SP 15 there were only six 16-hour blocks when
17 those trades would have cleared the market. Say
18 what you will about Ted Craver, he's got very
19 sound business judgment.
20 Now, this is focused principally on
21 merchant plants, and there is, of course, the
22 notion that, well, the regulated plants, they
23 don't really face that competitive pressure. I
24 can tell you from the perspective of the guys
25 that trade their bonds, or that underwrite the

debt portion of their capitalization, that sooner or later it's that market price that is your benchmark. And the regulatory system is not going to prop up a plant that is wildly out of the market. Is there any reason to think that these same forces don't apply to Diablo Canyon?

And I recognize that the role of the Energy Commission statutorily as the State's energy contingency planner, I know one of the first rules of contingency planning is you try to minimize the potential for surprises; it's a lot easier to plan around a non-surprise environment, and I would suggest to you today that there's no reason to think that the economics at Diablo Canyon, despite its admirable running history, can't collapse just as quickly as they did at San Onofre. My great-grandmother used to say, "It's a wonderful life if you don't weaken." I looked that up on Google the other day and it turned out that was a slogan for the troops in World War I; it might be a good aphorism for utilities that own nuclear power plants today.

You heard a lot this morning about the seismic environment at Diablo Canyon and I was at the State Lands Commission last year when they

1 did approve the 3D high energy seismic surveys.
2 Each of the State Lands Commissioners observed,
3 you know, this is probably the last place in the
4 world we'd put a nuclear power plant if we were
5 siting it today. And I think as you look at this
6 map and you watch the progress of the seismic
7 surveys that PG&E is performing, and in many
8 instances at the direction of your two
9 Commissions, you've got to ask yourself that
10 question: would we do the same thing from a
11 siting standpoint today with the knowledge that
12 we have? And from what I'm about to show you, I
13 want to make certain that your record picks up --
14 I am indebted, or my client is indebted, to the
15 California Public Utilities Commission. Thirty-
16 seven or 38 years appearing on your transcript,
17 and I see Commissioner McAllister looking at me
18 with surprise, I have not had many opportunities
19 to say nice things about the Public Utilities
20 Commission, so I don't want to miss this one,
21 Administrative Law Judge Thomas Pulsifer granted
22 my client's motion to compel discovery and, as a
23 consequence, I think we've learned a lot that we
24 didn't know a short time ago about how PG&E has
25 responded to information concerning the Shoreline

1 Fault.

2 This is from the NRC's reaction to

3 PG&E's Shoreline Fault Study, PG&E's final study

4 had been published in January 2011; of course,

5 between January and August the Fukushima

6 catastrophe happened, but the NRC staff in August

7 of 2011, quite critical of PG&E's approach and,

8 in fact, was prepared to write them up for a

9 fairly significant license violation, went on to

10 indicate that the so-called Double Design

11 Earthquake, the more limiting largely because of

12 its conservative damping assumptions and its

13 conservative assumptions about soil structure

14 interaction, the Double Design Earthquake, even

15 though it's associated with an earthquake of

16 smaller magnitude than the Hosgri, a Double

17 Design Earthquake is actually a more demanding

18 set of licensing requirements.

19 And the NRC staff in August of 2011

20 quite insistent that simply comparing Shoreline

21 Fault information to that developed in the LTSP

22 was not going to be sufficient to meet the

23 license requirement. How did PG&E respond? This

24 is a series of internal emails that my client has

25 gotten through discovery at the PUC, and the

1 reference there in the first one is to Dr.
2 Michael Peck, who was the Senior NRC Resident
3 Inspector at the plant, and I should note that on
4 September 9, 2010, the San Bruno explosion took
5 place. The morning of September 10th, Dr. Peck
6 started asking questions about whether you could
7 meet the safe shutdown earthquake criteria that
8 had now been put in a different light with
9 information surrounding the Shoreline Fault. Dr.
10 Peck has said that, beginning in September 2010,
11 the NRC staff knew that the Shoreline Fault, the
12 Los Osos Fault, and the San Luis Bay Fault all
13 could produce ground motion 70 percent greater
14 than that which had been assumed in the Double
15 Design Earthquake. Dr. Peck has also indicated
16 that PG&E corroborated that in December of 2010.
17 You see the September 20th email, that is what I
18 would characterize, as a former Regulator, a red
19 flag, a greater chance of having to shutdown,
20 this is an economic issue, not a safety issue.
21 It goes on to suggest that, as early as September
22 2010, PG&E recognized that there was an
23 insurmountable problem in meeting the criteria
24 associated with the Double Design Earthquake, and
25 I want to emphasize the primary reason for that

1 insurmountable difficulty was the conservative
2 damping assumptions and soil structure
3 interaction assumptions associated with that
4 test. The Diablo Canyon license carries three
5 separate design basis earthquake tests, 1) the
6 Design Earthquake, 2) the Double Design
7 Earthquake, and 3) the Hosgri Earthquake, they
8 all have different damping assumptions. But from
9 a compliance standpoint, the Licensee is supposed
10 to be able to meet each and every one of those
11 tests.
12 In October, the reality, I think,
13 becomes fairly clear. The Hosgri probability --
14 and you heard a lot about probabilistic seismic
15 analysis this morning -- the Hosgri probability
16 is so small that simply relying on that would
17 mask the issue in what this October 1st email
18 calls "PRA space." And I should say, with
19 respect to the bottom quote, CLB stands for
20 Continuing License Basis.
21 Dr. Peck obviously made a bit of a pest
22 of himself, he continuously pursued the notion
23 that the shoreline information needed to be
24 evaluated based on the Double Design Earthquake
25 criteria -- the Double Design Earthquake is

1 specified in the license as the Safe Shutdown
2 Earthquake -- PG&E attempted to say that, no,
3 using the LTSP, which is more modern, more
4 probabilistic, is a much more sophisticated
5 approach; Dr. Peck clearly wasn't buying this and
6 suggested that the NRC staff in NRR, which I
7 believe is Nuclear Reactor Regulation, had been
8 misled by earlier information that the LTSP was
9 actually part of the license.
10 January 2011, remember, this is still
11 pre-Fukushima, PG&E offered what I truly think is
12 a sincere approach, that there is a difference
13 between safety and licensing compliant, and I am
14 not prepared to question the sincerity of those
15 that think applying other tests than the Double
16 Design Earthquake can still provide for a State
17 facility, in fact, I asked this question to Dr.
18 Robert Budnitz at the Diablo Canyon Independent
19 Safety Committee last week, and he told me that,
20 you know, he didn't want to address licensed
21 compliance, that was not within his remit, but he
22 had personally satisfied himself that the plant
23 was safe, that the equipment can adequately
24 perform. That may very well be, for all I know,
25 but I can tell you that we operate in a system of

1 the rule of law, not the rule of men, and the
2 only way in which our system can work is if the
3 terms of licenses are objectively applied.
4 When I was here at the Commission, I was
5 the Presiding Member of the Siting Committee and
6 I know how difficult some of those siting cases
7 can be. We authorized 23 power plants in the
8 five and a half years I was here. And you
9 develop a compliance program with respect to
10 every license. You don't ask the inspector to
11 exercise his personal judgment as to whether
12 something is safe or not, you ask the inspector
13 was the license complied with. If the license
14 needs amending, change the license, there's a
15 process for doing that, but you don't have ad hoc
16 judgments take precedence over what the license
17 actually requires.
18 PG&E, first instinct, I think legally
19 the correct instinct, was if you don't want to do
20 the test, amend the license, and that's what
21 produced the August 1st write-up by the NRC
22 staff. PG&E was, I think, quite candid in their
23 November 2011 10-Q and I think from a regulatory
24 standpoint, you know, in the hierarchy of
25 credible information coming from utilities, the

1 very top of the pyramid is that which there is a
2 securities lawyer's review before it's disclosed
3 to the market. This bottom bullet is, I think,
4 the pertinent point because the stakes are very
5 high, the NRC could order the utility to cease
6 operations until modifications are made, or the
7 utility could voluntarily cease operations if it
8 determined that the modifications were not
9 economic or feasible.
10 And I want to tell you what I heard from
11 Dr. Munson this morning was pretty disconcerting
12 in that context because what I heard, consistent
13 with what Dr. Peck was saying as early as
14 September 2010, was that the NRC staff doesn't
15 expect these 2015 evaluations that PG&E is going
16 to be doing to be able to satisfy the Double
17 Design Earthquake standard. And that's a pretty
18 long period of forbearance from enforcing the
19 requirements of a license. And I think from the
20 standpoint of your contingency planning
21 responsibilities, you probably ought to get to
22 the bottom of this information, get the
23 information from PG&E as to just how broad an
24 exceedance is there between the Shoreline Fault
25 information, the Los Osos Fault information, the

1 San Luis Bay Fault information, and the Double
2 Design Earthquake. If you don't get that
3 information, how else are you going to have a
4 handle on the prospect of a sudden shutdown?
5 The next section of this, I think, is
6 even more troubling. It's PG&E's notes, and I'll
7 tell you as a lawyer, they're hearsay, they're
8 not evidence that the Branch Chief, Neil O'Keefe,
9 actually said this, what they are evidence of is
10 this is the way PG&E wrote up the call report.
11 And from my perspective as a former Regulator, I
12 think it verges on what I'd characterize as
13 inappropriate coaching. His advice is that we
14 eliminate the Double Design Earthquake as our
15 safe shutdown earthquake. His opinion is that,
16 by leaving it in, it appears as if we are
17 covering something up. I'll tell you, that's a
18 red flag. The simple story won't stand on its
19 own if we leave the Double Design Earthquake in.
20 Neil's greatest concern is that we cannot provide
21 a good argument for why the analysis using the
22 Double Design Earthquake can't be done. He made
23 the comment that it is better to be legally clean
24 than legally correct, but confusing. I don't
25 think I ever saw anything like this when I was at

1 the Energy Commission either as its Executive
2 Director, or as a member of the Commission. I
3 can't say the NRC and its Licensees have the same
4 culture that we had, but I think from the
5 standpoint of the State of California, it should
6 be a matter of profound concern.
7 Even after the call, that persistent Dr.
8 Peck continued to stress his view that PG&E
9 cannot use the alternate analysis method. Now,
10 look at this, if he is correct -- and that means
11 if Peck is correct -- and we can't use that
12 approach, we have to apply Shoreline using the
13 Double Design Earthquake approach, that would
14 almost certainly result in exceeding Code
15 allowable limits that would require us to get NRC
16 approval to continue to operate.
17 Dr. Peck graphed the difference between
18 these damping assumptions -- I'm sorry that the
19 graph is difficult to read, it comes from a non-
20 concurrence filing, meaning that he was
21 dissenting from what became the NRC Management's
22 position, and I have to tell you that is a
23 relatively rare event to have your Senior
24 Resident Inspector dissenting from what
25 Management decides to do. This is his graph of

