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*

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P R O C E E D I N G S

JUNE 19, 2013 9:30 A.M.

[Meeting already in progress]

MS. KOROSEC: Our first speaker is Joan Walter, who is the Energy Commission's Senior Nuclear Policy Analyst.

MS. WALTER: Good morning, Commissioners, presenters, and everyone in the audience and everybody listening remotely. I'm Joan Walter, the Nuclear Policy Advisor with the California Energy Commission. I'd like to thank everyone for coming here today to participate in this workshop and to discuss these important issues relating to Nuclear Power in California.

Before we begin with our panels, I'd like to provide a little background on the AB 1632 Report and the context for today's workshop.

As of 2011, California had two operating nuclear power plants, Diablo Canyon located north of Avila Beach in San Luis Obispo County, and San Onofre Nuclear Generating Station, located south of San Clemente in San Diego County. As most of you are aware, just last month Southern California Edison announced plans for the permanent closure of San Onofre. We will have an

update from Southern California Edison on their closure plans in our first special report.

California has a long history of seismic concerns related to the operation of Diablo Canyon and San Onofre. The state has completed a number of reports that recommend actions to address these concerns. Additionally, as a result of the Fukushima nuclear disaster, new recommendations for enhancing U.S. nuclear power plant safety have been put in place by the Nuclear Regulatory Commission. Panel 1 of this workshop provides an opportunity for the utilities to give us updates on their progress in implementing some of these recommendations.

Panel 2 will include updates on seismic hazard analyses, state review of seismic research projects, and presentations on continued seismic uncertainties along the central coast and their implications for Diablo Canyon.

Panel 3 will include the status and path forward for Fukushima lessons learned from the NRC, discussions of economic considerations for both internal and external, and a look at the causes and consequences of nuclear accidents.

And finally, the last portion of the

workshop will provide an opportunity to look at different perspectives on nuclear power such as our second special report on Thorium Molten Salt Reactors, and our final panel made up of representatives of public interest groups with their perspective on issues related to nuclear power.

Assembly Bill 1632 was signed into law in 2006 and it directed the Energy Commission to assess the potential vulnerability of California's large-based load plants, that is, Diablo Canyon and San Onofre, to a major disruption from a seismic event or a plant aging, and to adopt that assessment as part of the Energy Commission's Integrated Energy Policy Report, or IEPR.

The AB 1632 Report was adopted in November of 2008 and the recommendations from the report were incorporated into the 2008 IEPR. Concurrent with the adoption of the AB 1632 report, PG&E announced the discovery of a previously unknown fault, the Shoreline Fault less than a mile from Diablo Canyon.

PG&E and the NRC have since concluded that Diablo Canyon's design would withstand

potential ground motions from this fault, however, the fault's major characteristics are still largely unknown. We will receive more information on this in our second panel from Dr. Jeanne Hardebeck who discovered the shoreline problem.

The United States does not currently have a facility for the permanent disposal of the spent nuclear fuel. Because of this, power plants across the country, including Diablo Canyon and San Onofre, have had to store the spent nuclear fuel they've generated at the plant until a permanent repository is approved by the Federal Government.

The AB 1632 report identified that the spent fuel pools at San Onofre and Diablo Canyon have been re-racked to increase storage capability by placing the fuel assemblies closer together. While in conformance with NRC Regulations, more densely configured spent fuel pools are considered to have a greater risk than those with a more open racking arrangement.

The 2008 IEPR recommended, among other things, that further studies should be completed using advanced technology to help resolve

remaining seismic uncertainties and that the utilities should return their spent fuel pools to open racking arrangements as soon as feasible.

However, in 2011, both PG&E and Southern California Edison reported that the inventory of spent pool assemblies stored in the pools have not been returned to open racking. For San Onofre, Southern California Edison reported the inventory of the spent fuel pools to be almost double the original design capacity and, for Diablo Canyon, PG&E reported the inventory to be roughly four times the original design capacity. Furthermore, if Diablo Canyon is relicensed, PG&E plans to store the fuel assemblies generated through the licensing period in the spent fuel pools which would maintain close to the 2011 inventory level of four times the original design capacity.

We will be provided with a lot more information about these important issues from each of our distinguished presenters. So without further delay, let's begin with our special report from Mark Nelson, Director of Integrated Planning and Strategy for Southern California Edison on the status of San Onofre Nuclear

Generating Station.

MR. NELSON: Good morning, IEPR Lead, Commissioner McAllister, Chairman Weisenmiller, and Commissioner Florio. I have with me Caroline McAndrews, who is director of Strategic Projects for San Onofre, so she is from the site and she can handle the hard questions.

My name is Mark Nelson and I am the Director of Integrated Planning for Edison. And now we're going to see if we can use technology and make this thing move.

Very good. I think we're in the wrong presentation, though. I guess we can start here, that's fine.

MS. KOROSEC: When you say the other presentation, Mark, I'm sorry, which one did you mean?

MR. NELSON: The other SCE presentation, please, it would be the briefing on the Retirement Plans. Okay, thanks very much.

All right, we've conquered the technology, thank you. So as announced on June 7th, we have stopped operations and retired both Unit 2 and Unit 3, we have sent the Certification of Permit Cessation to the NRC, and I'm sure that

Chairman Weisenmiller has received that. And planning is underway now for permanent shutdown of the related activities and decommissioning. As you can imagine, it's a long and complex activity and will take some time to get the planning fully understood and get the planning reports to the NRC.

Units 2 and 3 ran for about 30 years, obviously with the support of many dedicated employees who we're now going to treat very fairly as we downsize and stop operations at the plant. And it simply became a case where, as our Chairman, Ted Craver said, the continuing uncertainty of getting restarted was so large and we just couldn't overcome that and the odds of a by end of year restart where thought to be 50/50 or less, so the decision was made to go ahead and retire the plant.

So obviously we will still take nuclear safety as the number one activity on the site as we continue working. The key issues will be decommissioning, reduction in staff, and choosing appropriate staff to continue moving forward with the decommissioning, the storage of used fuel, the seismic issues, and then once-through

cooling. And I'd like to talk at the end of this presentation a little bit about issues that Chairman Weisenmiller just brought up in terms of what we do to keep the grid reliable in the short run and in the long run for Southern California.

So looking at decommissioning first, it will be a long process, it's expected that the planning will occur and then work will occur on radiological material, which will be put in the dry cask storage. This is all to be funded by the decommissioning trust, the current trust balance is $2.7 billion for SCE. We are continuing to evaluate both the cost of decommissioning and the timing of decommissioning, as well, whether perhaps it can be accelerated.

Staffing at the plant is currently at about 1,500 employees and that will be reduced to 400, that will obviously not all be done at once, but it will be done across the next year. We will be working through, again, the employee issues and treating the employees fairly. In some cases, we have Union contracts, so we'll have to do the negotiations there, as well. So it will be quite an effort, but again our number

one objective with the employees is they've been fair to us, they've been dedicated employees, and we're going to treat them fairly, as well.

Looking at the used fuel storage onsite, there are currently about 2,400 assemblies in the fuel pools and wet storage, there are about 800 assemblies that are currently already in dry cask storage. So roughly speaking, we're going to have to triple the size of the dry storage in order to eventually get everything out of wet storage. We will be defueling Unit 2 in July, Unit 3 was already defueled, so that activity should be done approximately -- it should take less than a month, so I would assume we would be done toward the end of July. And then, over the next seven to 12 years, and they're in the process of analyzing that, obviously, as part of decommissioning, that fuel would then be moved to canisters and put into ISFSIs, or the bunkers that hold the canisters. In this case, the ISFSI will also need to be built, so, again, we need to roughly speaking triple our current storage.

COMMISSIONER MCALLISTER: Just a quick question. Do you know or anticipate where those 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

assessing what the impact of that work and that data would be on used fuel storage. So, again, that work is underway, but at this point we believe at least speculatively that we probably don't need to continue for NRC requirements.

The plant was obviously once-through cooled. There was a study underway, the OTC Nuclear Special Study at the State Water Resources Control Board, with the intent of determining whether on a go forward basis, after 2022, which was our shutdown date, end of original license, if we would need to find an alternate cooling from once-through cooling. So at this point, since the plant will not be operating, we believe that there's no need for those studies, we will be talking to the State Water Resources Control Board about it.

Additionally, the flows have been reduced and at this point only about 25 percent of the prior flow is required for the used fuel cooling, and there may be some need for cooling water during decommissioning, but again, that's an issue that we will work in decommissioning planning, so we'll determine what to do with that and where that goes, and we will be working with

the Water Resources Control Board.

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

condensers, which means that they consume power rather than provide power, but they do provide reactive power for voltage stability. So again, margins are tight this summer. Under normal conditions, we should get through summer. Under extraordinary conditions, fires, etc., then we're more exposed to potential outages.

Looking at the longer term, the service territory for Southern California Edison was largely built to be served by coastal power plants, so as a result the transmission grid tends to run from the coast toward inland, so it was feeding, if you will, essentially coastal to the east. So with the once-through cooling retirements from the Water Resources Control Board policy, most of those retirements in the LA Basin and the LA area would take place in 2020. The Water Resources Control Board has in fact indicated flexibility for system reliability purposes, so we recognize that, but in general we would be looking to retire about 6,500 megawatts. And with SONGS retirement, that puts roughly an 8,800 megawatt hole in our resources in the Basin, so it's a significantly different grid than what we had seen before. And there is a

fair amount of work going on obviously with the CAISO, in the CPUC's LTTP, and we are currently preparing for solicitations for fossil generation preferred resources as part of this current LTTP.

Some challenging issues we may face would be some of the 220 system in the Basin may conceivably need to be upgraded to 500, 500 kV is a bigger, taller footprint, so that is a challenge. Some of the prior coastal units, the once-through cooled units, may face fairly stiff opposition being repowered, so that's a battle that has yet to be seen, but one of the local communities has already attempted but not succeeded, but only by a handful of votes in changing the zoning of the Redondo Generating Station. So, again, we would anticipate that there may be challenges there.

And it's interesting, I see it as a non-attainment area, I guess now what I'm hearing is that AQMD has had EPA declare that LA is in attainment for PM10, Federally at least. But in any event, AQMD Rule 1304 would be the operant rule that would allow for repowering of coastal units, and if either additional power is needed, 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?

So there's really just a whole host of issues that we believe that a living pilot can really sort out. At this point, we believe we have authority from the CPUC in the LTTP for up to approximately 400 megawatts of preferred resources beyond what was mandated as the minimums, and we believe that we can focus those megawatts on preferred resources such as this living pilot. So, you know, obviously we don't have funding and we need to come back for additional authority, but we believe we have a unique opportunity at this time.

As I said before, we may wind up with new transmission, we may wind up with upgraded transmission. Electrically speaking, San Onofre being at the far south end of our system, and the north end of San Diego system, have a lot of unique ability to pass power between the systems. Potentially, a 500 kV connection between SCE and SDG&E, that's one possibility. There's been a number of discussions about potentially pulling 500 kV into San Onofre, which would mean we need to convert the substations there to 500. There will be a number of challenges with that. Obviously, that all sits on leased land, so,

again, it's a relatively small footprint site even on the east side of the 5 on what's typically called the Mesa. So, there will be a number of challenges there and, again, not to mention the typical resistance to siting a 500 kV line or high voltage lines.

And then some amount of targeted fossil generation for the inertia that it provides, for the ramping that it provides. And also, I view the targeted generation as a good way to backstop our ability to move to even higher levels of preferred resources because if we can determine where targeted generation would need to be, then we can go ahead and think about getting -- not building there, but having, say, AFCs which is a process through the CEC to license, or at least be really site ready so that, in the event we just can't get the preferred resources to materialize, or in the event that we can't get perhaps control of the preferred resources in the short run, we would have the ability to build some amount of fast start, probably peaking equipment, so again, I see the targeted generation as really serving multiple needs, it serves the inertia need, it serves the resource

integration need, and it also allows us to go ahead and try to go deeper into the preferred stack.