1 the containment building at I think the 88-foot
2 level. His point in the narrative of his Non-
3 Concurrence is this is where the air coolers are
4 that the facility depends upon in mitigating a
5 loss of coolant accident and main steam line
6 break.
7 Neil O'Keefe was Dr. Peck's supervisor.
8 This is how he responded to the Non-Concurrence:
9 "The actual facts are not in dispute. While this
10 concern has overtones of safety, the actual
11 questions are procedural." Well, from a
12 procedural standpoint, it's hard not to regard
13 this lengthy period of forbearance from license
14 enforcement as a de facto license amendment, and
15 those of you familiar with the ASLB decision on
16 San Onofre know what a large role the phrase "de
17 facto license amendment" plays in determining
18 whether there's a right to public hearing before
19 that type of change is put into effect. Under
20 the licensing provisions, the State of California
21 is supposed to be consulted before that type of
22 change is made.
23 There is a lot more to this story which
24 my client will address in the testimony it will
25 be filing in PG&E's general rate case on June

1 28th. I will also submit that to your docket and
2 would be happy to respond to any questions.
3 CHAIRPERSON WEISENMILLER: Well, thank
4 you. Obviously, I was going to suggest PG&E
5 respond, you know, since obviously there are
6 different snippets here, to the dates when the
7 comments are due as opposed to trying to respond
8 at this moment.
9 I guess just sort of shifting gears for
10 a second, obviously you're trained as an
11 attorney, and also in the securities area, and so
12 one question we're struggling with is when we
13 look at the economic damage that occurred in
14 Japan and try to figure out the abilities of
15 anyone to deal with that type of event, is that
16 something that's ever discussed in the financial
17 disclosures?
18 MR. GEESMAN: Well, it's akin to both
19 the liability insurance that in this country goes
20 under the Price Anderson rubric, or the
21 responsibility for permanent waste disposal that
22 is absorbed by the Federal Government. These are
23 sums that very quickly get to such large
24 magnitude that they're passed off to the
25 taxpayers because there's really no other way to

1 do it. So as long as those legal provisions
2 exist, or as in a wildfire, or flood, Hurricane
3 Katrina-type situation, if your contemplation is,
4 well, of course the Government would have to step
5 in to address that, from a securities analyst
6 standpoint, that's an easy risk to jump over, not
7 try to quantitatively evaluate, discuss it
8 qualitatively, depending on your perspective,
9 either lament it or celebrate it, but don't dwell
10 on the numbers too closely because they quickly
11 cascade.
12 CHAIRMAN WEISENMILLER: Thank you.
13 Commissioners, any other questions?
14 COMMISSIONER MCALLISTER: Yeah, I guess,
15 I mean, that was an interesting play-by-play and
16 really appreciate all the digging on that.
17 Obviously, I think there's a lot to discuss
18 there. So at this moment I don't necessarily
19 want to dig into it, but I certainly feel that
20 the sort of dynamic, I asked about it before a
21 little bit with respect to, you know, does our
22 regulatory structure kind of capture the ability
23 to work through these issues in a fairly
24 relatively responsible, transparent way, and I
25 would want to kind of keep that discussion alive

in the sense that PG&E and the Commission, the NRC, consider sort of a little bit of procedural analysis in comments to this proceeding, or in another adequate proceeding. So thank you.

So, let's see, I think this session is scheduled to go to 3:50, so let's go to Mr. Lam and then see how much time we have at the end.

MR. LAM: Okay, thank you. Honorable Commissioner McAllister, Honorable Chairman Weisenmiller, Honorable Commissioner Florio, ladies and gentlemen in the audience, good afternoon. I am Peter Lam. I am the Chairman of the Diablo Canyon Independent Safety Committee. I am honored and privileged to serve as the California Energy Commission's appointee to the Diablo Canyon Independent Safety Committee.

May I share with you today some opposing arguments about nuclear reactor safety? And I frame my discussion today as the causes and consequences of major nuclear reactor accidents. Now, this slide illustrates a previous estimate of accident frequency to be about ten to the minus one, or ten to the minus four, ten to the minus five, it's about once in 20,000 reactor years of operation. That means within this

1 country we would not expect a single nuclear
2 accident because we have only 104 nuclear power
3 plants before San Onofre's proposed shutdown.
4 However, within the last several
5 decades, we do see three major nuclear accidents,
6 Chernobyl, Three Mile Island, and Fukushima.
7 With that data, the new estimate now may be --
8 you see the question mark there -- once in 2,000
9 years. What does that mean? That means do we
10 expect to see a nuclear major accident every five
11 years? Because now we are at about 450 nuclear
12 reactors operating in the world. And even with
13 only 100 nuclear reactors in this country, with a
14 once in 2,000 year frequency, we are talking
15 about two percent probability of a nuclear
16 accident happening for a plant within its 40-year
17 lifetime.
18 Now let's talk about successes here.
19 How do we so far prevent nuclear accidents?
20 These two slides are really self-explanatory.
21 For those of us in the Nuclear Safety business,
22 we really practice application of fundamental
23 safety principles, of redundancy, diversity, and
24 physical separation. We pay attention to design,
25 manufacture, installation, operation, and

1 maintenance of critical equipment. There is a
2 role for Federal oversight. There is continuing
3 Licensee vigilance. And we have industry
4 group participation, international cooperation,
5 and State agencies involvement. An example to be
6 given is the Diablo Canyon Independent Safety
7 Committee, we have three committee members, we
8 have three appointed by the State Governor of
9 California, appointed one committee member, the
10 State Attorney General appoints another one, and
11 the State of California Energy Commission
12 appoints another member. And then we do have
13 continuing operational experience analyses and
14 feedback.
15 Now let's talk about Causes and
16 Compounding Factors, which is a diplomatic way of
17 talking about failure. You are looking at a
18 complex and unforgiving technology. You are
19 dealing with intricate system interactions. You
20 are talking about numerous human and machine
21 interfaces. You are talking about safety systems
22 with large capacity on standby. The system is
23 basically idle until you need it, and when you
24 need it you need it in an hurry, and these are
25 large systems. You are pushing against the

1 envelope of the limits of the law of physics.
2 And then you talk about equipment unavailability
3 and failure and this is related to equipment
4 aging. Each and every plant in this country is
5 almost middle aged. You're talking about an
6 average age of about perhaps 20-years-old. And
7 then you talk about human errors and errors of
8 omission, errors of commission and operation in
9 repair and in tests. And then we are talking
10 about beyond design basis external events.
11 And then you're talking about numerous
12 potential accident initiators, and how about many
13 vulnerabilities. How about unpredictable
14 accident sequences? And then last, but not
15 least, what about a long and unknown or
16 unknowable developments.
17 Within the Federal agencies that
18 regulate nuclear power, it used to be an
19 impermissible attack on agency regulation if you
20 talk about malicious acts, and the agencies' old
21 criteria was unforeseeable events. And of
22 course, after 9-11, the landscape had changed,
23 but still the last bullet is important because
24 there are things that we may not know and be able
25 to predict.

1 Let me show you a typical picture of a
2 typical 2-Loop Pressurized-Water Reactor,
3 courtesy of the United States Nuclear Regulatory
4 Commission. You see a pristine structure, you
5 see a simple elegant design, it tells you this
6 thing works. Another picture also conveys the
7 same language. Yes, indeed, through the
8 proponent, nuclear technology has served us well.
9 We have not had a major accident that has caused
10 any human fatality, including Fukushima, no
11 member of the public ever died from a major
12 nuclear accident, so this technology has served
13 us well through the proponent.
14 Now, this is a 35-year-old picture from
15 NRC training manual. Now, at that time when the
16 picture was drawn, a steam generator -- it's
17 forced steam generator there -- because a steam
18 generator was about $5 million at that time,
19 today a steam generator at San Onofre cost about
20 $100 million or $250 million.
21 Now, what about the consequences? This
22 slide is self-explanatory. For truly nasty major
23 nuclear accident, you are dealing with potential
24 human fatalities and latent health hazards. You
25 will be looking at immense environmental impacts

1 from radioactive material releases and
2 dispersion. You talk about huge financial
3 burdens. And then you talk about long term post-
4 accident management for years or decades. Why?
5 Let's look at radiation hazard before we go to
6 the next slide. If we talk about large
7 inventories at the reactor core or the spent fuel
8 pool, or at the dry cask storage site, you talk
9 about lethal doses, you talk about different
10 pathways, you are talking about some very long
11 half-life isotopes, and then some radioactive
12 isotopes act like potassium or calcium to the
13 human body. If they act like calcium, they will
14 go to the human bones, potassium would be widely
15 dispersed in human tissues.
16 Now let's talk about lethal doses. The
17 last item on this slide refers you to the Greek
18 figure, Medusa. Medusa is one that you look, you
19 die. Now, the lethal dose of 50% of the
20 population is roughly about 500 rems. Rems is a
21 unit of measurement of doses to human body, it's
22 same for Roentgen Equivalent Man because man
23 comes in different sizes and shapes and gender
24 and age. Now, about 500 rem will kill 50 percent
25 of the people who are exposed to it, that's what

1 LP50 means. Now, the contact dose of a fresh
2 brand new spent fuel -- now the fuel has been
3 sitting in reactor core for maybe three years,
4 four years, if you remove it from the reactor
5 core, the contact dose is about Bundle is about
6 1,000,000 rem per second, or 10,000,000 rem per
7 second. Okay? Within a split second, it would
8 deliver thousands of times of a lethal dose to
9 human being.
10 Now, let's talk about the Decay Heat
11 Removal. In any accident consequences, you're
12 dealing with a dose and then you're dealing with
13 a decay heat. The simple illustration here is
14 about long term decay heat is less than 0.1
15 percent. For major nuclear power facility,
16 you're talking about 1,000 kitchen ovens and
17 within the confined space that you're dealing
18 with, that heat needs to be removed.
19 And what is the problem? The problem is
20 facing two fundamentally conflicting technical
21 demands, to release the decayed heat, you need to
22 open the system. To contain the radioactivity
23 damage to that alignment and to your fellow human
24 being, you need to close the system. And then
25 you need to do that for years or for decades, and

1 then you need to do that also -- to be really
2 successful, you need to move people away, and
3 then you need to deny them of the land use, and
4 then you need to find money.
5 Now, the policy consideration here is,
6 1) is compliance alone with Federal Regulations
7 sufficient? 2) Do Federal design basis accidents
8 cover all the important accidents? Now, this is
9 an important consideration. In performing my
10 duty as the Chairman of Independent Safety
11 Committee in Diablo Canyon, in response to public
12 inquiry, some of my response is framed this way:
13 I for one am persuaded that Diablo Canyon
14 complies with all important Federal Regulations;
15 that, I can testify to. But are the Federal
16 Regulations adequately developed and implemented?
17 That is another matter.
18 Now, the third bullet is, is the
19 technical analysis that the experts have done,
20 are they complete? Now, in this business,
21 completeness is not only important, but it is
22 difficult for anybody who ever tried to do
23 accident analysis, you're talking about numerous
24 sequences, you're talking about unpredictable
25 development, you're talking about material

1 science, and then you're talking about physics.
2 And then you're talking about thermal hydraulics.
3 You're truly talking about multi-disciplinary
4 effort here. Once in a while, here and there,
5 maybe some of the analyses are not complete, and
6 most of the time the incompleteness is okay, it's
7 rather trivial, they are development, but they
8 are not material to the outcome. But we persuade
9 all the time that we are complete in analysis.
10 And then, are we making realistic assumptions?
11 Now, may I give you three examples on the
12 adequacy of Federal rules? Number one is the
13 2011 earthquake, the Mineral, Virginia, impacting
14 North Anna Nuclear Power Plant. The forces
15 experienced by the facility had exceeded both
16 operating design basis and the design basis
17 earthquake, so it really exceeded the ODB and the
18 DB heat. Now, the proponents' argument is "Aha,
19 little equipment damage was observed and, indeed,
20 that is a good demonstration of large safety
21 margin of how we design equipments." The
22 opponents' argument is "Gee, where were you guys
23 when you put the design basis earthquake
24 together? Why did you set it so low?"
25 The next example I like to offer you is

1 on adequacy of Federal rules related to the
2 pressurized thermal shock rule. Now, I for one
3 consider the pressurized thermal shock accident
4 one of the major accident sequences that deserve
5 our undivided attention. It has nothing to do
6 with Fukushima, it has been on our books for
7 years. Now, in the old NRC rule on the PTS rule,
8 there were seven nuclear power plants that were
9 not eligible for license renewal for another 20
10 years. The new rule, which was developed after
11 decades of intensive research, it's been offered
12 to the Licensee, it's not mandatory, it's
13 voluntary, you don't have to choose it, you don't
14 have to comply with it, but if you do choose to
15 comply with it, it would now make all nuclear
16 power plants in this country for additional 20
17 years of license extension.
18 Now, the proponents' argument would be
19 "Hallelujah, this is a clear demonstration of
20 elimination of unnecessary Federal, restrictive
21 Federal rules." It demonstrates a more realistic
22 assumption on neutron damage to the Reactor
23 vessel. The opponents' argument would be "Well,
24 I don't care about who is going to be eligible
25 for license renewal, the new rule obviously

1 introduces a relaxation of safety margin." And
2 of course, there's a standing assertion on the
3 table that the new rule may be politically
4 motivated.
5 And then the third example of Federal
6 rule adequacy has to do with something in Japan.
7 Now, everybody is aware that the Japanese nuclear
8 industry has been using most of our regulatory
9 framework and system for how they regulate the
10 nuclear power industry, not to mention the design
11 of General Electric, the design of Westinghouse
12 we have, for example. Now, near Tsuruga Reactor
13 Unit 2, it was just recently discovered -- now, I
14 cannot testify to the validity of that discovery
15 because I only read it in the ups news article,
16 that the reactor in Unit 2 was sitting on an
17 active seismic fault. Now, assuming that is
18 factual, then I'm proposing to you, the
19 proponents' argument would be "Oh, don't worry,
20 the plant has been sitting there for so long, a
21 major seismic event would be unlikely. Besides,
22 one can always develop effective remedies." Now,
23 the opponents' argument would be, "Hey, for that
24 case, you site a plant there? And telling us it
25 was safe?" Now, if I may also offer you

1 entertaining question, is, as much as I have a
2 great deal of respect and admiration, and a great
3 deal of deference to our seismic scientists and
4 engineers who practice this trade for so long,
5 and try to protect the safety of public among
6 many other things, in my humble opinion, the
7 seismic science is not in a mature state to be
8 able to answer this fundamental question: "If you
9 know so much about seismic activity, please tell
10 me when and where and how big the next earthquake
11 will come from. And I give you plus or minus and
12 leeway on your predictions of the size of the
13 earthquake, and I give you plus or minus 10 miles
14 from the epicenter." This is just an assertion
15 that I hear numerous times in the public
16 meetings.
17 And now may I conclude my observations?
18 On accident prevention, as we all are working
19 towards making sure the existing power plants are
20 safe, it's not only prevention of recurring
21 accidents, as much as I, again, respect the
22 amount of effort being done on Fukushima, to me,
23 it does not give me comfort if you tell me, "I'm
24 no Fukushima, I'm 80-feet, I'm 200-feet above sea
25 level. I do everything that would save a station

1 blackout. My concern is on the second support on
2 the first one, which is what about new nuclear
3 accidents? By "new," I mean they have not
4 occurred, and God forbid, let's make sure they
5 don't, and some of these accidents have been on
6 our books for years. If I may offer you one
7 example, or two examples, one had to do with the
8 pressurized thermal shock, it's a nuclear reactor
9 vessel rupture. If it ruptures, it would present
10 a very difficult situation for anybody to manage
11 that accident. Now, admittedly, every single
12 Licensee that I know in this country are on top
13 of it. We had humans in the reactor vessel, we
14 test them, we extrapolate, we interpolate, we had
15 numerous people focusing on it. But my urging is
16 let's make sure we're doing enough. And the
17 second one would be another reactor accident
18 that's on everybody's mind, is what would happen
19 to a nuclear reactor if you need to scram it and
20 it does not scram, right? So my urging is, let
21 us do what we are doing on post-Fukushima lessons
22 learned, once that is done if we have any energy
23 left, perhaps we refocus our attention to
24 preventing something that has nothing to do with
25 Fukushima, but has everything to do with nuclear

1 power safety.

2 And then the second bullet is what I had

3 offered to you for consideration on adequacy of

4 Federal rules, and then the post-accident

5 management difficulty, really well known, and

6 they are self-explanatory. And thank you very

7 much for your attention.

8 COMMISSIONER MCALLISTER: Thank you very

9 much. Just to comment, I guess we've had from

10 various angles, we've had some relatively

11 pragmatic discussion, I think, about the

12 particulars of the plants we have here in

13 California, looking at the various regulatory

14 kind of processes that are in place, the studies,

15 the technical -- you know, I often -- I liked the

16 way, Mr. Lam, you set up sort of on the one hand,

17 on the other hand, what the proponents would say

18 and what the opponents would say about any given

19 issue, and I think it does highlight the fact

20 that this relatively difficult to understand or

21 complex set of issues really does get pretty

22 quickly back to individual world views. What you

23 think about this in a lot of ways boils down to

24 what you feel like our society ought to look like

25 in order to support a technology like this. It

1 boils down to, kind of fulfills -- maybe we
2 should have a panel of philosophers to help us
3 work through some of these issues. But the fact
4 that you have a highly complex, very technical,
5 inherently centralized technology, and you could
6 say that about the electric grid sort of
7 generally, but you can particularly say that
8 about nuclear, is I think -- you know, France has
9 chosen one route, the U.S., we have a different
10 nature to our Democracy in important ways, and I
11 think people apply their feelings about what kind
12 of society they want to live in onto this
13 question. And it brings up a lot of really
14 fundamental, almost existential questions and
15 issues, and I don't propose to have the answer to
16 them, but I do feel that your presentation, I
17 think, can help us kind of understand what the
18 choices we make and where those might be leading
19 us, which fork in the road we take on any given
20 issue, or any given point along this discussion
21 could have long term impacts on the kind of
22 systems we need to put in place to mitigate risk
23 and the cost that we're imposing on society, and
24 the kinds of structures that we need to put in
25 place, etc. etc. So I just want to put that out

there to elevate the discussion a little bit, to say, you know, this is not necessarily just about relays and backup systems, per se; this is really kind of a very fundamental discussion in an important way, so we're obviously not necessarily talking about that here today, to figure out how we're going to move forward with particular plant regulation, but I think it's worth saying because this does actually have to do with what your vision of what the electricity system ought to look like, and we do have limited options and I think it's really good to work through this when we have the opportunity. So thanks for that.

MR. LAM: Thank you.