And I think that speaking with panels like this and coming to the various State agencies is going to be increasingly important as we move forward because there will be a host of players in this, and we will need the cooperation of many agencies in order to move forward. The Water Resources Control Board, in the event that reliability doesn't come together and we need some extensions, perhaps, on once-through cooling; CAISO, obviously, we have a lot of work to do with CAISO on how do we use preferred resources, how do they count, what value can you get out of them, you know, we want them to be valuable, so in order to be valuable, we need to work with CAISO and get clear understanding between all as to how they can be used. We need determinations, we'll go through the LTTPs, Track 4, and we'll take a look at SONGS out, track the RFO process. I believe we need to get a compliance filing in July 15th, so the first 1,000-1,200 megawatts will be moving along.

Air permitting, right now we have Rule

1304 in the South Coast AQMD, but if generation is needed in other Air Basins, the path may be less clear because they don't have such parallel rules, so emissions offsets may be more challenging. I think local zoning, again, can be another big issue, and whether it's an attempt to change zoning such as Redondo Beach did, or whether it's just direct consumer objection to the re-powering, I think that's a very possible issue to pass through. So any road will require the cooperation of many many agencies, and many many things to come together and, you know, we frequently say that your choices are between generation and transmission, but the reality is you need all the preferred resources, you need all the transmission and all the generation just in the event that some of it can't materialize. So I think you run all of the paths as contingency.

Okay, thank you very much and that concludes the report on San Onofre and the road forward as we see it now.

CHAIRMAN WEISENMILLER: Mark, I have a couple if I can go first. First, I wanted to say 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,

there's been a fair amount of discussion about just the need for reactive power in that area. The CAISO approved one or two projects for SDG&E because, again, the plant is actually in SDG&E's territory, so they approved one or two projects that I believe were both synchronous condensers, standalone synchronous condensers, and SVCs, and San Diego is currently working on those projects. We also have been looking at the potential use of SONGS 2, 3, or both as synchronous condensers, so that analysis is still underway. We're in communication with San Diego, I've discussed it with them I guess as recently as last week, so we will certainly work with them to see if that turns out to be a preferred option to the path they're going down now, or perhaps an option that is either parallel, or an option that might be in in addition to it.

CHAIRMAN WEISENMILLER: Have any of the other nuclear plants in the U.S. been converted to synchronous condensers?

MR. NELSON: Yes, the Zion plant north of Chicago had about a 10-year run as a synchronous condenser, it's recently shut down and they're moving toward full decommissioning.

CHAIRMAN WEISENMILLER: Okay. How long does your lease go and how does that affect the ISFSI?

MR. NELSON: The current leases, to the best of my recollection, lasted through the license period, so 2022. So the intent, of course, had been that with license renewal that would put us in a position to need to renew those leaseholds and figure out whether it was, again, 2042 or some future date beyond that. So that's part of the decommissioning and shutdown planning analysis that's currently underway, that would be what would be next to ask for some sort of lease arrangements.

CHAIRMAN WEISENMILLER: Okay. And what percentage of the fuel has long term contracts, or would come from long term contracts?

MR. NELSON: I don't know. I can get that information for you, I'm not aware right now.

CHAIRMAN WEISENMILLER: Okay. Mike.

COMMISSIONER FLORIO: Just one question. You indicated a period of seven to 12 years to move this spent fuel to the dry cask storage. 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,

thanks.

MR. NELSON: Okay, I'd like to move on to the current cycle of IEPR discussion. We received a data request with approximately 50 items in it. Logically, they can be broken up into three categories, the progress on reporting on the original 1632 report and the '08 recommendations, progress from 2011, and then other.

Looking forward, we've just talked a little bit about used fuel, we'll obviously be continuing to work on that, to work that issue, but again the short story is by the end of July we hope to have Unit 2 defueled, and then at that point we'll need to work with dry storage and, again, we'll need more ISFSIs.

We think that with the retirement of the units, probably most of the IEPR questions probably aren't germane now to the -- they were more targeted toward an operating plant, obviously, so we're in the process of sorting through that, but we think that most of that -- most of the questions have probably been answered sufficiently to handle it up to retirement. We anticipate that during retirement you'll probably

have new questions. And as we understand retirement and decommissioning better, we'll be in a better position to answer those questions because, again, that will be a different process.

We do clearly have experience decommissioning with Unit 1, so we have a model to go by. There's other industry experience, as well, and we want to leverage all of that during the planning process. Things like station blackout, the evacuation for the operating plant, those are issues that we'll be working. Station blackout obviously isn't an issue for an operating plant now, but we still need to deal with power requirements of the used fuel pools.

Unit 1 still has some groundwater remediation going on and we'll be working that issue, as well. So, again, moving forward -- and, again, I anticipate that you might have some different questions, that are different than they were for the operating plant, but we've submitted our responses. If you have specific questions, we do have some members of the team here that can answer those, as well, from the IEPR questions.

COMMISSIONER MCALLISTER: I mean, certainly this conversation has shifted a lot,

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

MR. NELSON: So is the question

specifically on cost recovery?

COMMISSIONER MCALLISTER: Yes.

MR. NELSON: And Commissioner Florio obviously can do that or -- but the OII, the Order Instituting Investigation on San Onofre is currently in four phases, Phase 1, I believe, is the recovery of costs for the year 2012. We were in a peculiar ratemaking situation, we didn't have a GRC decision, our 2012 GRC typically would have been expected at the tail end of 2011, instead it was late in 2012, and so all of 2012 costs were in a memorandum account, which is the typical ratemaking. So we have had hearings on part of Phase 1, I believe we still need to discuss the replacement power, which would be the ERRA, so there should be hearings on that, as well, that was typically recovered through ERRA, and that's Phase 1. Let's see, I believe that Phase 2 -- I'm drawing a blank here on PUC activity -- I guess I can --

COMMISSIONER FLORIO: Continued rate base treatment or not.

MR. NELSON: Thank you. Phase 2 is really what we consider the PU Code 455.5, which is the consideration by the Commission as to

whether or not the plant is in rate based. That's obviously taken on a different light at this point since we have, in fact, retired the plant. I would think that the discussion there would probably center around the removal of the plant that's already occurred.

COMMISSIONER MCALLISTER: The decommissioning charges that we've all been paying, is there a relevant number here for how much has been collected on this, is in the fund there?

MR. NELSON: SCE's share, I believe, is -- the collection is $2.7 billion. The overall decommissioning obligation, I believe, based on again estimates, is around $4 billion. The rest of that would be San Diego, Riverside, and Anaheim, who are the other co-owners. So we believe that it's reasonably well funded. We're funded at about 90 percent, I believe.

And then the CPUC has two additional phases, one phase has to do with recovery of 2013 costs, and the other phase has to do with really a little bit more technical phase, I think, on the analysis of what happened with the steam generators. So I believe that's the process, and

then the PUC ultimately, of course, will be working the issue of rate recovery.

COMMISSIONER MCALLISTER: Right, and on that final issue, I think, so there's likely to be a phase 5-6, I guess. But the final issue actually has global importance and certainly national importance, I mean, figuring out what happened so the industry can sort of learn from it, that's definitely true.

COMMISSIONER FLORIO: And just to add that, you know, in the wake of Edison's announcement, President Peevey encouraged the parties to try to reach settlement on some of these ratemaking issues, certainly a sentiment that I second, and if the parties bring us a settlement, we'll try to process that expeditiously and, if not, this will be a fairly lengthy process. So trying to take it step by step so that parties can focus on a discrete set of issues at one time, rather than one massive proceeding that's hard to keep all the pieces straight.

CHAIRMAN WEISENMILLER: So with MHI, do you expect to go to litigation or arbitration?

MR. NELSON: I believe it has an

arbitration clause, so at this point we're still obviously in negotiations with them.

CHAIRMAN WEISENMILLER: Okay.

COMMISSIONER MCALLISTER: Great. Thank you very much, Mark.

MR. NELSON: Thank you.

MS. WALTER: Okay, next we're going to have Stu Nishenko who is the Senior Seismologist in the Geo Sciences Department of Pacific Gas & Electric. He serves as the Technical Manager of the Central Coast California Seismic Imaging Project.

DR. NISHENKO: Commissioners Weisenmiller, McAllister, Florio, good morning. And thank you for allowing PG&E the opportunity to report out on the progress that we have made addressing the recommendations in the Energy Commission's AB 1632 report.

This morning, I have three basic questions I want to address in my presentation, and there's quite a lot of material here, so I'll try to get through it in a timely fashion, but if we kind of reach the limit, please let me know and we'll terminate this as quickly as possible.

So the first question here is seismic

hazards at Diablo Canyon, the overall status of ongoing efforts to understand those hazards through a Long Term Seismic Program (LTSP). And we are currently following a Senior Seismic Hazard Analysis Committee, or SSHAC, a Level 3 process that is scheduled to be completed in 2015.

MS. KOROSEC: I can run it for you if you would prefer.

DR. NISHENKO: My apologies.

MS. KOROSEC: No, no worries. Unfamiliar technology.

DR. NISHENKO: Actually, let's go back one. Okay, so this is a flow chart that shows the seismic hazard analysis, SSHAC process update, and the point that I want to make is the role of the information that we're collecting is part of the AB 1632 process, in the box over here on the left-hand side of the slide. So this is information that we basically describe a seismic source characterization, finding basic information about the earthquake sources, their geometry, their rate of activity, things like that, that then get fed into this hazard update process that finally at the end winds up with a

probabilistic Seismic Hazard Update. So the work that we're doing is part of AB 1632 is integral to that Seismic Hazard Update. Next slide.

The information that we're considering as part of this process includes the original 1988 LTSP Tectonic Model and then new data that we've collected as part of the AB 1632 studies including Marine Data, Multi Beam Echo Sounding of the sea floor, low energy Seismic Reflection Surveys of the sea, as well as Onshore Data, we're again doing 2D and 3D Seismic Reflection Surveys on land, geologic mapping, topographic mapping, as well as Potential Field Mapping, looking at variations of gravity and magnetic. So to address the specific requests that we use, three dimensional data; this is an example of the kind of information that we are considering, and I'll have some examples of that later on this morning. Next slide.

In terms of ground motion characterization, it's sort of the complementary half to a seismic source characterization, we've been very busy in continuing to develop our next generation ground motion model in terms of adding more information to the database, as well as

making updates to the model, itself. In addition to, if you will, empirical updates, we've also been working very closely with scientists from the USGS, Southern California Earthquake Center, and the Pacific Earthquake Engineering Research Center in Berkeley to develop Numerical Models, Dynamic Rupture Models, Finite Fault Simulations, to help fill in the blanks, if you will, what we don't know from observed information from earthquakes. This turns out to be critical to help us understand a question about the intersection of the shoreline in the Hosgri Fault, for instance, and we'll talk about that next. Next slide.

So question 2 says, at this point in time, have we found any information to indicate larger than expected hazards at Diablo Canyon, and whether or not the plant was built with sufficient margin to continue operating reliably and safely. At this point, we have not found any evidence to suggest that we have a problem at the plant, but I would just caution you that the report, the SSHAC Level 3 report which will address all this in great detail, is scheduled to be completed in March of 2015. But right now

there's nothing on the horizon. Next slide.