CHAIRMAN WEISENMILLER: Actually, just a follow-up question. I was thinking back. Obviously, as a nuclear scientist, I can say a lot of us spent a lot of time thinking about the implications of our research, both in terms of bombs and also in terms of some of the challenges of nuclear power which people like Ivan Weinberg, certainly a leader in this area, always talked about sort of the Faustian bargain there, but anyway, getting to more prosaic issues. My recollection is that one of the Diablo Canyon

1 reactors has copper weldments and so the PTS
2 issues could be relevant there? Is that true?
3 MR. LAM: Yes, indeed, Chairman
4 Weisenmiller. And not only is it relevant, the
5 plant has been focusing on that, you know,
6 because the Independent Safety Committee's
7 inquiry recently, and they have been focusing on
8 that for a long time.
9 CHAIRMAN WEISENMILLER: Yeah, I remember
10 before Diablo started operating, PG&E was
11 starting to come to grips with that, the copper
12 weldments, at that stage.
13 MR. LAM: Right. And their coupon
14 program has been very adequately planned and
15 implemented. And based on the latest, I was
16 onsite about a month ago, my inquiry has to be,
17 you know, the general features of the plant, but
18 specifically they had some coupon that has been
19 extrapolated to 60 years of fast fluence
20 exposure. Assuming that fact is not disputed,
21 assuming there's no dispute there, then that may
22 demonstrate the reactor vessel, at least that
23 coupon is good enough for 60 years. The reason I
24 hedge is, well, you had the coupon, but the
25 vessel is huge, and you're telling me the coupon

1 will survive for 60 years. Well, the question
2 remains, is the coupon representative of the
3 vessel? Or does it just something that happens
4 to be the strongest, I mean, when you get that
5 coupon 40 years ago, who observed selecting of
6 that coupon? Are there any things that may
7 happen to your vessel while it's being
8 constructed? Right? I am, you know, belong to
9 the old school like President Regan say "trust,
10 but verify." None of these questions and
11 inquiry, it has nothing to do with saying
12 somebody may have done something wrong, I'm just
13 saying let us make sure that, you know, I am
14 persuaded the coupon will survive for 60 years of
15 operating because it has been demonstrated, but
16 does that mean the vessel would, too? Is there
17 anything else that may come into play? I, for
18 one, have no expertise, somebody who has
19 expertise in material and in testing and
20 manufacturing needs to come in and provide
21 further examination of this important issue.
22 CHAIRMAN WEISENMILLER: Thank you.
23 COMMISSIONER MCALLISTER: I appreciate
24 the Chair bearing with me on my waxing
25 philosophical here, but I think we're right at

3:50 and let's take our break, a ten-minute break, and we'll come back right at 4:00, do our final panel, and then at the end of that open it up for a wrap-up and public comment.

MS. KOROSEC: Public comments, yes.

COMMISSIONER MCALLISTER: Thank you.

(Recess at 3:49 p.m.)

(Reconvene at 4:01 p.m.)

MS. WALTER: Okay, next I'd like to introduce Walter Horsting from Business Development International for his presentation on Thorium Molten Salt Reactors.

MR. HORSTING: Thank you. Ladies and gentlemen, members of the Commission, I welcome this opportunity to talk about "The Good Reactor," is how I like to title this presentation.

The problems that we've been hearing about with Fukushima, San Onofre, Diablo Canyon's concerns, many are addressed by issues that come up with Thorium LFTR, what I like to say is what fusion would like to be, a fusion reactor would like to be.

World energy consumption of five billion tons of coal, 31 billion barrels of oil, nearly

1 three trillion cubic feet of gas, and 65,000 tons
2 of uranium can be equaled by 6,600 tons of
3 thorium properly burned.
4 What I'd like to say is what Mr. Lam was
5 mentioning earlier about many of the issues with
6 safety, I will get into later and I would like to
7 talk about how abundant this energy source is for
8 the world, and how conflict energy will be a
9 thing of the past if we approach it sensibly.
10 One ton, one gigawatt, one city, is all
11 it takes to power. It has a low cost, it's a
12 proven technology, it was developed in Oak Ridge
13 National Labs in the 1960's and ran for 20,000
14 hours; ironically, it was said to be on a nuclear
15 bomber during the Cold War because it was so
16 compact. The issue is that it wasn't viable for
17 making nuclear weapons. We're talking safety
18 issues with nuclear power plants. This is low
19 pressure, high temperature reactor, it's a molten
20 salt, it has roughly 1,000 centigrade operating
21 temperature range of its molten nature. It can't
22 run away, can't melt down, it can't blow up. It
23 doesn't mean a billion dollar containment
24 building. It's efficient. It burns 99 percent
25 of its fuel versus one percent on a solid fuel

1 rod system. It has very little by-products,
2 we're talking a couple of decades for a majority
3 of its waste stream versus hundreds of thousands
4 of years. Because it's high heat, it can be very
5 compact generation sets. It can burn our nuclear
6 waste. MIT's Transatomic just got an energy
7 award for a waste annihilation reactor system.
8 Thorium can burn our nuclear waste. It's carbon-
9 free energy, of course. It has heat properties
10 to convert garbage, biofuels, and in a
11 conversation with the chief chemist from the
12 Naval Research Lab, they're working on a process
13 of making jet fuel for their aircraft carriers
14 out of sea water, actually taking the CO_2 out of
15 the water and converting it, cracking the water,
16 and making jet fuel, and doing it at a lower cost
17 than they can deliver it to their ships.
18 It has magnitudes less waste. For a
19 uranium reactor, you're talking 800,000 tons of
20 ore mining versus 200 tons with thorium. You're
21 talking huge waste streams with uranium versus
22 thorium. It must be looked at. It can be built
23 modular in the 50-100 megawatt range, which means
24 you can put it where the power needs to be, you
25 could do desalinization and power for coastal

1 cities instead of having to have large generating
2 plants and do massive distribution systems. And
3 they can be built much much quicker in terms of
4 two to three years' range for one Canadian firm
5 -- full disclosure -- I represent Thorium Power
6 Canada that is looking for the funding to do its
7 first demonstration plant in the next two to
8 three years. They can be built on a assembly
9 lines just like Boeing builds a commercial
10 airliner, which is a highly complex machine. It
11 can be very inexpensive to deploy, good payback,
12 and one of the ironies of this technology is,
13 during the Cold War, it was put on the shelf at
14 Oak Ridge National Labs because it wasn't a good
15 source of bomb making material, you had to go
16 through way too many steps than what you can do
17 with a typical fission reaction with uranium.
18 It's a fertile material, it's not a fissile
19 material.
20 So you're dealing with a system that
21 can't melt down, can't blow up, there's tons of
22 it everywhere in the world, thousands of years of
23 sustainability, and what I'm hoping to get out of
24 this session is to be invited back with a full
25 technical team to get into depth on the

technology and also to hopefully change California policy for the thorium LFTR to be considered a sustainable energy source and a good energy source.

And the walk away safety issue on this technology is there's a free -- it's a gravity-fed freeze plug system, so if the power goes out, the freeze plug melts and it drains away, it's a safety tank, so this was all worked out in the 1960's at Oak Ridge.

So how I see this tying in to California is we led the world with building the Trans-Continental Railroad and locomotive construction, and now we're lagging behind in building high-speed rail. We've done electrification in California with the power plant in Folsom, and now we're shutting down all of our nuclear plants. What's next? We've lost the photovoltaic market to China, we're building an expensive water project that will not create a drop of water, I'm suggesting that we look at thorium LFTR to not only generate power, but provide desalinization for Southern California.

And I think that is the majority of my comments. I welcome any questions.

CHAIRMAN WEISENMILLER: Okay. Well, thanks. I think when we talked before, obviously we think back to I guess 'Chip' Bupp's book, you know, back when people -- Light Water Dream (*sic*) I think it was called -- but anyway, it was sort of the variety of fuel cycles we could have picked and invested in, but we picked the one we did --

MR. HORSTING: Unfortunately.

CHAIRMAN WEISENMILLER: -- yeah, may or may not be, but it is one of these questions of whether nuclear would ever have a second chance in that sense, and so certainly people are looking at that and thinking also back to Harvard MIT studies again and saying, you know, how do we marginally improve what we're doing as opposed to basically striking out on a whole new path, although I guess you've gotten some money from ARPA-E in this area? Probably the most likely venue for --

MR. HORSTING: Well, China is on a crash two billion dollar program with 180 PhDs working on shared DOE plants on the Oak Ridge work --

CHAIRMAN WEISENMILLER: Well, I thought India also really focused on thorium given its

materials.

MR. HORSTING: Yeah, I think, well, it's so abundant I think they're trying to start with their solid fuel reactors and then build toward later phases. Norway is getting into it big time, I also think UK is seriously looking at it now.

COMMISSIONER MCALLISTER: Where are the major deposits of thorium? You said it was very prevalent --

MR. HORSTING: Everywhere. It's as common as lead. There's enough thorium to power our society at highly accelerated levels for thousands of years. You just can't run out of the stuff.

COMMISSIONER FLORIO: Is there a prototype or demonstration project actually in place anywhere?

MR. HORSTING: There is a mothballed facility at Oak Ridge National Lab that ran for 20,000 hours, it was a test bed for a nuclear bomber powered by a nuclear power plant, and it lost out to the Polaris Submarine Missile Platform during the Cold War, and since it wasn't able to really produce any nuclear weapons out of

1 it during the Cold War, there wasn't really an
2 issue, a need to throw money at a great power
3 source.
4 COMMISSIONER MCALLISTER: So you're
5 saying that the down side to this technology is
6 that it can't produce bomb making material?
7 MR. HORSTING: Yes. And it will also
8 burn our nuclear waste.
9 COMMISSIONER MCALLISTER: Right.
10 MR. HORSTING: From our plants.
11 COMMISSIONER MCALLISTER: So maybe I
12 missed something on the technical side, so
13 basically since it's not a fission basis, it's
14 basically producing lots of heat to run a steam
15 cycle? Or --
16 MR. HORSTING: Well, it's a fertile
17 material, not a fissile material, so it needs a
18 starter seed of uranium to start creating
19 neutrons that convert it into 235.
20 COMMISSIONER MCALLISTER: Oh, okay.
21 Thank you very much for being here.
22 MR. HORSTING: Thank you very much.
23 MS. WALTER: And finally, our last panel
24 is the Public Interest panel discussion with
25 Rochelle Becker of Alliance for Nuclear

1 Responsibility and Kendra Ulrich with Friends of
2 the Earth.
3 COMMISSIONER MCALLISTER: Thanks for
4 coming. First up?
5 MS. ULRICH: Commissioners, Chair, first
6 I just want to say thank you for the opportunity
7 to be here and, I have to say, when I received
8 the invitation from Joan Walters to be here, I
9 had a very different idea of what I would be
10 speaking to you about. It changed drastically on
11 June 7th, as you know our interest has been
12 primarily San Onofre here in the state. First, I
13 just want to applaud the CEC for your leadership
14 and forward thinking in calling for a Plan B for
15 a Southern California without San Onofre.
16 I also just want to say, as my dear
17 friend and colleague Dave Freeman has said
18 frequently, that California is no longer one
19 power plant away from rolling blackouts and I
20 think that San Onofre really demonstrates the
21 fact that, you know, the ISO, the PUC, the CEC,
22 has been able to respond very rapidly to the loss
23 of a major power plant, and last summer and this
24 summer really demonstrate the fact that we don't
25 need these incredibly centralized, dirty, and