And so here we're asked to delve into a little more detail about our progress in completing the AB 1632 recommended studies, so that's what I'm going to be addressing for the rest of the presentation. Next slide. And just as a reminder, the 1632 study, which was an assessment of California's nuclear power plants, recommended that both PG&E and Edison update their seismic hazard assessments, and this is the SSHAC process, that we actually initiated prior to the NRC issuing their 50.54(f) requirements after Fukushima in 2011, and also to use 3D geophysical reflection mapping and other advanced techniques to supplement these previous and ongoing programs, so as I showed you before and will show you again, how we're using that information moving forward. Next slide.

This is just quickly a summary of the funding history for the project. We began with an initial request of $16.7 million in 2010, and about a year later in September of 2011 reopened that request for additional funds, and now we have a budget of about $64.25 million to cover all the research activities that we had

identified. Next slide.

Again, as part of the decision to provide that funding, the Public Utilities Commission required that an independent peer review panel be established, and that's comprised of representatives from the California agencies that you see listed here, as well as a number of supervisors from San Luis Obispo County to provide some oversight. Next slide.

This is a slide of the seismicity offshore Diablo Canyon, so Diablo Canyon itself is located right about here, this area is called the Irish Hills, and what you see offshore of the plant is the seismicity patterns that we are concerning ourselves with. This is information, by the way, that was provided from Jeanne Hardebeck of the U.S. Geological Survey, and there are two sets of dots, red dots and green dots. I think the red dots are updates of earlier locations that were done in 2010, and using new improved information, the red dots give us relocations as of 2012. The point I wanted to make here is that, with the seismicity, you can clearly see the strands, the two strands of the Hosgri Fault that exists offshore, there's a

western strand, and there's another eastern strand that is right here at the edge of the Continental Shelf, but more important it is this lineation, the seismicity that runs close to the shoreline near Diablo Canyon. So this is the seismicity that initially was used to confirm the fact that there is a Shoreline Fault zone offshore of the power plant. And that started a whole series of investigations that were reported on --

COMMISSIONER MCALLISTER: Could you point out exactly in this map where Diablo Canyon is? Is it sort of on that open spot half-way up?

DR. NISHENKO: It's right about here.

COMMISSIONER MCALLISTER: Yeah, there we go, okay. Thank you.

DR. NISHENKO: So the proximity of this lineation of seismicity to the plant itself is less than a kilometer, it's probably under about 600 or 700 meters. Next slide.

We used what we call a seismic source characterization sensitivity study to help us prioritize the kind of information that we needed to improve our seismic hazard study for the area, so basically what we're trying to do here is

reduce the uncertainty in some of the basic parameters that we need to know in order to do the seismic hazard assessment and this sensitivity here shows different realizations of the hazard, depending on variations in particular parameters, like variations in the slip rate of the Hosgri Fault, or the dip of the Hosgri Fault, produce a wide variation in what the answer is that you're going to get, so that's a measure of the uncertainty. So we've designed the work that we've done to try to reduce that uncertainty, to get better estimates of the slip rate of the Hosgri, for instance, or the slip rate of the Shoreline Fault, as well as looking at the dips or the geometry of these major fault zones that we've identified in and around the Diablo Canyon area to improve the accuracy of the hazard assessment. Next slide.

Okay, this is supposed to be kind of a sequential slide, but the point that I want to make here is that from 2009 to 2011, we've been doing a great deal of work onshore and offshore, it began with sea floor mapping and this potential field mapping looking at the gravity of 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

examples in a moment. Next slide.

In 2012, we continued these investigations and here is where we looked again in more detail in San Luis Bay at the Shoreline Fault Zone. In 2011, we discovered information that was going to, we think, help us constrain this rate emotion on the Shoreline Fault Zone, so we went back in '12 and collected more data to help us with that analysis, and then also extended that analysis to the Hosgri Fault further offshore, looking for information that would give us an independent confirmation about what the rate of fault motion is on the Hosgri. Currently, the only -- the primary source of information we have on the rate emotion to Hosgri is where it comes on shore in San Simeon, so there's a great stretch of this fault where it's underwater and heretofore unavailable for geologic investigation, so we're trying to address that right now.

In '11, we spent a lot of time onshore in the central and eastern part of the Irish Hills. In '12, we spent a great deal of time in the area in and around Diablo Canyon itself doing onshore seismic reflection profiling and getting a better

idea of the geology in that area. Next slide.

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

But one of the operational issues that we had -- actually, if you can go back a slide -- is the existence of what we call the "White Zone," you really can't see it here, but there's an area near shore that's impossible to get into with conventional boats that we're using to do this Multi Beam Mapping because of the presence of kelp in the water, shallow rocks, and things like that, we're kind of limited in how far close to shore we could get. So working with the folks at Monterey Bay, they developed -- basically put a sonar head on a jet ski and were able to take the jet ski in and out of the shallow water and allow us to fill in this white zone, so now we have comprehensive bathymetric cover from the shore out to sea, or basically wall to wall coverage of the sea floor. So this is key in that it allows us to basically continue geologic structures that we map onshore to the offshore, and vice versa. Next slide.

In addition to that Sea Floor Mapping, we also did what we call Potential Field Mapping, looking at subtle variations in the strength of the earth's magnetic field, as well as the earth's gravity field, to better understand

geologic structures in the area. So this is a summary of the helicopter survey we did in 2010 across the Shoreline Fault Zone, again, Diablo Canyon is located right here. One of the characteristics early on that was recognized was that fault zone itself seemed to be associated with a series of magnetic highs, probably because of rocks that were entrained inside the fault zone itself, and that gave us a good marker to actually not only trace the continuity of that fault zone, but it also models geometry and its potential depth.

The next slide shows the results from a gravity survey which was done earlier by the USGS and we're actually in the process of updating it as we speak to get more gravity data. But here the key point is that there are more information available for us to use to address these problems, to constrain these geometries than just seismic. And this becomes critical down the road because of the fact that our application for doing high energy seismic and the offshore was denied last year, so we are looking at other data like gravity magnetics and old seismic data that was collected in the '70s and '80s to see if we

can address these questions without having to go through that and reapply for doing high energy work. Next slide.

This is a helicopter shot of the vessel that we're using to do some of the low energy work in San Luis Bay, and this is an again state-of-the-art technology, this is called a P-cable. Back here where you're dragging about 14 separate streamers that are about 15 meters in length behind the boat, the sound source is located here, and what this allows us to do is do these surveys, or what we call "mow the lawn" in a quicker amount of time, a shorter amount of time. When we first started doing this in 2010, we only had four streamers behind the boat, so tripling the number of streamers basically makes it more effective and less time to do. Next slide.

All the data that we've collected for the Marine work has been processed in Houston and this is just a flow chart showing how that data was processed and also that each step of that processing had a quality control process, as well. All the work that we're doing under AB 1632 is being done to nuclear quality assurance standards, so there's a whole set of procedures

that need to be followed and records kept for all this information as collected and processed and interpreted. So this is all being done to the highest standard possible. Next slide.

So the first work that we did in 2010 and 2011 was off of Point Buchon here in the inset map, and Diablo Canyon is here. So this is the area where the Shoreline Fault was seismicity that was associated with the Shoreline Fault, seems to start intersecting the Hosgri. So we went at first to that area to see what we could learn about the geology and geometry. This is what we call a time section from the 3D survey that we did, so this is basically a horizontal slice through the volume that we collected at a depth of about 115 meters below sea level, or roughly about 50-60 meters below the sea floor. Prior to our doing this work in 2010 and '11, previous surveys in the area had looked with spacing between ship tracks on the order of 800 meters. For the 3D survey that we did here, spacing between ship tracks is on the order of 12-20 meters, so a dramatic increase in the density of data, the resolution that then allows you to put together literally a 3D volume that

you can look at in different orientations, take slices as you see here in different directions, to help you further understand the geologic structure.

So in our 2011 report to the NRC, onshore line fault zone, we had identified a number of faults in the area in addition to the Hosgri, a feature in 2011 that we called the North 40 West fault, that using the new data that we collected in '10 and '11, we've now renamed as the Point Buchon Fault, and also come to realize and map greater detail for this fault zone than we knew before. Next slide.

This shows an overlay, then, of the seismicity -- again, these red and green dots I showed you in the earlier slide -- on this time slice and, again, to try to understand the correlation between geologic structure and seismicity in this area. One of the things that is difficult is that this Low Energy Seismic Survey, or LESS, only gives you imaging to the top 200 or 300 meters of the sea floor, this doesn't have enough energy to propagate deeper. And the seismicity that we're looking at here is occurring at depths of 3, 4, 10 kilometers below.

So necessarily what you see at the surface may not reflect everything that's going on at depth. But, again, it is a step forward. Our original goal was to try to do basically top to bottom mapping from the sea floor down to the depths of the earthquake so we can understand that entire crustal column. Next slide.

This is kind of a complicated diagram, but the point being is, as you get into that intersection zone between the shoreline and the Hosgri Fault, the seismicity starts to merge together and a lot of times it's not clear whether you're looking at earthquakes that are happening on the Hosgri Fault, you're looking at earthquakes that are happening on the shoreline, and what their relationship between the two of them are. I think later on this morning, Dr. Hardebeck is going to talk about this a little bit later. But this is a point where a lot of the numerical modeling that we've been doing with the other groups comes into value in that it helps us to start understanding what the mechanical interactions are between these two faults, and hence what kind of earthquakes we could expect if these faults interacted with one

another. So this gets to understanding the reality of the situation and how it impacts ground motions at the plant, itself. Next slide.

The report for that 2010-2011 survey was completed in 2012 and was transmitted to both the IPRP, as well as the SSHAC study team to inform them in their deliberations and our policy is also being posted on the PG&E website, so we have a policy to provide all the information to the public as part of the transparency, and we'll talk about that in the last slide. This is just one of the reports that we were coming out with in the datasets.

This is our boat again, and here we're going to be talking about the southern end of the Shoreline Fault Zone in San Luis Bay. Next slide.

When we were doing reconnaissance work in San Luis Bay in the winter of 2011, we uncovered what at the time looked like the ancestral continuation of San Luis Obispo Creek, which is located here on shore as it cut across the Continental Shelf, out into the Santa Maria Basin. So this is a contour map of that buried channel, if you will, stream channel, as it is

cutting across the Continental Shelf. What got us excited about this is that a trace of the Shoreline Fault Zone, shown here in red, cuts across that channel. So this is an example of what geologists call a piercing point, where you have a geomorphic feature that's cut by a fault, and then if you can document offsets of that geomorphic feature, and you know it's something about the age, you can come up with a rate of motion. So we went back in 2012 and 2011 to survey this area in much more detail, the inset shows the survey tracks that were done in '11 and '12 using this 3D technology. And this is really where it kind of shines. Next slide.

This is just one profile through that buried channel, and you can kind of see how the surface here, the basement surface, has been eroded away and then filled in with sediment, so this is an uninterrupted profile and the next slide shows you an interpretive profile where we have bedrock surface below the channel that was cut in during the low sea level, then later filled in, and then overlying the younger sediments, sea floor surfaces located right here. So in 3D what we can do is put many of these

profiles together, stack them up next to one another and come up with this volume. And the next slide, I'll just kind of show you -- hopefully this is going to work, what we can do with the volumes. So here is from top to bottom ocean surface, down through the sea floor. Next slide. Rats. Okay, that was the one, another sequential slide, but the whole idea is that basically you can peel away the layers and look at the geologic structure in detail. So if this had worked, what you would have seen is we would peel away the ocean layer, you could see the sea floor, then we identify where that basin surface is, where the hard rock is, peel away the overlying younger sediments, and the next slide then shows the geometry of this channel, these buried Paleochannels as they cut across the Continental Shelf. So here, again, we're looking for places where the fault has offset this channel.

And this is basically something called Maximum Similarity, which is basically additional processing that you can do to the data after you've collected it to emphasize more subtle features. And with it, you can kind of see right

through here is this is the trace of the Shoreline Fault zone. In fact, what we've managed to do is identify an eastern and a western trace of the Shoreline Fault Zone here in San Luis Bay. So, again, this is all information that's below the sea surface, below the sediment layer, you don't see it on the surface like you did that Bathymetric map that we had offshore Diablo Canyon. Next slide.

So in fact, what we found in our surveys is there are a number of channels that cut across the Continental Shelf that also cut across the Shoreline Fault Zone, so we're actively now looking at these channels in detail to see what they can tell us about the rates of offset for that particular fault. Next slide.

One of the setbacks, if you will, for the uncertainties that we have is in the age of sediments that are deposited in these channels. But luckily for us, sea level has not remained static over hundreds of thousands of years, and the sea level curve, which goes back 430,000 years, shows that there are episodes of low sea level stands, this latest one, too, is associated with the most recent glacial maximum during the

Ice Ages, and these are the times when you would expect to have streams cutting across the Continental Shelf. So what it does is it starts to give us ages that we use to bracket some of the rates that we're going to be coming up with, with slip rates for the Hosgri Fault. And obviously one of the longer term areas of concentration is going to be to see if we can get better information, better constraint on those rates. Next slide.

As I mentioned before, in addition to work in San Luis Bay, we also looked at the Hosgri Fault itself to see, again, if we could see stream channels that came across the fault that were subsequently offset. And down here near Point Sal, the Santa Maria River, which is one of the largest drainages in the Central Coast of California, cuts across the Hosgri, and this is an area of particular interest and evaluation. Next slide.

This again shows you kind of amplitude volumes that we can construct with this data, and the next slide shows you a map view, again, horizontal time slice through the Hosgri Fault, so this is a detail here on the right-hand side

of the slide, the Hosgri is located in the center of that image, and you can kind of see these patterns here. These are stream channels that we've identified in both map view and cross section, and our responsibility is to match up the channel on the east side with the channel on the west side. So the next slide shows a kind of interpretation and the colored bands show some of the channels that we've identified, and the red shows just the complexity of the surface trace of the Hosgri Fault in our survey area. So this is one of the things that happens, you know, when you look at things in more detail you find out they're much more complex than you originally thought.

The next slide -- go back again, please -- so basically where we are right now is looking at these channels in more detail and just trying to understand the history of the offset of these so we can come up with an estimate of the slip rate for the Hosgri, both in San Luis Bay and then further north in Estero Bay. Next slide.

This report is scheduled to be issued in the fourth quarter of this year, 2013, and like the last report we issued, will be distributed to

the IPRP, the SSHAC team, and then also posted on our website for interested readers. Next slide.

The HESS Survey, just briefly, this is supposed to be the complementary piece to the Low Energy Seismic Survey work that we did. Low energy was much easier to permit and conduct than high energy. The next slide shows just the history of the steps that we went through to try to seek a permit to do this work offshore, and this required coordination with both the State of California, as well as a number of Federal agencies because we were bracketing State and Federal waters to do this. Next slide.

Unfortunately, while the State Lands Commission issued us a Geophysical Survey Permit in August of '12, the Coastal Commission decided to deny our development permit application and its result, that work was stopped. And on the Federal side, our Incidental Harassment Authorization was withdrawn. So here in 2013, the final decision on these high energy studies offshore is really pending the review of existing data. This gets back to that other geophysics that I talked about earlier.

COMMISSIONER MCALLISTER: What is the

issue or issues that kept that from being approved? Or what were the sort of concerns about doing that high energy work?

DR. NISHENKO: It's primarily the effects of sound in the sea on the environment, that these were rather loud noises that people were afraid were going to be deleterious to marine mammals and other wildlife in the area.

COMMISSIONER MCALLISTER: Okay, thanks.

DR. NISHENKO: Next slide. So this is just a review of the work that we've been doing onshore, so this is complementary to the marine work, and here with this idea to develop a top to bottom profile, we used different sources. This is what we called accelerated weight drop, which gives us high resolution imaging, again, to the first couple hundred meters of the crust. And then these Vibroseis trucks which located here, that give us deeper imaging. Again, the idea to image to the depths at which the earthquakes themselves are occurring. Next slide.

In 2011, we succeeded in surveying about 120 miles of road in and around the Diablo Canyon area here in the Irish Hills. Survey routes are shown with the green lines, and these red dots

that you see here was an attempt for us to install high density instruments to record data from these green routes, to construct three-dimensional image of the crust underneath the Irish Hills, again to help us identify faulting in that geometry.

In 2012, we concentrated our activities in and around the Diablo Canyon Area. Part of this was in preparation for the offshore surveys that we were expecting to do later on that year, but didn't occur. But nevertheless, we did get a lot of valuable data on land, in and around Diablo Canyon. Next slide.

This just shows a detail of one of the seismic lines to north, this is near Montana del Oro, Morro Bay is located right here, and one of the things that you want to do with seismic work is try to tie in what you see in the reflection profiles with well data, it gives you some hard evidence that you can use to interpret the seismic sections that you create. So these are the locations of some available wells that we had in the area, and the next slide shows the cross section through that survey route with the well locations, and then some preliminary

interpretations of that seismic data in terms of the geology and the stratigraphy. This is an activity that is currently ongoing now with our seismic interpretation team -- next slide -- and we expect to have the report on that interpretation issued in the second quarter of 2014. So by this next summer, the SSHAC group will have all the information on Seismic Source Characterization for their work in developing their Probabilistic Hazard Assessment. Next slide.

Our Ocean Bottom Seismometer Program, so recognizing that there was a considerable degree of uncertainty in earthquake locations offshore primarily because all your seismic stations are located onshore, and the directly of maximum uncertainty, if you will, is perpendicular to the coast, we initiated a program to install ocean bottom seismometers offshore in the area near where this intersection of the two faults occurs. So these are pictures of a temporary unit that we're going to be putting down this summer for a couple weeks to just get a better understanding of noise conditions in the area, and then a diagram of a more permanent facility that is

going to be located offshore for about 10 years. So the idea is that by installing these offshore, and these are all going to be wired in real time to the plant located here, we'll have the necessary control to improve the earthquake locations in this critical area. Next slide.

Finally, as I mentioned before, all the information that we've collected as a part of this project is going to be put into a legacy data archive, so information about earthquake geology, geophysics, all will be available at a PG&E website, and we're also in negotiation with some other organizations to help us manage the great volume of seismic data that we're going to be generating as a result of all this work. But the goal is to make this information available so others can take a look at it, if they want to develop what we call proponent models, or additional models for the SSHAC to consider in their deliberations, everybody will be working off the same page, using the same database. So this is our commitment to provide this information in a public forum. And that is my briefing. Thank you.

COMMISSIONER MCALLISTER: Thanks very

much. So just a very high level -- this is a lot of information, a lot of effort, a lot of resources, and so one specific question, you know, how on the high energy stuff, I guess a little more description of what that entails, actually, like what you are asking for and maybe your idea of why the Coastal Commission was uncomfortable with it more than sort of generic impacts on mammals, like what are you actually proposing to do? And then a more -- you know, that isn't happening, but lots of things are happening and this has been going on for decades, and I guess more specifically how is this report going to sort of -- what are the then policy questions and potential actions going forward that this improved understanding is presumably going to enable? Is it additional earthquake retrofitting on the plant site itself? Is it contingency planning in other ways? Is it informing the relicensing conditions? What sorts of things are you anticipating that this broader deeper understanding is going to enable? So two questions.

DR. NISHENKO: Let me answer question 2 first, and then I'll defer to my colleague, Mr.

Strickland sitting next to me. The work that we're doing right now really is probably a first major improvement of our understanding of the geology and tectonics of Central California Coast in more than 20 years, and that last episode was, you know, coincident with the LTSP work, and a lot of exploration work that was being done in the 1980's. So we've added a new chapter in our understanding of onshore and offshore geology as a result of this. This is very expensive to conduct and this is not typically what outside of the oil industry you would expect folks to do, so this is giving us an opportunity to have a unique picture of the area that we're concerned with.

The impacts of this work, as you asked, on policy decisions and engineering decisions, I think we're really going to wait until SSHAC finishes their deliberations in 2015, and then coordination within the regulatory commission. So the SSHAC group has been empowered to take all this information and analyze it, evaluate it in terms of this seismic hazard assessment, so that's the point where we'll start to see the impact in terms of the engineering safety of the plant.

MR. STRICKLAND: My name is Jearl Strickland and I'm the Director of Nuclear Projects for Diablo Canyon. And what we expect is that, as the SSHAC process completes the development of seismic source characterizations and associated ground motion characterizations, that that will then be used as a part of the response to the Nuclear Regulatory Commission's orders 50.54(f) to be able to then create a new seismic spectra for Diablo Canyon, compare it to the existing design basis, and in turn evaluate whether or not there are additional studies that need to be performed to assess the capabilities of a plant. An example would be that if, say, on the low frequency end of the spectra that you determine that you had some responses outside the range of your current spectra, you'd go back and you'd look at what types of equipment components and systems that would be sensitive to that type of motion and, in turn, then evaluate as to whether or not any additional motion would have an impact on the qualification of those components.

COMMISSIONER MCALLISTER: Okay, so thanks. That helps me understand. This set of

issues is one of these, I mean, nuclear in general you can kind of characterize like this as sort of the probabilities are relatively hard to get one's head around. And so how low probability -- I imagine, you know, the seismic assessments sort of feed into what are sort of the probabilistic approach to what might happen and what the risk of that is, and then what the sort of justifiable investment in remedying any risk, at what level, and all that, so that probabilistic assessment in reducing risk overall, that's really difficult to do. And so it's obvious to you who are in this industry, but I think this is a particularly difficult thing for policy to grapple with and we're talking long term, right? I mean, so 2015 and some number of years to sort of digest, come up with recommendations, base it in the technology as actually the plan, and then come up with something concrete to actually do to the plant if that's necessary. We're talking 2020? What is the timeframe on that whole process to sort of play out?

MR. STRICKLAND: The timeline right now would be that by 2017 that we would have to

better quantify as to whether or not there were any specific areas in the plant that needed additional assessment or potential modification.

COMMISSIONER MCALLISTER: Okay, and then that assessment and then potential modification. Okay. Thanks.

MR. STRICKLAND: Did you want Stu to talk about --

DR. NISHENKO: Do you want to talk about HESS?

COMMISSIONER MCALLISTER: Yeah, so second question.

DR. NISHENKO: So on the screen, on the right-hand side are the ship tracks that we had proposed for the HESS study. So these were basically drawn to help us understand the deep geometry of a number of different fault zones in the area, including the Hosgri Fault Zone, Shoreline Fault Zone, and then also additional faulting here in San Luis Bay. So the HESS itself, or the High Energy Survey, would involve firing a series of air guns with a volume of about 3,000, 4,000 cubic inches on a repetitive basis and then recording the echoes of the 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

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

despite that, it was just ruled to be too environmentally dangerous to proceed forward.

COMMISSIONER MCALLISTER: Okay, I appreciate that in depth, I mean, I can kind of imagine why, I mean, it's going to be kind of loud and disruptive in ways that I think others have confronted those same challenges, I mean, in the Military and the sonar issues in there too, and I think some similar characteristics, although a different kind of process, but you certainly would not want to minimize those impacts.

DR. NISHENKO: Yeah, and just to add a little bit more, this is a discussion that's happening right now, actually, on the east coast of the United States, too, in terms of exploration on the Continental Shelf in the eastern United States, is the impact on marine life.

COMMISSIONER MCALLISTER: So you know, we haven't done any public questions yet. Are we --

MS. KOROSEC: We hadn't planned on doing that as part of the panels, we were going to save that for the public comment period; however, we are about five minutes ahead of time if you do

want to open it up for people in the room.