1 dangerous old nuclear facilities.
2 I just want to first give a brief
3 overview of FOE's role in the San Onofre issue.
4 As you know, we have been engaged at the PUC in
5 both the OII investigation, as well as in the
6 Long Term Procurement Proceeding. As far as the
7 NRC is concerned, we had filed a petition almost
8 a year ago that contended that both the restart
9 plan, as well as back when these drastically
10 redesigned steam generators were replaced, that
11 Southern California Edison should have been
12 required to go through the license amendment
13 process. On November 8th, the NRC Commissioners
14 voted unanimously to defer this to the Atomic
15 Safety and Licensing Board, as well as to a 2206
16 Petition process. The Atomic Safety and
17 Licensing Board is a panel of Judges comprised of
18 scientists, of engineers, and of lawyers, that
19 took a look at the facts that we presented and
20 summarily rejected both the NRC staff's opinion,
21 as well as SCE's contentions, and upheld all of
22 Friends of the Earth's contentions. What they
23 said was that these were not like-for-like
24 replacements, that these were drastically
25 different replacement equipment, that restart

1 was, in fact, a nuclear experiment, and that this
2 was in fact a de facto license amendment process.
3 That was on the 13th of May, three weeks later
4 San Onofre, Ted Craver announced that they were
5 shutting down San Onofre, citing the ASLB
6 decision as the decisive factor in that decision.
7 And I just want to say that this isn't a
8 case of regulation overburdening a utility, this
9 is a case in which the facts were weighed by
10 technical staff, by engineers, and by scientists,
11 based upon the technical evidence that Friends of
12 the Earth had been able to submit due to our
13 expert consultants that said that this is in fact
14 an experiment with Southern California, so we
15 were obviously delighted that it is shut down.
16 As far as San Onofre going forward, we
17 just want to say that we fully support the CEC's
18 position that the spent fuel pools are over-
19 packed, that they need to be thinned as quickly
20 as possible, and in the case of San Onofre that
21 the spent fuel needs to be transferred into dry
22 cask storage and hardened onsite storage as
23 quickly as possible, and that's just from a
24 public safety perspective that that needs to
25 happen.

1 As far as San Onofre national
2 implications, we keep hearing from the Nuclear
3 industry that this is, you know, an isolated
4 situation. Really, 2012 has been kind of a
5 bellwether year that is indicative of a nuclear
6 renaissance that was dead on arrival. We've seen
7 the shutdown of four nuclear power plants, San
8 Onofre Units 2 and 3, the Kewaunee in Wisconsin,
9 and Crystal River in Florida. Kewaunee shut down
10 because it was non-competitive, it was a small
11 merchant reactor that is non-competitive, and
12 it's likely to be the first of many around the
13 country that will be shut down. Crystal River
14 and San Onofre Units 2 and 3 were shut down
15 because of the utilities that cut corners in the
16 interest of money and in the interest of time.
17 And so, as we move forward, what we're seeing is
18 an aging nuclear fleet in this country that is
19 dealing with the problems of any technology that
20 is four decades old and equipment that is three
21 to four decades old, generally speaking. And as
22 they're trying to replace and repair this old
23 archaic equipment and old archaic technology,
24 we're seeing a lot of problems and obviously they
25 are trying to minimize the cost and the burdens.

We heard a lot today about Fukushima retrofits. These are retrofits that are going to cause extended outages going forward as they're trying to invest Ratepayer money, generally speaking, into bringing these old buildings, old equipment, old technology, up to date, which really from our perspective needs to be invested in clean renewable energy technologies, transmission upgrades to support that. With San Onofre's shutdown, Southern California is certainly poised to be an example of that transition. And here in California where you're already on a trajectory for 33 percent renewables, with the Governor calling for an increase to 40 percent renewable energy, we definitely see that firmly underway, that process, that transition. But what we will need is for the CEC to show that leadership in to steward responsible decisions to pivot away from fossil fuels and pivot away from these old dirty technologies to energy efficiency, energy storage, and clean renewable technologies. So with that, I want to say thank you again and if you have any questions about the work that we did on San Onofre, I'd be happy to answer that.

1 COMMISSIONER MCALLISTER: Thanks very
2 much for being here, that's helpful. Any
3 questions?
4 COMMISSIONER FLORIO: Just a question on
5 the issue of thinning out the spent fuel pools
6 and moving to dry cask.
7 MS. ULRICH: Uh-huh.
8 COMMISSIONER FLORIO: Edison indicated
9 this morning that they thought it would be seven
10 to 12 years before the assemblies could be -- the
11 last one into the pool could be taken out. Do
12 you have any different information? Or do you
13 agree with that assessment?
14 MS. ULRICH: Yeah, the timeframe for
15 cooling fuel that's recently been removed is five
16 to seven years. Obviously, the spent fuel pools
17 are packed with fuel that's been in there for
18 quite a long time, that can be quickly removed.
19 With San Onofre's shutdown, I mean, the nuclear
20 threat in California is definitely reduced, but
21 we've got 1,200 tons of high level waste onsite
22 in a seismic zone, in highly vulnerable spent
23 fuel pools. And so in the interest of public
24 safety, like what we're seeing at Fukushima, the
25 spent fuel pool is a crisis at these reactors in

1 Fukushima, and we certainly don't want to still
2 have that kind of nuclear threat sitting on the
3 shores in between two of the largest cities in
4 the state.
5 COMMISSIONER MCALLISTER: Thanks.
6 MS. BECKER: Actually, before I begin, I
7 was wondering if Kendra might mention your ASLB
8 Petition because I'd like to have the Energy
9 Commission support that, but I'd like you to
10 explain it, so….
11 MS. ULRICH: Sure. So that's the
12 petition that I was talking about earlier, was
13 the petition that we filed on June 18th last year
14 with the NRC, was deferred on November 8th into
15 two different processes, one before the Atomic
16 Safety and Licensing Board that was looking at
17 the restart plan and one before a Petition Review
18 Board, which is a 2206 petition. The Atomic
19 Safety and Licensing Board was looking
20 specifically at the NRC's Confirmatory Action
21 Letters, so this was their return to service
22 conditions that they had to comply with in order
23 to get NRC approval for restart. The problem at
24 San Onofre was that the equipment was so severely
25 damaged and so drastically different that they

1 couldn't comply with the terms of the CAL while
2 still in compliance with their license. So our
3 contention was that this is, in fact, a de facto
4 license amendment process which entitles the
5 public to a public hearing. The Atomic Safety
6 and Licensing Board agreed with that wholly. As
7 I said before, these were not like-for-like
8 replacements, that this was in fact a nuclear
9 experiment and that this was in fact a de facto
10 license amendment process which required the
11 public hearing. Edison, in the face of actually
12 having to go through the proper regulatory
13 process, Edison chose to shut down instead. You
14 know, but the fact remains that if they had had
15 to go through this process before, many of these
16 design flaws would have likely been caught and
17 unfortunately the lives and livelihoods of 8.7
18 million people were unnecessarily jeopardized for
19 the time that the reactors were operating with
20 that defective equipment in place.
21 COMMISSIONER MCALLISTER: Thanks. Can I
22 ask a question about --
23 CHAIRMAN WEISENMILLER: No, I was going
24 to say I did follow same at the NRC and the
25 points made were, before the decision of Edison

1 to shutdown, 1) was that the NRC had to decide
2 determine it was safe before it was restarted,
3 and 2) that there had to be a public process to
4 basically review that. I did not get into all
5 the intricacies of the different procedural
6 aspects at the NRC, and frankly I know my own
7 procedural stuff here, but I'm always hesitant to
8 jump into another commission that has a pretty
9 intricate legal system and take a guess on what
10 is the best mechanism there.
11 MS. ULRICH: And I just want to say that
12 I did see your comments and we very much
13 appreciated the State weighing in and saying that
14 safety needs to be put first, and public process
15 needs to be put first, and that's really the case
16 in the State of California, as well as throughout
17 the country.
18 COMMISSIONER MCALLISTER: So that's a
19 good segue to my last question here. So on the
20 spent fuel issue, and sort of the local issues
21 around San Onofre, how does that link to any work
22 that you're doing at the Federal level on the
23 fuel issue more generally? I mean, this is not
24 just a problem at this one plant, but it's one of
25 the perennial problems here for the nuclear

1 industry, so just any comments you have about
2 that and what the path you're working on actually
3 is.
4 MS. ULRICH: Well, our position right
5 now, because the spent fuel issue is a problem
6 nationally, as you mentioned, but it's also a
7 decades old problem where the nuclear industry
8 has been waiting around for some fantasy permit
9 solution while packing spent fuel pools, saying
10 that eventually someday there's going to be a
11 final repository for this stuff. Our position is
12 that, at the present moment, the safest possible
13 thing is hardened onsite storage without
14 transferring high level waste on the nation's
15 highways, etc., at this point. So our position
16 is that it needs to be secured onsite.
17 MS. BECKER: Yes, thank you. I'm glad
18 to close this very long day and actually a very
19 long road for many of us. Many of the questions
20 and the issues brought before us today are
21 questions and issues that were brought forth in
22 the 1980's when my face was younger than that
23 face there. So it's nice to see the young face
24 and it's nice to hear us really seriously talking
25 about some of these issues -- a bit too late, but

1 better late than never.

2 I started with the Energy Commission in

3 2005 testifying as a public voice, I have

4 probably been the only consistent public voice at

5 every one of your IEPRs, and will continue to be

6 so until we have no more nuclear plants in

7 California because we can't afford them.

8 However, there were some issues that were brought

9 forth today that I find rather puzzling.

10 PG&E said that they were quite prepared

11 if there was a seismic event onsite. Well, most

12 of my community does not live onsite. And if

13 they are concerned about roads and bridges not

14 being available to them, you could imagine how we

15 feel about roads and bridges not being available

16 to us. When they first wanted to license Diablo

17 Canyon, we asked them to consider an earthquake

18 and a radioactive release at a nuclear power

19 plant and the Nuclear Regulatory Commission told

20 us, no, that was too remote and speculative;

21 there might be a radioactive release, and there

22 might be an earthquake that could affect bridges

23 and roads, but that the two would not happen.

24 Many lessons have been learned and that is one of

25 them, but that doesn't help the community.

The costs are our consideration. I haven't passed in my comments yet because I didn't want you to be looking at my comments when I spoke, I wanted you to mostly be looking at something that looks like this. Big enough? It's a dollar sign.

COMMISSIONER MCALLISTER: Should we have you submit that to the record?