COMMISSIONER MCALLISTER: I think, yeah, anybody in the room and I don't know how many folks we have listening in, but it would be good to open it up for comment, it looks like we have a couple of interested parties here. Questions, really, not comments.

MS. KOROSEC: Yeah, questions particularly. Please.

COMMISSIONER MCALLISTER: I'm not sure -- you guys -- Lynette or Suzanne, you probably want to manage the flow here. If you would introduce yourself, that would be great.

MR. LUTZ: My name is Ray Lutz and I'm with Citizens' Oversight. In the first part of your presentation, you made the statement that nothing to worry about really with Diablo Canyon in terms of seismology concerns and we can go forward with the way we are. Then we had a long presentation about a lot of work that was done to try to figure out what's known about these faults, and it sounds like you don't even really know. But I guess the question is, can you answer this, what is the likelihood that we'll have a devastating earthquake near Diablo Canyon

such that there will be an emergency at the plant which will cause an evacuation? Since you said there's no concern, I hope that you've gone through the process of saying there's a certain probability. Have you gotten to that point or not?

DR. NISHENKO: That is the role of the SSHAC process in the 50.54(f) reports that we are currently undertaking right now.

MR. LUTZ: So would you like to retract the statement that you think that it's safe because you don't really know at this point?

DR. NISHENKO: I don't think I said that it was safe in my remarks, I said that as of today we have not uncovered any information that indicates that we're outside of our licensing basis.

MR. STRICKLAND: So let me add some information on that. Where Diablo Canyon has a seismic licensing and design basis that we've been designed for and continue to be analyzed for, that seismic design basis has been reviewed by the Nuclear Regulatory Commission and Diablo Canyon has determined to be safely configured and 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

we get it accurate. Thank you.

COMMISSIONER MCALLISTER: Thanks for your questions. Next up.

MS. MCANDREWS: Just to maybe add on, we have provided that information in one of our data requests to the CEC.

COMMISSIONER MCALLISTER: Great, and those are public, right.

MR. GIBSON: Thank you, Commissioner McAllister. I'm Bruce Gibson, I'm the Second District Supervisor for the County of San Luis Obispo and the County's Representative to the IPRP.

COMMISSIONER MCALLISTER: Hey, great. Thanks for being with us today.

MR. GIBSON: My pleasure. I sit on the IPRP both as an elected official, but also holding a doctorate in Geophysics with a 15-year research career in High Energy Seismic Reflection Surveys. If you would indulge me just a brief amount of technical commentary, I would offer you the chance, I'd be happy to chat with you later about some of the technical issues in the High Energy Survey proposal, in the IPRP, and particularly between Dr. Nishenko and myself, we

had a robust conversation and it was my conclusion that the technical details of the proposal were not up to the state-of-the-art, and that means both in terms of their environmental impacts and the quality of the image that might be gained. This has been hashed out in a long series of things, so I won't go into that at this point.

But I would like to also offer Commissioners a question that I thought that you might consider, and that is at the nature of the policy question here is an assessment of the risk to this very important facility. It is being conducted under probabilistic seismic hazard analysis and, you know, Dr. Nishenko and others have gone through the stages there. Basically we tried to find out what's the biggest earthquake that might occur within the region, it has to do with the length of faults, the depth of faults, which way they trend, and how fast they move. Out of that, we find that the bigger fault area that we can find, the larger is the potential earthquake. But in a completely counter-intuitive way, if we find a larger magnitude 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

estimate for decommissioning?"

MR. NELSON: There's actually a cost estimate that's being done right now, as well, an update. But the current estimate is approximately $4 billion for the entire decommissioning process.

COMMISSIONER MCALLISTER: All right, thanks very much.

MS. KOROSEC: Thank you. And with that, that's the end of this panel, we're due to take a 10-minute break before we start our second panel, so if parties can be back here at 11:35? Thank you very much.

(Break at 11:23 a.m.)

(Reconvene at 11:38 p.m.)

MS. KOROSEC: We're going to go ahead and get started now, folks.

MS. WALTER: Okay, everybody. As soon as everyone is seated, we're ready to being the next panel and the last panel was the perfect lead-in for a discussion of seismic hazard analysis update. We have Cliff Munson, a Senior Level Advisor from the U.S. NRC, Office of New Reactors, Division of Site Safety and Environmental Analysis, to go over the NRC SSHAC

Level 3 process. We have Chris Wills, Supervising Engineering Geologist with the California Geological Survey, to give us an update on the state review of seismic projects, and we have Dr. Jeanne Hardebeck, a Research Geophysicist with the USGS, Earthquake Hazards Team, to give a report on the uncertainties and implications for California nuclear power plants in the Central Coast. So without further ado, we have Cliff Munson.

DR. MUNSON: Good morning, Commissioners. My name is Cliff Munson, I'm a seismologist from the NRC. And I'm here this morning to give you an overview of the NRC Fukushima Near Term Task Force recommendations that concern seismic issues.

So once the accident occurred in March of 2011, the NRC formed a Near Term Task Force and that Near Term Task Force published a report and the NRC issued letters to each of the nuclear power plants in March of 2012, and it specified in those letters the seismic and flooding reevaluations that we wanted to see for each of the nuclear power plants.

So let me go over the seismic

recommendations. I'm primarily going to talk about recommendation 2.1. Recommendation 2.1, the first step is a seismic hazard evaluation for each of the nuclear power plant sites. That hazard evaluation is done in a probabilistic fashion using our latest methods. Those hazard evaluations are ongoing right now, each of the licensees are performing those hazard evaluations, and those will be submitted to us next year for the Central Eastern U.S. plants, and then in March of 2015 for the three Western U.S. plants.

Depending on the outcome of those hazard evaluations, some plants may need to do seismic PREs, Plant Risk Evaluations, and take that hazard information and bring it into the plant, and so those Seismic Risk Evaluations will take three years after the hazard evaluations and then, depending on the outcome of that, the NRC would perform regulatory actions after those.

Recommendation 2.2, which hasn't been talked about too much is that the NRC is proposing a rulemaking that this activity would occur every 10 years on a 10-year cycle, as opposed to just doing this once and then waiting

until the next Fukushima Daiichi accident. The NRC is proposing that, on a 10-year interval that we take a look at the hazards again and potentially do more evaluations for risk for the plants.

Recommendation 2.3 has already taken place and those were seismic inspections of the nuclear power plants where inspectors went into the plants and looked at the condition of the equipment with respect to seismic robustness. And let me talk a little bit more about that one. Excuse me, first, the organization, NRC has a Japan Lessons Learned Directorate, and NRC offices like the Office of New Reactors, which I'm part of, are providing the technical support and those are some of the key players. I know many of you know Dr. Annie Kammerer, who has been out here several times, she is working on Recommendation 2.3 and also with Recommendation 2.1, and I'm the overall lead for Recommendation 2.1 and 2.3 under Dr. Chokshi.

So Recommendation 2.3, I just have one slide on that, the Licensee sent inspectors out into the plant, they looked at about 100 pieces of seismic critical equipment that is needed for

the plant, and they looked at this equipment in terms of the condition of the anchorages, the potential for the equipment to interact, knock together during earthquake, the overall condition of the equipment, and they submitted these inspection reports to the NRC in November of last year. So these seismic walkdowns have given us a brief snapshot of the readiness and the ability of the plants to withstand earthquakes at their design basis levels. So that was submitted to the NRC in November of 2012 and we're currently evaluating those walkdown reports.

Recommendation 2.1 is divided into two phases, the first phase involves a hazard evaluation which is ongoing, and if necessary a risk evaluation. And then in Phase 2, the NRC will take that information and determine if we need to issue orders, if equipment needs to be upgraded at the plant, how that should take place, and so that will be Phase 2. The thing I want to emphasize is that the hazard evaluations are based on current practices for new reactors, so what that means is in the past nuclear power plants used deterministic kind of maximum scenario-type earthquake to develop their design

basis ground motions; for new licensing, we use a probabilistic approach, and I'll talk more about that and discuss how we do that. And then, as I said already, risk evaluations are needed for those plants where the hazard exceeds the design.

So Licensees are performing probabilistic seismic hazard analysis, they're following our NRC guidance for 1.208. For the Central Eastern U.S. plants, which are 96 units on 59 sites, we have regional models that cover the entire Central Eastern U.S., and those models were recently developed as SSHAC 3 processes. NRC, together with the Department of Energy and industry, we worked over a three or four-year period to develop these models and those models are going to be implemented by the Licensees of the Central Eastern U.S. nuclear power plants.

In the Western U.S., which now are three sites, Palo Verdes, Columbia, and Washington, and Diablo, we don't have a regional study for the Western U.S., so each of those nuclear power plants are performing SSHAC level 3 studies, and then those studies will be used to develop ground motion levels that we will evaluate. So let me talk a little bit more about those.

What is the SSHAC process? The SSHAC process is a structured framework for conducting these multiple expert assessments and they're basically model building exercises that are used as inputs to the seismic hazard. These procedures are defined by the Senior Seismic Hazard Analysis Committee and that committee was -- those procedures were developed in the 1990's. The Chairman of that committee was Dr. Bob Budnitz and he's still a consultant to the NRC.

And so let me talk a little bit more about those features of the SSHAC process. So it is a comprehensive collection of available data models and methods. They're structured formal workshops with interactions and key participants in those workshops. The objective is to create a model that incorporates a range of views that are present in the broader technical community, and there's a rigorous peer review of the entire process.

So this is just an example of a SSHAC Level 3 process. Some of the key issues here, there's three workshops, Workshop 1, Workshop 2 and Workshop 3, the key players are the Technical Integration Team, and the Participatory Peer

Review Panel. So the Technical Integration Team is tasked with developing the model, either a seismic source model, or a seismic ground motion model, and the Participatory Peer Review Panel follows this process along and to make sure that the SSHAC process is carried out correctly.

Resource experts are invited to these workshops, both Workshops 1 and 2, proponent experts, people with specific views about the faulting and different aspects of the earthquakes are invited, and then Workshop 3, which hasn't taken place yet for Diablo Canyon, they'll actually present their preliminary model and get feedback from the experts on their preliminary model. These models are then fed into a PSHA, Probabilistic Seismic Hazard Analysis.

This is PG&E's website, they're on Workshop 3, which is upcoming, and they were in collaboration with Southern California Edison and Palo Verdes on the ground motion, so they've already had one workshop on the ground motion, and then the next two are yet to happen.

So the NRC is attending each of these workshops. We're sending our staff geologist and seismologists to these workshops. We participate

as observers at these workshops, so we don't interactively intervene and disagree or discuss the models, but we participate as observers and our formal evaluation of the SSHAC procedure and the models that come out of it will occur in March of 2015 when they're submitted to us. So over probably a year or more in time, we'll evaluate these hazard models that come out of these SSHAC workshops and determine if they actually follow the SSHAC guidelines. Some of the issues we look at: are all available data models and methods thoroughly considered? Do they adequately cover the models giving them different weights? Do they actually explain that and justify that? And then, do they provide a technical basis for their decisions and document the results?

This last bullet -- let me just put it all up there so it's not confusing -- okay, so this is currently each of them, Diablo is performing their seismic source characterization workshops. They're going to come up with a seismic source characterization model that looks at the seismic sources, their magnitudes, 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,

which is fed by this SSHAC process.

These ground motions are put together as a response spectrum, a ground motion response spectrum and, as I said, that is roughly about a one in 10,000-year ground motion level -- per year ground motion level.

So we will take those ground motion response spectra which are the red curves, and will compare them to the plant design basis, okay? That's usually referred to as a Safe Shutdown Earthquake. Now, this is a ground motion level that the plant should be able to withstand and safely shut down key equipment and components. This is not the ground motion level that we expect to see extensive core damage, this is a ground motion level that there's some slight damage, but not enough damage that the equipment can't shut down. It's called a Safe Shutdown Earthquake.

The GMRS, that Ground Motion Response Spectra, that 1 in 10,000 year ground motion level, will be compared to the plant design. In this outcome, the plant design are the SSE earthquake exceeds the Ground Motion Response Specter and this Licensee would be done and not

have to perform further analysis.

In this possible outcome, the plant SSE, there was just a black curve, exceeds this reevaluated ground motion hazard, this ground motion response specter, exceeds it out to 10 Hz right here. At the higher frequencies about 10 Hz, the ground motion response specter exceeds the SSE. What that means is that most of the equipment, most of the structures in the nuclear power plants have frequencies -- the important frequencies are between 1 and 10 Hz. Electrical relays and equipment sensitive to really high frequency ground motion shaking would be susceptible to this higher ground motion. So industry is currently performing shake table testing of this higher frequency sensitive equipment, like electrical relays, they're putting them on tables, shaking them at really high frequencies to see what kind of damage, at what levels you start to get damage. So that's ongoing right now.

The scenario that we expect to see for Diablo Canyon is Outcome 3. Diablo Canyon will be using their Double Design Earthquake as the SSE for comparison and then this ground motion

response specter, this is -- we don't expect it to look exactly like this, but we do expect probably that we will see this Ground Motion Response Specter which is coming from this Probabilistic Hazard Analysis and also coming from this SSHAC process. We do expect that it will exceed the Double Design Earthquake. What that means is that they will need to perform a Plant Risk Evaluation, and let me talk a little bit more about that.

So if the two seismic plant evaluations are required, if the hazard exceeds the plant design, if this GMRS exceeds the SSE, first is an expedited plant evaluation where the Licensee will look at a subset of equipment that is needed to handle station blackout, loss of AC power, and to keep the core cool immediately after an earthquake, so that subset of equipment will be looked at in terms of what is the seismic robustness of that equipment, can it handle the ground motion, and they have to evaluate that equipment and then upgrade that equipment if it can't withstand that earthquake ground motion shaking.

COMMISSIONER MCALLISTER: Can I just ask

a clarification question? So who actually does this research? Universities that you partner with, or with consultants? Or do you have a lab of your own? Or what's --

DR. MUNSON: No, these are all done by the Licensees, so --

COMMISSIONER MCALLISTER: Oh, okay, so --

DR. MUNSON: -- yeah, so PG&E is going to perform this expedited plant evaluation. Now, this is going on while a complete plant risk evaluation, PG&E is performing a complete plant risk evaluation. Now, PG&E has already performed what's called a Seismic PRA, Seismic Probabilistic Risk Assessment, but they will need to update that to account for this new reevaluated ground motion levels that are going to come out of the SSHAC process, that are coming out of this Probabilistic Seismic Hazard.

COMMISSIONER MCALLISTER: Okay, but as far as like taking a backup generator, or a relay, or whatever it is and shaking it under these new parameters, who actually does that work?

DR. MUNSON: Well, a lot of it is, you know, you can't actually take a huge piece of --

COMMISSIONER MCALLISTER: Absolutely, so this is going to be modeling, right?

DR. MUNSON: Right, it's modeled. But PG&E is doing this. The Licensees are doing this and actually they'll be doing it at each of the nuclear power plants where the reevaluated hazard exceeds the design level.

COMMISSIONER MCALLISTER: Okay.

DR. MUNSON: Is there a way to go back, please?

COMMISSIONER MCALLISTER: Presumably you provide the specs for that work where you sort of put them --

DR. MUNSON: Right, so --

COMMISSIONER MCALLISTER: -- what you're expecting them to do exactly, so when they report it back to you, you can evaluate it and make sure that's done right?

DR. MUNSON: Yeah, so we've spent the past actually two years working on a document that outlines the specific details of what we're looking for in terms of the hazard, as well as the risk evaluation. The key parameters that we want to see, the documentation that we want to see, and as far as the plant risk evaluations,

they involve modeling of the plant systems, looking at different accident scenarios for station blackout, loss of coolant accidents, everything that the earthquake can cause, they use fault trees to determine pathways that lead to either damage, or non-damaged states, and they look at the equipment in terms of its seismic capacity or fragility, this piece of equipment could withstand .5 g, maybe this piece of equipment can withstand 1 g of shaking. And then they put this altogether as a seismic risk quantification number. And so what we do there is we take the seismic hazard curves, we convolve it with the seismic fragility of the plant, and we come up with the seismic core damage frequency. So that will be done by the licensees and this is due to us which is a segue for the next slide.

So right now the hazard evaluations are ongoing for the Central and Eastern U.S., they're due in March of 2014 for the Western U.S. because they did not have these regional models that were developed for the Central Eastern U.S. We gave them more time and those will be done in March of 2015, so the SSHAC workshops and everything will

be done by then. These enhanced interim actions will be then conducted by Central and Eastern U.S. plants, and then by the Western U.S. plants at a later date. Again, this is plants where the new hazard exceeds the design basis, or the reevaluated hazard exceeds the design basis level.

Now, also we have these plant risk evaluations which I just talked about, and we're going to group these into higher priority and lower priority. The higher priority risk evaluations are situations where the reevaluated ground motion levels were much higher than the design levels. So those will be higher priority plants and those will be group 1, and those will be completed in the summer of 2017. Now, I have drawn this back here, this line back here, for the risk evaluations because many plants already known that their hazard is going to exceed the design basis and they've already started doing their seismic PRAs, their seismic risk assessments. For example, PG&E is in that group. Then the lower priority groups will extend out to 2019, and if we need group 3, it would extend out to 2020. So that kind of gives you a timeline of

the activities that are going on for this Recommendation 2.1, which is again a hazard piece and then two risk pieces if necessary. So hopefully that has cleared up some of the questions you may have had on that. So that's my presentation. Thank you.

CHAIRMAN WEISENMILLER: Thanks. I've got two brief questions. The first is, does this analysis focus on -- you know, both the walkdown and the risk assessment -- is it focused only on the nuclear components? Or does it include the non-nuclear components at the site?

DR. MUNSON: It's primarily focused on the equipment in the nuclear power plant, the equipment needed to mitigate different accident scenarios. So it's primarily seismic category 1 equipment, but there are seismic equipment that's not category 1 that is also included as part of that seismic risk evaluation. But primarily it's the important pieces of equipment in the plant that need to be able to withstand seismic shaking.

CHAIRMAN WEISENMILLER: Yeah. My impression was you were looking pretty much at safe shutdown, now it may be the plant is out

pile after that for the non-nuclear components, but primarily safe shutdown.

DR. MUNSON: Right. So this enhanced interim evaluation is looking at equipment needed to handle -- to keep the core cool, to handle station blackout immediately after an earthquake, whereas the risk evaluations are looking at equipment that actually would be needed over a longer term basis, so it's also a more complete risk evaluation of the plant.

CHAIRMAN WEISENMILLER: Okay, and is the SSHAC process -- is that a public process?

DR. MUNSON: The SSHAC?

CHAIRMAN WEISENMILLER: The SSHAC process, yeah.

DR. MUNSON: No. The SSHAC process is up to each of the licensees to determine whether they want to make the meetings public or not. The NRC doesn't have any specific guidance or requirements that the SSHAC meetings need to be public meetings. All NRC meetings are public meetings. And when we evaluate the SSHAC work that was done, the SSHAC procedures, those will be public meetings, but the Licensees have the option of whether to make the meetings public or

not. Another point is much of the work that is done on this SSHAC model development is done in between the meetings. The SSHAC workshops are a forum for the experts to come and provide their views on the model and the different scenarios for faulting in earthquakes, so there's no NRC requirement that they be made public.

CHAIRMAN WEISENMILLER: Thank you. Thanks for being here.

COMMISSIONER MCALLISTER: Thank you.

MR. WILLS: So I guess we move on. I'm Chris Wills, Supervising Engineer and Geologist at the California Geological Survey, here representing the Independent Peer Review Panel. Most of the genesis of the IPRP, you know much better than I do. It's just a reaction to AB 1632 in 2006, and the resulting report done by the Energy Commission which recommended various seismic studies for the nuclear power plants. And a couple of words on this slide which we took from the AB 1632 report to kind of describe the charge of the IPRP, and what we've taken is our mission which says that the operators of the plants could use three-dimensional geophysical seismic reflection mapping and other techniques

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

both PG&E's studies, they are relicensing applications through NRC, the SSHAC Level 3 process you've just heard about, we've been invited to and have been observers at all the SSHAC workshops so far, and then also the development of the Uniform California Earthquake Rupture Forecast Version 3 by the Working Group on California Earthquake Probabilities, that's the Seismic Hazard Model that underpins the National Seismic Hazards Maps, which are prepared every few years by the U.S. Geological Survey and the California Geological Survey participates and provides most of these seismic hazard -- the fault information for California.

So all of these things are ongoing and we try to stay aware of all of these and then build on what's going on in these different studies so we can comment on what's going on at Diablo Canyon.

We've had a number of public meetings and issued a number of reports. Most of these are kind of reactionary; PG&E will present what they are planning to study and how they're planning to study it, we will write a report saying we think this is a good idea, or you can do something

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

So what we started out doing is asking PG&E what are you planning to do and why are these various studies important. And so we looked at all the various things around the plant, the various studies they have planned.

This is an image that's borrowed from PG&E and all of the images in this presentation are borrowed from somebody, rather than created by the IPRP, although I will note that all of the fault lines on the map are borrowed by PG&E from the California Geological Survey Fault Activity Map of California, except for the pink one, of course, which is Jeanne's. Though they're doing a series of studies on the faults around the plant, the Hosgri Fault is the big player in this, by far the highest contribution to hazard because it's the highest slip rate fault. Other important faults are the Shoreline Fault, other minor faults on the south side of the Irish Hills, and the Los Osos certainly falls on the north side of the Irish Hills. So we're looking at what can we learn about all of these faults and how much difference does it make. And one of the important things on seismic hazard analysis is that you don't want to spend all of your

effort trying to better constrain a parameter that doesn't make any difference.

And so what we're trying to look at in Seismic Source Characterizations, this is the same image that Stu showed earlier, in which of these parameters does it make a big difference in the Seismic Hazard Analysis. In terms of the top few, it's the slip rate on the Hosgri Fault because that is the highest slip rate fault in the region. The Hosgri Dip is important because if the fault dips towards the plant that's closer to the plant, the hazard is higher; also important is the slip rate on the Hosgri Fault, on the Shoreline Fault, because the slip rate essentially governs how much energy in the system, how much energy can be released in earthquakes by that particular fault.

Other parameters that we could focus on are less important as we've tried to focus on the top few. We've also focused more recently on parameters that are not part of the seismic source characterization, but are part of the ground motion characterization in the hazard analysis. And those can be as important as the slip rate.

So what we've done in a series of reports is gone through the various parameters and say what can you do to study these, and then what is PG&E currently proposing, and is this something that is very important to have more information of this kind to study. And so in our reports we looked at the slip rate on the Hosgri Fault, how can you study it, commented on whether this is the right way to study this parameter. In general, we've agreed with PG&E's approach, at least the various seismic hazard parameters, and in terms of these things which you can use, the low energy 3D seismic surveys, of the type Stu presented earlier, we think these are a key type of study that we recommend more of to better constrain these parameters, both the slip rate on the Hosgri, the slip rate on the shoreline, and then also at the south end, the extension of the shoreline towards shore on the east.