MS. BECKER: I'm not an artist, but I'm pretty sure most of us recognize it. The original price estimates? About $300 million. Final price tag under construction, $5.7 billion. What we've heard today are a lot of things that PG&E is doing to make sure that plant is safe, but PG&E doesn't plan on paying for those, they plan on passing those on to Ratepayers. And Ratepayers' pockets are virtually empty. I'm lucky enough to pay rates for both SDG&E and PG&E, so my rates are going to be higher for both nuclear power plants, for questions that I asked the state to address in the 1980's.

Last week, two days before SCE decided to retire their nuclear power plants, Friends of the Earth brought former Chairman Jaczko to San Diego, and he had some really interesting words,

1 and we will link his tape to our testimony so you
2 can hear what he had to say. I listened very
3 carefully when he was talking because I was
4 looking for certain things, and I was looking for
5 things that went somewhat like: "Over the years
6 we began to rely more and more on the
7 fact that things were not likely to happen and
8 as a result we didn't need to spend money to
9 address them. Clearly the accident -- the
10 accident at Fukushima told us otherwise. A
11 recent assessment that was done by the American
12 Nuclear Society which is a very important
13 credible organization made up of nuclear
14 professionals, estimated in a report that they
15 did following an accident that the overall costs
16 including economic costs, loss of activity, and
17 loss of viable use of land is approximately $500
18 billion." We can't afford that. I don't know
19 what replacement power will cost, but I do know
20 it won't cost $500 billion. We are facing people
21 that cannot return to their homes. We are facing
22 millions of
23 When we're
24 deal
25 ing with

1 nuclear
2 power plants we are dealing with a
3 millions of tons of radioactive water and soil
4 that they don't know what to do with. And Diablo
5 Canyon lives on the same Pacific Rim, just the
6 other side, and there's no less seismic activity
7 on our side of the Pacific Rim than there is on
8 Japan's side of the Pacific Rim.
9 These are important questions. And they
10 have impacts to our lives, and they have impacts
11 to our livelihoods, not just the people sitting
12 in this room because many of us are getting
13 older, but our children and our grandchildren,
14 long after that last megawatt blows out of that
15 plant, as we're learning at San Onofre, we're
16 going to be paying for power that we're no longer
17 getting. We need to consider the full lifetime
18 cost of nuclear power. We needed to consider
19 them in the 1980's. We've had many heads up, and
20 the next heads up could be California, and then
21 it's too late. Thank you very much.
22 COMMISSIONER MCALLISTER: Thank you very
23 much. I appreciate all your efforts through the
24 years, that consistency helps our process.
25 MS. BECKER: The institutional memory is

getting older, guys, get ready.

COMMISSIONER MCALLISTER: I have to say, all this discussion about middle age is sort of hitting home with me, so hopefully --

MS. BECKER: Look to your right and look to your left.

COMMISSIONER MCALLISTER: Great, so I'll pass it back to Suzanne to keep us moving ahead here. Thanks very much for being here.

MS. KOROSEC: All right, now the moment all you folks have been waiting for, it's our public comment time. I've got several blue cards here to -- okay, our first commenter is Ben Davis. And please remember, we're trying to keep comments to three minutes so that everybody has a chance to talk.

MR. DAVIS: Thank you very much. I'm Ben Davis with the California Nuclear Initiative. Last week I spoke here after CAISO gave a report on how we were doing with nuclear power and how we were reacting to the loss of San Onofre. I've also spoke several times before during the IEPR proceedings concerning basically exclusively the issue of the benefits of nuclear power, and by that I mean I was asking what they were. You

1 might recall that the first time I came before
2 the Commission I came and did so because I had
3 spoken with your staff about whether or not we
4 could close the nuclear power plants in
5 California, and they had informed me that we
6 could. And then the next day they retracted
7 that. And then I returned to CAISO for the
8 information and found out that they had quite a
9 different view of it. Well, since then, as you
10 know, your staff has been proven correct; we can
11 do without San Onofre, without rolling blackouts,
12 and without the associated costs. I'm here for
13 the same reason today. I want to talk about what
14 those potential benefits of nuclear power are.
15 The potential detriments you covered
16 very thoroughly, but what a state needs to
17 consider, what our Legislature needs to consider,
18 what our Governor needs to consider, and our
19 citizens and the other agencies, all of which you
20 report to about our energy situation in
21 California, what we need to consider in choosing
22 our energy sources is the benefits versus the
23 risk, that's the classic analysis. Listening to
24 what was presented today basically all I heard
25 about was risks. I made a quick list of them and

I don't think I covered everything, but one of them that wasn't mentioned so much was the once-through cooling is one of the detriments of nuclear power, it's still there. The seismic potentials, not only the potentials of the unknowns of what can happen because of an earthquake, but also the tests we'll have to do, for example, the high energy test we were talking about are also detriments if we go ahead using nuclear power. The more obvious ones are nuclear power's accident potential, which was just well described by the last speakers, and the nuclear storage, which also involves its accident potential. And costs, these are all detriments.

What I heard nothing about today was any benefits to nuclear power here. As I mentioned last week, it appeared from the report that you were given that not only do we have our 15 percent surplus in California without San Onofre, but we even have five to eight percent at least more of a surplus than that; therefore, without the operation of Diablo Canyon, which only supplies five to seven percent of our state's energy, electrical energy in the state, we still have more than our standard 15 percent surplus.

1 Given that, it seems like -- oh, I want to
2 mention one more thing from a past -- one of the
3 things you referred to me as an agency in our
4 past discussions of the benefits of nuclear
5 power, there's a report done in 2008 that
6 discussed if we closed both nuclear power plants,
7 how much would it affect rates in California.
8 And I believe it came to $.2 per kilowatt hour or
9 something, it was a very small amount in any
10 event, it would have translated into about $3.00
11 per average ratepayer. That's certainly gone
12 down from everything I can see now. We can close
13 the nuclear power plant without going into our
14 surplus and why are we operating it, then? I
15 think the long and the short of it is, I'm asking
16 you, is there any evidence at these proceedings,
17 was there any evidence produced today that I did
18 not notice that shows any benefit to nuclear
19 power? Is there anything that shows our rates
20 would be significantly affected if we closed
21 Diablo Canyon today?
22 CHAIRMAN WEISENMILLER: Well, I'm sure
23 PG&E would have been happy to put a bunch of
24 stuff in the record on this, we did not
25 specifically ask those questions, I suspect they

1 may or may not respond later in their written
2 comments, but we didn't specifically say to PG&E,
3 "Come in and demonstrate." You know, so -- but
4 as I said, I'm sure they're likely to respond to
5 you.
6 MR. DAVIS: Well, then might I see just
7 that you should because when you report to the
8 Legislature and the Governor and the citizens of
9 California as you intend to do with this IEPR, so
10 that we can make our energy choices, what we need
11 to do is balance the benefits and the risks. You
12 haven't shown us any benefits, all you're showing
13 is just risks.
14 CHAIRMAN WEISENMILLER: Well, in the 205
15 IEPR report, I think we did note that nuclear
16 power was providing carbon-free power in that
17 it's going forward cost -- just looking at fuel
18 cost -- was relatively attractive and that at the
19 same time, I'm trying to recollect the various
20 pieces, certainly there are a lot of people that
21 get jobs from that. So, there are other
22 benefits, you know --
23 MR. DAVIS: In 2005 is what you're --
24 CHAIRMAN WEISENMILLER: What I'm
25 recalling was there was a consultant report done

in 2005 which is certainly outdated, but that certainly acknowledged some of the benefits of nuclear power in that, although it didn't try to do a comprehensive cost benefit analysis.

MR. DAVIS: No, the 2008 did a much better job. Well, just to conclude, what I would like to see you do as a person who will benefit from this IEPR is list the benefits and the risks and the evidence behind them so I can choose as a citizen of California whether I want to continue to use that last nuclear power plant we're relying on. Thank you very much.

CHAIRMAN WEISENMILLER: Sure, thank you.

MS. KOROSEC: All right, next commenter is David Weisman.

MR. WEISMAN: Good afternoon. David Weisman, Alliance for Nuclear Responsibility. I'd like to set up the short two and a half minute video clip that will follow me on the overheads. Since transparency was a word we heard recurring today, my concerns, and I'm sorry that Dr. Munson of the NRC has not remained to address them, regards the openness and public observation of the SSHAC process, which was an integral part of the post-Fukushima review

1 ongoing. In March, the first ground motion SSHAC
2 was held for the Western U.S. plants in Oakland.
3 I traveled to the event with our attorney, John
4 Geesman, and our seismologic consultant, Dr.
5 Douglas Hamilton, who is in the room. We
6 gathered in the morning before the event began,
7 representatives came, told us we were not welcome
8 to stay, and stayed with us as they escorted us
9 out the door of the building. This, in spite of
10 the fact that the actual SSHAC document authored
11 by Dr. Robert Budnitz, who you will hear from
12 momentarily in the video, says on page 56, SSHAC
13 level transparency, transparency for level 3,
14 interested parties can view the interactions at
15 the workshops where Interveners in the case at
16 the PUC seem to make us interested parties, we
17 were escorted from the room, no video was taken
18 of this meeting, so we cannot be aware of what
19 was said in our absence. The question remains,
20 what part of this ground motion characterization
21 is so fragile that it cannot withstand near
22 public observation? And how is any public
23 confidence in this process engendered when the
24 public is precluded from simply observing it, nor
25 is any video, nor to our record any transcription

1 of the events that took place? But we decided to
2 let the Safety Committee, of whom Dr. Lam you
3 have heard from, tackle this question for us. So
4 if you could please roll the tape, that might
5 help explain more.
6 (Video is played)
7 COMMISSIONER MCALLISTER: Thanks for
8 bringing that to our attention.
9 MR. WEISMAN: And I regret, I looked
10 around to see that I guess Dr. Munson has left
11 for the day, so….
12 COMMISSIONER MCALLISTER: So it is now
13 on our record, but you know, we obviously don't
14 have jurisdiction over that. But thanks for
15 bringing it to our attention.
16 CHAIRMAN WEISENMILLER: -- transparency
17 would help, I guess, you know, presumably this
18 was ratepayer money and it gets to some of the
19 PUC challenges.
20 MS. KOROSEC: All right, our next
21 commenter is Martha Sullivan from Coalition to
22 Decommission San Onofre.
23 MS. SULLIVAN: Good afternoon. My name
24 is Martha Sullivan and I'm a representative of
25 the Coalition to Decommission San Onofre. And we

are happy that our name has, you know, played out the way we hoped it would. We're a locally based coalition of grassroots organizations in Southern California that came together in the last year to advocate on behalf of the nine million people that live within 50 miles of San Onofre. And I just wanted to make a point here that we intend to continue to advocate for Southern Californians. Our focus is going to continue to be on ratepayers, and that they not bear a disproportionate burden for Southern California Edison's management mistakes and poor choices. We're also obviously going to be very focused on the decommissioning process and making sure there continues to be a public voice in that. We're also concerned about the workers who are going to be displaced by this economic transition, and so we've made other suggestions to the PUC and other decision-makers to try to incentivize and encourage in whatever way we can Edison to transition those employees to what we believe continues to be the future of California, and that the Energy Commission and the PUC both have had a hand in directing us to, which is energy efficiency and renewables; that's a burgeoning