Just to give a couple of examples, I think, from PG&E's studies, and you saw a couple earlier in Stu's presentation, they've been doing an extensive survey off of Point Buchon of the intersection of the fault, and they're able to draw these really impressive 3D volumes of the

shallow part of the earth's crust and you can see the folds and faults that are expressed within those layered sedimentary rocks, and then to be able to trace those faults through -- in this survey volume, they've been able to trace from the Shoreline Fault up through the now Point Buchon Fault as that extends very close to the Hosgri Fault, and so to be able to show the near surface, at least, extent of these faults is very valuable information. And as you go to other places, you can actually look at the slip rate, use the same to look at the slip rate, as Stu described earlier, so these are all very important types of investigations, and the types of investigation that the IPRP has gone on record to say this is the right thing to do, we need more of this kind of information.

Other types of information can also come from either 2D or high energy 3D on land surveys, also things that Stu described earlier. The on-land surveys of the Los Osos Fault and other thrust faults in the Irish Hills are critical to understanding both the slip rate and the geometry of those faults, the potential for any other previously unrecognized thrust faults in the

subsurface beneath the Irish Hills is something that needs to be investigated, needs to be particularly understood, and so this is the right kind of investigation to do that. As Stu pointed out, there's a whole series of investigations they've done throughout the Irish Hills, those are studies that they've been interpreting since they did those originally in 2011-2012. We are hopeful that they will give a very good 3D image of the layers of sedimentary rock, bedrock, and where the faults are within that whole pile of geological material underneath the plant, and be able to give us a better handle on how active those faults are.

I would point out there are a whole series of investigations, and this was also mentioned, that things were best investigated by the high energy 3D seismic, and that includes the dip of the Hosgri Fault as it extends to depth in the seismogenic depths, how the Hosgri and Shoreline Faults interact at seismogenic depths, and then other details in the geometry of the Shoreline Fault, all were targets of the high energy 3D seismic. I would point out also that there was initial proposals for investigating the

step over zone between the Hosgri and San Simeon in which we looked at that and said that's probably not worth pursuing that investigation, the potential impacts outweigh the potential change in the seismic hazard evaluation. So in advance of the State Lands Commission and Coastal Commission, we had looked at these and said you probably don't need to pursue this one leg of it, but the other ones we were supportive of getting additional information on these parameters. But as you've heard, the Coastal Commission decided the impacts of that kind of study was too great, and they denied the permit. Just to give you that same geometry of the different studies that were proposed at the Shoreline and the Hosgri Fault and some of the other faults, the Los Osos Fault which comes into San Luis Bay, those are all things that, you know, there's no such thing as bad data about where the fault is and how they interact, but those were probably lower priority than the things like the slip rate studies that are ongoing, but these are thing that would have helped constrain some of those parameters.

Just a couple words about the San Onofre research projects that were ongoing, and I guess

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

that's about to be closed -- is being closed.

There are other ways to study this besides the high energy seismic being proposed. These are detailed on-land, you know, a geologist looking at the dirt very closely, studies by Tom Rockwell and others, that he's been continuing this work which is published in '92, and if that thrust fault continues underneath the shoreline, it should deform these marine terraced platforms that were eroded 100,000 or 200,000 years ago, and if you don't see that deformation of those surfaces, then that thrust fault isn't very important because it's not moving very fast, if at all. So there's other studies like this that were ongoing. It would be nice for implications overall, Southern California seismic hazard, to see some of these continue, but I suspect that the continued support from SCE for these is going to be minimal, at best.

So just to sum all of that up, the IPRP for Diablo Canyon has been reviewing these seismic study plans to ensure that studies will result in increased understanding or decreased uncertainties in seismic hazard. And we've been putting reports together saying these are the

kinds of studies we'd like to see more of, or trying to direct PG&E to make the most bang for our buck, the most impacts in terms of seismic hazard.

And then we've started on an IPRG report for San Onofre, we actually never got that activated through an Interagency Agreement from PUC, but we've done one report and attended a couple of meetings and they had some detailed studies that at this point are probably not going to happen.

COMMISSIONER MCALLISTER: But what's your view of, just on the San Onofre studies, what's your view of what subset of the originally proposed studies might still be needed just because of the long term issues there for storage?

MR. WILLS: I don't know anything about the vulnerability or the design of storage facilities.

COMMISSIONER MCALLISTER: But presumably there's going to be something there for the next however long?

MR. WILLS: Presumably there's going to 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

back at the process PG&E has gone through, what would be your takeaway in terms of lessons learned?

MR. WILLS: I think -- the process they've gone through in terms of the investigation process? Or the other permitting process?

CHAIRMAN WEISENMILLER: Yeah, investigation and permitting.

MR. WILLIS: In general, I think they've been pretty good in focusing on what is important for understanding the seismic hazards of the plant. I think when AB 1632 was enacted, there wasn't a very good understanding on how much effect some of the information you would get from a high energy seismic survey, how much effect that would have on seismic hazard analysis at the plant. I don't think there was that feedback in terms of both the Energy Commission report and the original legislation didn't have that feedback from the people who did seismic hazard analysis, saying what are we going to learn from this and how much is this going to change our knowledge of seismic hazards at the plant, and so 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

surface materials is not something you would ever do for gas exploration, it's something that is applicable and is stunningly useful for fault evaluations in the near surface, and so this kind of a really detailed survey of the near surface sediments as they interact with faults is something that is new and I don't think seen before.

COMMISSIONER MCALLISTER: Thanks. And just the reason I asked, if this does have some value for emergency planning, for looking at our urban areas somehow, or understanding broader impacts of seismic activity, then there could at least be some upside to this investment, right?

MR. WILLS: All of these. And just a little bit more background, I've been very involved in the development of the UCERF, Uniform California Earthquake Rupture Forecast, a member of the working group on California Earthquake Probabilities, currently a member of the Advisory Panel for the National Seismic Hazard Maps, and all of this kind of information, anything we know about fault activity does get folded into that. And those seismic evaluations that are done for all the State of California and nationwide

underpin the Building Code. And so this information gets used for ordinary buildings and is very broadly applicable beyond these plants.

COMMISSIONER MCALLISTER: Great. Thanks for that. Thank you very much for being here. That was helpful. So let's move on to the next speaker.

DR. HARDEBECK: Thank you for having me here today to talk. I'm just going to present a fairly brief overview of the faults in the vicinity of Diablo Canyon Nuclear Power Plant, talk about what we know about these faults, how we know what we know, and particularly what are the big things that we don't know currently about the faults that are, of course, big sources of uncertainty.

So when we do Probabilistic Seismic Hazard Assessment -- and this is primarily what the USGS does when we and our partners produce products like the UCERF Map, is that we're looking at the probability of an earthquake occurring in a particular place during a particular timeframe where the probability of some level of ground shaking occurring in a particular place during some particular

timeframe. And this is also the sort of probabilistic assessment that one might do at a particular site like a power plant site.

There's a lot of ingredients that go into these types of maps and we of course need to know about the faults, and there's two basic kind of ingredients that we need that have to do with the faults, one is that we need to know the fault geometry, we need to know where they're located, how long they are, what's their strike and dip, and the rake, what direction they're moving, and we need to understand how they connect to other faults. The second thing we need to know about the faults is how fast are they moving because the faster moving fault is of course more likely to produce an earthquake than a slower moving fault, and there's a number of ways that we can get to this idea of how fast a fault is moving.

So I'm going to then focus today just on what we know both about the geometry and the slip rate of faults in the vicinity of Diablo Canyon. And this is a map, there's really four and possibly just a couple more faults that we really need to understand to understand the seismic hazard near Diablo Canyon. The most important

fault in the region is the Hosgri Fault, which is part of the San Andreas Plate Boundary System in California, and the other faults are much smaller local faults.

So I'm going to break these faults down into two systems and talk about them separately. The first system is going to be the Strike-slip fault system, and this is the Hosgri Fault and the Shoreline Fault, and these are faults that are near-vertical and the two sides of the fault move horizontally relative to each other. And so, as I said, of course, the Hosgri Fault goes off both sides of this map, it's a fairly large fault, and the Shoreline Fault is here along the coast near Diablo Canyon.

So what we know and don't know about these faults, their geometry, we actually have a pretty good handle on their geometry. It's not perfect, there are some small uncertainty in everything we know, of course, but we know the geometry of these faults actually pretty well. We know that they're both near-vertical and we know that they both move in a strike-slip sense. We've seen that they appear to join at depths, we see this primarily in earthquake locations, the

locations of small earthquakes that are occurring at depths of two to 10 kilometers in the crust, the depths at which large earthquakes also occur, so this makes us think that it's possible to at least consider whether they could rupture together.

Currently, the southern end of the Shoreline Fault is unknown and we don't know how it then connects to any other faults south of the Shoreline Fault. In terms of the slip rate, there is an estimate of the slip rate of 1-3 millimeters a year from geologic observations where the fault goes onshore near the City of San Simeon. Unfortunately, that's a ways away from the power plant and we don't know the exact slip rate of the Hosgri Fault directly offshore of this power plant, but we can expect it to be fairly similar to this range of estimates from San Simeon.

On the other hand, while we have some estimate of the Hosgri slip rate, we really don't have a very good handle on the Shoreline slip rate at all.

So just to go through some of the ways 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

referred to earlier today as having some interesting magnetic signals along the fault, there's actually a fairly sharp magnetic signal in a number of places along the fault; this strongly implies that the Shoreline Fault is a vertical fault, or very near-vertical.

We also have information from earthquakes. These are the small earthquakes that align along the Shoreline Fault, this is part of the Hosgri Fault. We can see unfortunately that this line of earthquakes kind of peters out down here just south of Point San Luis and there's no further earthquakes on the Shoreline Fault to the south of here. We do see a continuation of that magnetic anomaly implying that the Shoreline Fault does continue further to the south than what we can see with the earthquakes, but at this point it's really unclear where exactly the southern end is and how it may interact with any other faults.

Looking at the small earthquakes, we can try to use these small earthquakes to tell us something about the fault geometry at the depths where earthquakes occur, so this is from some work of my own where I've been using a published

peer reviewed objective technique to take the locations of earthquakes and try to back out where the fault plans are that these earthquakes are occurring on. And in this map here, the red plane and the red earthquakes are the Shoreline Fault, and the blue plane and the blue earthquakes are the Hosgri Fault. And we can see from this technique, again, that the Shoreline Fault is one continuous fault, it's not broken up into any segments that would be barriers to earthquake rupture, and we also see that it reaches all the way to its intersection with the Hosgri Fault. We see that it's near-vertical. We also see that the Hosgri Fault offshore of the plant is near-vertical to dipping somewhat towards the plant, but not very shallowly, near-vertical, but dipping somewhat towards the plant. And for those of you who are familiar with focal mechanism studies, I'm not going to go into the details of that today, we see a very similar thing if we look at the focal mechanisms of the earthquakes occurring along these faults.

The fact that the Shoreline Fault and the Hosgri Fault appear to connect at the depths at which earthquake occurs brings up the question

of whether or not multi-fault earthquakes could occur. So we've seen in a number of other places around the world, we've seen large strike slip earthquakes that have taken place on a number of faults that connected during the earthquake, or where the earthquake jumped between faults during the seismic rupture.

So because we've seen this in a number of places around the world, it seems reasonable to assume that at any connected fault system we should be considering that multi-fault earthquakes could occur, unless we have some evidence to the contrary.

So a hypothetical earthquake is what if an earthquake occurred along the northern part of the Hosgri Fault, north of its intersection with the Shoreline Fault and along the Shoreline Fault itself. There's been some debate about whether this sort of earthquake could occur and it basically centers on this idea. If you have an earthquake that starts up here and is rupturing south along the Hosgri Fault, when it reaches the juncture of these two faults, it has a choice, does it continue growing on the Hosgri Fault, or does it sort of take an exit and go off onto the

Shoreline Fault? And there's been some modeling studies that suggest that, in this particular configuration, this earthquake would almost certainly continue to go on the Hosgri Fault; however, the work that's been done to date, the modeling work that's been done to date that suggests this, is actually fairly simple work that includes some very simplifying assumptions about the fault structure, about the stresses acting on faults, and about how the strength of faults evolves during an earthquake. So I think this is a question that's really still sort of -- the jury is still sort of out on this question until we have some more sophisticated modeling and some more comprehensive look at whether or not this could happen.