1 marketplace, it's where our economy is
2 transitioning to, and we need to help those
3 workers to make this economic transition just as
4 in past transitions between industry and
5 technology, and so forth.
6 And then finally, I wanted to reinforce
7 a couple of people who made this point earlier
8 and I want to really reinforce it from a local
9 perspective, of the people who live in the shadow
10 of these plants. This point was made during the
11 wonderful seminar in San Diego a couple weeks ago
12 where former Prime Minister Kan and former NRC
13 Chair Jaczko and another former NRC Commission
14 member, and then Arnie Gundersen who is an expert
15 witness who has been working for Friends of the
16 Earth, and Arnie shared a slide which really sort
17 of captures a key key point that we need to keep
18 in mind, which is that the NRC's probabilistic
19 risk analysis claims basically one meltdown in
20 200 years, a 200-year event; but history shows
21 that there have been five meltdowns in 35 years.
22 So I think that really highlights the weakness of
23 probabilistic risk assessment, and I think we all
24 need to bear that in mind. And it's something
25 that former Chair Jaczko commented on, as well,

1 that he believed it's time to move past that and
2 not use that as our standard for determining what
3 an appropriate level of planning and preparation
4 should be for an accident or a disaster at one of
5 these plants. That's going to continue to be a
6 factor for the people who live within these
7 plants, even as they're decommissioned because
8 that spent fuel is going to be there for the
9 foreseeable future, we don't have any other plan
10 for it.
11 And then finally, I just wanted to
12 emphasize that we're very glad to hear Edison
13 today talking about aggressive use of preferred
14 resources which in California means renewables
15 and energy efficiency. But we want to caution
16 about, you know, continuing with this idea of new
17 fossil generation as a "backstop." Our
18 experience is that, when there's new fossil
19 generation, that's not a backstop, it becomes an
20 obstacle to the full development and deployment
21 of available technologies for renewable energy
22 and for energy efficiency. And so, you know,
23 necessity is the mother of invention, we've shown
24 that in the last year and a half with the outage
25 of San Onofre, we've gotten through it without

any blackouts, or without any extreme measures, and so I would really encourage keep our eye on the ball, keep our eye on California's goals to move to a renewable energy economy, and one that emphasizes energy efficiency and demand-side management, and don't be sucked back into the fossil fuel addiction. Thank you.

COMMISSIONER MCALLISTER: Thanks for your comments. As lead on Energy Efficiency here at the Commission, I can definitely say I'm bending over backwards to make that happen as much as we can and there are a couple of different forums where we're trying to do that, along with Demand Response. At the same time, we're up here, you know, knocking on the melamine, we're knocking on the wood up here at the dais on this summer, and next summer and, you know, hoping events go our way, as well. But thanks for your comments.

MS. KOROSEC: Next, we have Barbara George.

MS. GEORGE: Good afternoon, Commissioners. Mr. Strickland said after Fukushima we learned that more than one unit could be affected. Previously, we assumed that

1 only one unit would be involved. Now, to me,
2 this is a stunning lack of common sense. If I'm
3 in a car wreck, or if I'm in an earthquake and
4 something collapses on me, why would I ever
5 assume that I'm only going to have one broken
6 bone, or that only one person in the car is going
7 to be hurt? I think that there are blind spots
8 in the nuclear industry that we really have to be
9 watchful for. Another example, just before
10 Diablo Canyon was licensed, the transcript of a
11 closed hearing on emergency planning was leaked
12 to the Press, Chairman Paladino said,
13 "Earthquakes are no worse than fog, or whatever."
14 And the Commission decided that it didn't need to
15 discuss earthquakes and emergency planning
16 because they had a precedent, they hadn't
17 considered that in licensing for San Onofre. And
18 so thanks to an Appeals Court decision by the
19 Honorable Robert Bork, that is still the decision
20 today in 2013. But I'd like to point out to you
21 that the NRC preemption is only for onsite
22 emergency planning. The State and local
23 government share responsibility for emergency
24 planning offsite. The CEC should take leadership
25 on this and immediately hold hearings on the

1 impacts of quakes on emergency planning. Some of
2 the things to consider, you might want to talk
3 about broken overpasses that might block
4 evacuations in the 10-mile zone, workers might
5 not be able to get to the plant to prevent a
6 meltdown. Outside the 10-mile zone where people
7 are supposed to shelter in place, the windows
8 might all be broken and quake-damaged buildings
9 might collapse on them. Hospitals that are only
10 marginally prepared for radiological emergencies,
11 what if they're flooded with earthquake victims,
12 as well?
13 At the Coastal Commission hearing, PG&E
14 was asked what would they do if the Earthquake
15 study showed that a quake would be beyond
16 Diablo's design basis. What did they respond?
17 Nothing. They wouldn't do anything. I'm really
18 not sure why we're spending all this money on
19 earthquake studies, you know, it's a good thing
20 to look at earthquakes, but nobody can predict
21 them, the USGS website says nobody can know the
22 magnitude of a fault because it can change after
23 the quake begins. We already know there's
24 earthquake faults right near these plants.
25 Tōhoku, the quake in Japan, was 100 miles away

1 and deep underground; I'd like to know, is this
2 really about oil and gas exploration off the
3 coast of California funded by Ratepayers?
4 Thanks. Just one last thing, we're going to wrap
5 up and replace San Onofre and we need to use the
6 cleanest resources possible, this is something
7 I've been working on with Commissioner Florio in
8 the procurement case, but it's all very murky and
9 has been for a long time. I've been calling for
10 two years for a public process to develop clean
11 replacement resources, and then this morning SCE
12 mentions something about a living pilot for
13 preferred resources, but I haven't seen any RFP
14 on that, so I'd like to know what we're going to
15 do in a public process. I think it's time to get
16 together in the public. And I really urge you as
17 regulators to start taking this on. California,
18 if we have an earthquake and a meltdown at
19 Diablo, we're looking at the food supply for the
20 United States, I mean, come on. Even if you
21 don't care about the people, you know, how about
22 the money involved? And that's something that
23 Mr. Lloyd Levine actually mentioned last year at
24 the hearing -- no, it was two years ago -- at the
25 hearing and, I'm sorry, I don't think we're much

further ahead, except San Onofre is shut down, thank goodness. But fuel pools could still cause major problems. Thanks.

COMMISSIONER MCALLISTER: Thanks for being here.

MS. KOROSEC: Next, we have Ray Lutz.

MR. LUTZ: Thank you. My name is Ray Lutz and I'm with Citizens' Oversight, and we encourage citizens to become more involved in their governmental agencies like this one, so you guys are doing a great job. I'm glad to be here for the first time.

Now, I got caught on one thing that you said I thought was really good, and that was that some of these questions that are before you are philosophical in nature and deal with a lot of ethics. Of course, they are. Of course, they are. That's why you're here. All these questions, if they get this far, are supposed to be philosophical in nature and have ethical issues. So I'd like to speak to that a little bit.

Now, my background is in electrical engineering. When I was in college, the Three Mile Island disaster occurred. And I realized

1 that these plants are extremely complex, even the
2 valve that got stuck at Three-Mile Island, I
3 don't know if you ever looked at it, I couldn't
4 even understand this valve, it's so complex it's
5 unbelievable, it's almost more complex than the
6 whole plant, and this was the one that was stuck.
7 People, humans over-estimate our ability to get
8 things right. This is what it comes down to. We
9 think we can get things right real easily. This
10 came out when software designers first started to
11 make Fortran language and so forth, they realized
12 it was really hard to get the programs right, it
13 was hard to get all the bugs out -- really hard,
14 really hard. A good example: San Onofre; they
15 started to design new steam generators and there
16 was no earthquake, there was no tsunami, there
17 was nothing, no disaster, they just couldn't get
18 it right. So what makes us think all the rest of
19 it will be right? It's very impossible to
20 believe this.
21 Now, safety is one of our key issues
22 that you guys are supposed to be chartered to
23 deal with, all government agencies are, we've got
24 police, military, we spend a lot of money on
25 this, so always give everybody congratulations

when they're helping out with our safety. We hear about safety being number one by all these utilities. If you go to a manufacturing firm and they talk about safety number one, they will shut down a production line if there's something unsafe in it.

So we see here, though, the production line is still running. We know that these earthquakes can occur, and yet they'll still keep the plant running even though they know that they don't even have the answer, they couldn't answer my question, what is the probability of a disaster? No answer. You should shut down a production line, it's over. But what happens here? There's something driving this, has to be only one thing that I know of, is profit. Somebody has to be making money here or something, or else this wouldn't be happening.

I just want to mention really quick, the carbon-free power, that's not true. There's no such thing as carbon-free power, maybe right at that one point when you're making electricity here in the state, and then it is, but there's the whole cycle when it isn't, and I just want to make sure that that's -- even solar panels are

not carbon-free, you've got to make the damn things. But please, continue, please continue to push the way you are, I really think that you guys are doing a great job, and consider those ethical questions. We're not going to be able to get it right, we can't. And so be safe. Thank you.

COMMISSIONER MCALLISTER: Thanks for being here.

MS. KOROSEC: Rochelle, you wanted to make one quick additional comment?

MS. BECKER: I wasn't sure if I should mention the legislation we have before the Utilities and Commerce Committee this coming Monday because it's a (c)(4) issue versus a (c)(3) issue, and I don't have a lot of money, so I can't afford to do it wrong, so I just wanted to wear my second hat here, but it's SB 418, we would very much like your support for this bill, it is a nuclear transparency bill, and what it asks is that PG&E put all foreseeable costs, the costs of alternatives to once-through cooling, possible expansion of emergency planning, seismic events, a list of things that the NRC has already told you we need to have from the lessons learned

1 from Fukushima. We would like to see that put
2 into legislation. It's not that we don't trust
3 the PUC, it's just that the PUC has not always
4 been worthy of our trust, and therefore, as much
5 as I like Commissioner Florio, I'd like to see
6 the PUC itself support this, so they don't have
7 any wiggle room. PG&E applied for a license a
8 little prematurely once in 2010, and they hadn't
9 finished their AB 1632 requirements, and the PUC
10 didn't say to them, "Take your application and go
11 home when you have," they said, "Here, waste 18
12 months of everybody's time and we'll dismiss it."
13 Well, let's not do that again, let's make sure
14 that they have to answer these questions. So I'm
15 leaving copies of SB 418 and a fax sheet. I know
16 that you have channels that some of you have to
17 go through, but not all of you have to go through
18 to get there, and so I really would appreciate it
19 if you would expedite those channels and support
20 this legislation. Thank you.
21 COMMISSIONER MCALLISTER: So I'll just
22 point out --
23 CHAIRMAN WEISENMILLER: I was going to
24 say, the Energy Commission does not take
25 positions on pending legislation --

MS. BECKER: Could you recommend that they do? I mean, could recommend that they support it?

CHAIRMAN WEISENMILLER: No, we don't. We do not take positions, we make recommendations to the resource agency and to the Governor's Office, and the Governor's Office will eventually decide what to do, but --

MS. BECKER: Well, then recommend that they support the bill. You're not off the hook. Okay, I'll leave it with you.

MS. KOROSEC: All right, is there anyone else in the room who would like to make a comment before we move to the WebEx? All right, can you open Donna Gilmore's line, please? Donna, your line is open, did you have a comment?

MS. GILMORE: Yes. Can you hear me?

MS. KOROSEC: Yes.

MS. GILMORE: Okay, great. I was listening to the statements about all the earthquake studies going on and I'm just looking at the USGS FAQ page, you know, Frequently Asked Questions, and it says they cannot determine the magnitude of an earthquake, they've never ever been able to predict a major earthquake, that

minor earthquake faults can produce major earthquakes, and this is a known fact, so I don't understand the point of all these studies when we know both of the nuclear plants are sitting on active earthquakes. And I noticed in -- what was the last speaker from the USGS, Ms. Hardebeck, she had a chart showing the maximum earthquake estimate. I have a question. Does her estimate assume that the length of the fault is not going to change after the earthquake starts? And if so, why would she make such an assumption since the fact is that it can change? I don't know if this is comment or I can actually ask, ask a question like that?

MS. KOROSEC: I believe Ms. Hardebeck has already left, unfortunately, but your question is in the record.

MS. GILMORE: She's already left, okay.

MS. KOROSEC: Yeah, so this is public comments at this point.

MS. GILMORE: Yeah, okay. And then the justification for these studies is to decrease uncertainty, that's the only justification? How can you decrease uncertainty if no one can predict a major earthquake? It doesn't make any

1 logical sense to me at all. I was hoping
2 somebody can answer that. And I have information
3 on the SanOnofreSafety.org website that gives the
4 backup for the statements I'm making about the
5 USGS quotes if anybody is interested. And I have
6 another question, I don't know if it fits in here
7 or not, but I understand in Baldwin Park they are
8 doing fracking right on the Inglewood Newport
9 Fault, which runs right by San Onofre, and is
10 that an issue that the Commission plans to
11 address? I guess that's question. That's all I
12 have right now.
13 COMMISSIONER MCALLISTER: So on that
14 final question, we're not the agency that would
15 be looking in that particular issue, that would
16 be probably over at the Department of Oil and Gas
17 Resources where they actually look at fracking
18 and the associated environmental impacts of that.
19 MS. GILMORE: Well, that might be the
20 case, I don't think they're looking at the impact
21 on the nuclear plants.
22 COMMISSIONER MCALLISTER: They actually
23 do regulate the fracking activity and I guess I
24 don't know whether that would fall within their
25 bailiwick to extend the analysis to the issue

that you bring up, but thanks for bringing it up.

MS. GILMORE: Yeah, my understanding is there really isn't much regulation at all on that issue, so I have a feeling there may be a disconnect that may need some overlap between agencies to make sure it's covered. Thank you.

MS. KOROSEC: Thank you, Ms. Gilmore. Can we open up the phone lines now to see if we have anybody on the phone who would like to make a comment? Hold on just a moment, we're still opening the lines. Okay, the phone lines are open, is there anyone who has a question? A comment, excuse me.

MR. CAMPBELL: This is Bruce Campbell. I just wanted to supplement what Donna Gilmore just said. Anyway, it's -- the Inglewood oil field in the Baldwin Hills area, which is LA County and a bit into Culver City, and that's along the Newport Inglewood Fault and it's the largest urban oil field in the nation, I believe. So I just wanted to say that.

MS. KOROSEC: Thanks. Thanks for that information. Is there anyone else on the phone who would like to make a comment? Hello? Yes? Yes, you're on the line, hello?

MS. SAVAGE: You might have heard me trying to answer my other phone, but I do have a question. This is J.A. Savage -- sorry! I didn't know it was that open. So -- I'm sorry, J.A. Savage, I'm Manager of *California Current*, and if there's an Edison person there? Is there an Edison person there anymore?

CHAIRMAN WEISENMILLER: I think they all have left.

MS. KOROSEC: Yes, I think they all had flights.

MS. SAVAGE: Ah, okay. I'll just ask you guys to keep your eye out --

CHAIRMAN WEISENMILLER: So you can say anything you want about Edison now.

MS. SAVAGE: It's not a comment, it's a question. So PG&E has been acting as its own contractor in decommissioning the Humboldt Bay Nuclear Power Plant, and so I have discovered over the years that there's really no checks and balances because the utility is decommissioning its own power plant. My question to Edison, you might ask them, is whether Edison plans to decommission San Onofre, or whether they have a third party that they plan on using where there

1 might be some checks and balances, kind of like
2 one of the oversight boards.
3 CHAIRMAN WEISENMILLER: Well, some of us
4 keep nominating that to be Phase 5 in
5 Commissioner Florio's case.
6 MS. SAVAGE: (Laughs) Okay, thank you
7 so much.
8 MS. KOROSEC: All right. We're opening
9 the next line. Are there any comments on the
10 phone? Okay, the lines are open. Going once,
11 going twice, any last comments on the phone? All
12 right, I think we have gotten everybody.
13 COMMISSIONER MCALLISTER: Thank you,
14 Suzanne.
15 MS. KOROSEC: We did have the written
16 comments, I don't know if you wanted to -- a
17 gentleman did request to have them read into the
18 record.
19 CHAIRMAN WEISENMILLER: As long as
20 they're short.
21 MS. KOROSEC: It's three short
22 paragraphs. All right. This is from a Mr. Frank
23 Brandt, who asked our indulgence. We don't
24 normally do this, but he is 91-years-old and it's
25 very difficult for him to get here and for him to

use the phone or the WebEx, so…. "Governor Brown, the State Legislature, and the CEC are all opposed to using nuclear energy for generating electricity. The principle but unstated function of this workshop is to devise more arguments against using nuclear energy. In this atmosphere, why bother with a workshop to show that an undiscovered earthquake fault might cause problems at SONGS or Diablo Canyon? Why not just prepare a graph in the 2013 IEPR recommending that SONGS and Diablo be shut down as soon as replacement power could be purchased or developed because they're not good energy sources? On the other hand, why not use this workshop to get the CEC to figure out how to turn the State Government around to a policy of encouraging nuclear power plants? Nuclear is an excellent energy source which can generate reliable and inexpensive electricity without production of greenhouse gas; granted that it has problems, but they are all soluble (*sic*) by good engineering, unlike the huge problems in wind and solar energy that cannot be solved. Diffuse and unreliable energy sources simply cannot be used to replace reliable energy sources. The CEC is fearful of

the Governor and State Legislature, but it must be brave and offer good advice instead of just telling the Legislature what it wants to hear. It's time for the CEC to incorporate this message in the 2013 IEPR. AB 32 and other restrictive State laws must be revised to allow nuclear energy as the preferred energy source if the State wishes to reduce state greenhouse gas production in a meaningful way." So on that note….

COMMISSIONER MCALLISTER: Thanks, Suzanne. We really appreciate your commitment to the process because I think it really is important if the right signal to be sending is the right thing to do, and you know, certainly here as in any other forum at the Commission there's the Public Advisor's Office, as well, that people can use to submit their concerns, comments, and input on any of our proceedings, including here in the IEPR and elsewhere in the Commission.

We are now at 10 after five. Really, I see good attendance here, so kudos to you all for sticking it out until the bitter end, and I think it's been a productive workshop, and thanks to

all the speakers in the morning and afternoon for being here and the quality of their presentations; I really enjoyed the dialogue. Again, I very much appreciate Commissioner Florio being here and the PUC's involvement; a lot of these issues, really the nuts and bolts get twisted and hammered and worked out over there, and so we'll look forward to working in any way we can to facilitate that process, as well. So thanks for being here.

CHAIRMAN WEISENMILLER: I'd like to thank folks for being here today and for their participation. And certainly, this is one of the stages of the IEPR -- what's our next one? Suzanne must know when our next IEPR workshop is.

MS. KOROSEC: The next IEPR workshop is on June 26th, and it's on Transportation Forecasts.

CHAIRMAN WEISENMILLER: Okay, and remind people when their written comments are due from today's?

MS. KOROSEC: They're due on July 3rd as posted up here on the slide, this is the process for submitting them.

CHAIRMAN WEISENMILLER: And she might

even entertain shifting that to the 5th, but anyway --

COMMISSIONER MCALLISTER: I think our next two workshops are actually on Transportation, aren't they?

MS. KOROSEC: Yes, they are.

COMMISSIONER MCALLISTER: I think that's right, okay. So we have the smorgasbord continues and we're going to have a nice couple of -- with Commissioner Scott up here and helping us work the transportation issues that are on the docket for the IEPR, so looking forward to that.

I think we stand adjourned.

MS. KOROSEC: Thank you very much, everyone.

(Thereupon, the Workshop was adjourned at 5:11 p.m.)

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