One thing that should not be controversial, though, is what would happen if an earthquake started on the shoreline fault and was moving north. If it had the energy to continue, it really has nowhere else to go except to continue north on the Hosgri Fault, so to me this seems like a very plausible scenario that an earthquake could begin on the Shoreline Fault and continue north on the Hosgri Fault.

So when we talk about these hypothetical earthquakes, we can also put some possible magnitudes on them and some possible maximum magnitudes for earthquakes simply because the length of an earthquake scales with the magnitude of the earthquake. If an earthquake occurred just on the Shoreline Fault, defined by its seismicity, the largest possible earthquake would be a 6.7. If the Shoreline Fault extended south all the way to the coast, this would be about a 6.8. So you can see just from these estimates that the actual location of the southern end of the shoreline fault is not a hugely critical uncertainty for the estimate of seismic hazard due to this fault; however, knowing what happens to the southern part of the Shoreline Fault and whether it connects with other faults to the south may give us some idea of whether we could expect connecting multi-fault earthquakes to the south, and would also inform our idea of how all these faults in the area interact together.

Just a rupture of the Hosgri Fault would be about a magnitude 7.5, and if this hypothetical earthquake did occur on the 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

geological features that colleagues of mine discovered along the Hosgri Fault near its intersection with the Shoreline Fault, there is a basin and an uplifted area with what looks like a second strand of the Hosgri Fault, set off of the main strand, and they hypothesize that this structure really shows the movement of the Shoreline Fault since it's been in its current configuration with the Hosgri Fault, as the two sides of the Shoreline Fault move relative to each other, this block gets kind of pushed into the Hosgri Fault and eventually it cuts through this block, leaving this basin in an uplift, and so this is a direct result of the motion of the Shoreline Fault, and this is perhaps something also that, if it could be dated, could give us an idea of the slip rate of the Shoreline Fault.

So just to turn my attention, then, briefly to the rest of the faults in the area which make up a reverse fault system, a reverse fault is one where one side of the fault is moving up and over the other side of the fault, and in the Diablo Canyon area, what's happening is that this Irish Hills block is being uplifted, so it's the top block, or the hanging wall, we

call it, on these reverse faults. We're pretty sure that the Los Osos Fault is the fault that's responsible for the uplift of the Irish Hills on the northeastern side, and at this point I think we're not very sure exactly what the fault configuration on the southwestern side of the Irish Hills really looks like, but the Shoreline Fault is probably not contributing very much to the uplift of the Irish Hills, there's the San Luis Bay Fault that is not a fully understood structure, and there may be other structures, as well.

So just to summarize that, we have some idea of the geometry of the Los Osos Fault, but it's not that well constrained, and we need to know more about other structures. On the positive side about the uplift of the Irish Hills, there's actually pretty good geologic observations giving us the uplift rate of the Irish Hills, and if we just understood more about the geometry of the faults that were causing this uplift, it would be pretty easy to get slip rates for those faults.

So just to give you an idea of what this Irish Hills problem really looks like, here's

four slides from Bill Lettis' talk at the last SSHAC Source Characterization Workshop that I grabbed out, that these are four different scenarios for what a cross section through the Irish Hills near the power plant might look like, that on the northwestern side here, we have the Los Osos Fault, and we're not really sure if it's a dip, and we're not really sure if it extends all the way beneath the power plant, or whether it may be cut off by other structures, or whether its deep so stipulated that it does not quite reach being directly under the power plant.

There's also a number of different scenarios from what may be going on in the southwestern side, whether the San Luis Bay Fault is a major fault cutting through, or maybe it's just sort of a small fault connected in some way to the Shoreline Fault, it's been hypothesized that there's this San Luis Range Fault dipping directly under the power plant, and there may be situations where most of the activity is actually going on in a nearly vertical fault.

So this is a big uncertainty not just in our understanding of how this fault system around 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

help us kind of fill in how all these faults interact with each other and give us a better idea of basically how this fault system works, which in the end should give us a better handle on the seismic hazard. Thank you.

COMMISSIONER MCALLISTER: Thank you very much. That was fascinating. So I guess you started to answer the question I was going to ask, which is sort of, in order to understand the uncertainty in the secondary faults better, how much of the work could be done on the land versus in the ocean? I mean, I think that's a pretty critical point just from the get it done perspective.

DR. HARDEBECK: Yeah, I mean, I think this issue of the faults under the Irish Hills, there is an extension of the Los Osos Fault offshore, and there may be things we need to understand in the near shore near the Shoreline Fault, but I think a lot of that could be addressed through on-land studies.

COMMISSIONER MCALLISTER: Great. And then I guess just trying to get a sense of the relative uncertainties here, in your view overall, where are the biggest uncertainties,

seismic uncertainties, with respect to just what the risk is to the plant? Is the critical frontier here the secondary faults going inland? Or sort of how does those stack up relatively?

DR. HARDEBECK: So a probabilistic seismic hazard tends to up weight the importance of the biggest, fastest moving faults. So in that sense, when other people at this workshop today have shown what they refer to as the tornado diagram where you see various sources of uncertainty in the width of the uncertainty, the Hosgri Fault always kind of migrates to the top of that because it's this high slip rate fault in the region, even though its geometry and its slip rate are actually pretty well known relative to how much we know about these secondary faults. So in purely the sense of trying to drive down the uncertainty at Diablo Canyon, a better understanding of the Hosgri Fault is going to have numerically an impact. But I think there's also, when making those tornado diagrams, there's some assumptions there about, for instance, Los Osos Fault and just vary the depth without getting into kind of I think larger questions of, well, or maybe it's cut off, maybe there's

another fault under there that hasn't actually even been included in the Seismic Hazard Assessment because we don't know about it, or it's not something that's accepted by the community, so --

COMMISSIONER MCALLISTER: So that tornado actually might be fatter or sort of from an uncertainty perspective, like if you were to draw the potential air bands around those slices of it, it might actually widen, or at least the uncertainty bands would be wider?

DR. HARDEBECK: I would think so, I mean, I haven't quantitatively done this exercise, but I think if you took into account kind of the range of views of what might be under the Irish Hills, and hypothetically what could be there that we haven't seen, it could become a larger tornado. So I think even though looking at the tornado diagram, it really just looks like we need to hammer the Hosgri Fault I think is really really important, to make sure that at least we're modeling the right faults for the Irish Hills and that we have some handle that there's no things there that we're not --

COMMISSIONER MCALLISTER: Great. Thank

you very much. Now, Mr. Wills, did you want to add something to that?

MR. WILLS: Yeah. I was nodding my head at what Jeanne was saying, and that is the key thing we need to know from the on-land seismic surveys that PG&E is doing, is not just where is the Los Osos Fault and how does it extend to depth, but is there something else down there, too, and are there other models for how the hills themselves are being uplifted on various faults, are there other models that we need to consider. And so the tornado diagram shows the range of parameters being considered on the faults that are in the model and the question, of course, is are there faults that are not in the model. And this is the right kind of study that PG&E has actually done the survey and they're processing the data, and we need to see those results.

COMMISSIONER MCALLISTER: Okay, great. Thank you. So any other questions?

CHAIRMAN WEISENMILLER: Yeah, just following up. So looking at your major sources of uncertainty, how much in potential further work, how much of this work is actually in PG&E's 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

if, along with the known uncertainties, whether there are any unknown uncertainties that pop up?

COMMISSIONER MCALLISTER: Well, you all have been incredibly informative and I think, not being an expert in this field, I am a little saturated, I don't know about the audience, but I don't want to come up with questions just for the sake of coming up with questions and would probably rather just break 10 minutes early before lunch and get back, say 10 minutes of two, I think, and that would put us more in line with traditional lunch, right?

MS. KOROSEC: Right. Thank you. Thank you very much, everyone.

COMMISSIONER MCALLISTER: Thank you very much and we'll see you all in the afternoon.

(Break at 12:49 p.m.)

(Reconvene at 1:53 p.m.)

MS. KOROSEC: Our panel discussion is an Update on Fukushima and Lessons Learned, and our first panelist is David Skeen.

MR. SKEEN: Well, thank you. And good afternoon, Commissioners. I'm pleased to be here this afternoon to provide an overview of the Nuclear Regulatory Commission's efforts to learn

from the accident at Fukushima Daiichi Nuclear Plant that occurred on March 11th of 2011 following the great Tohoku earthquake and tsunami.

I have been directly involved in the NRC's response to the accident for the past two years, overseeing the regulatory actions approved by the Commission to enhance safety at the U.S. Nuclear Power Plants. Immediately following the accident, I served as one of the On-Shift Reactor Safety Team Directors in our Incident Response Center as we monitored the accident 24 hours a day for the first two months, and also provided support to the U.S. Embassy in Japan to assure the safety of U.S. citizens in Japan, as well as providing technical support when we were requested by the Government of Japan over the next nine months following the accident.

I have visited Fukushima site twice, once with Chairman Jaczko about nine months after the event, and in this past December I went with Chairman MacFarlane for a visit again. We've been keeping track of what's gone on with the site over in Japan since the accident occurred.

After the situation at the site was

stabilized, I was selected to direct the special project group that was created by the Commission to learn from the Fukushima accident, and implement the safety improvements at the U.S. plants. We've been working over the last two years to develop regulatory actions designed to improve the capability of U.S. Nuclear Power Plants to withstand natural phenomena such as large earthquakes and floods that could lead to a prolonged loss of off-site power at all the nuclear power plants. Today I hope to focus the discussion on the more significant actions we're taking to enhance safety.

Shortly after the event, the Commission stood up a task force of senior regulators, there were about six senior managers that were mostly Deputy Office Director level that had an average of 25 years of regulatory experience behind them. The Commission asked this task force to take what we had learned over the first few weeks from the event and develop a report to see if there were any recommendations they could give to the Commission to enhance safety at U.S. plants. The task force was given 90 days to develop the report, which they did, and issued the report in

July of 2011 to the Commission.

Once the Commission received the report, they asked the broader group of the staff to take a look at it and try to prioritize the recommendations that they had gotten from the report. The task force concluded in the report that there was no imminent risk from the continued operation of nuclear power plants in the United States mainly because the type of event that occurred at Fukushima was not as likely to occur in the United States and, in addition, there were mitigating measures that we'd put in place following the terrorist attacks of 9-11 in 2001 that, if could have been applied, could have prevented such an accident in Japan. However, given that the, the task force still developed several recommendations where they thought it would be worthwhile to try to enhance safety at our U.S. plants.

So subsequent to the task force report, the NRC prioritized the recommendations into three tiers. We developed this proposal and sent it to the Commission and they approved our recommendations to go forward in a phased approach, and so of course Tier 1 were those

things that we thought as a staff we could start on right away and go forward to try to implement those at the plants. The Tier 2 items that we developed were things that either couldn't be initiated right away until some of the Tier 1 activities were completed because they would inform the Tier 2 activities, or because it took several of the same resources that we would need to do the Tier 1 activities, and we thought that the Tier 1 activities should go first.

The third tier, or the Tier 3 items, and these are items that are going to take longer term research, it's going to take again maybe some results from the Tier 1 or Tier 2 activities before we can really decide what to do, and so we put it in a logical order that we thought was worthwhile. And the Commission agreed with that. So I'll spend the bulk of my time here to talk about the Tier 1 activities since those are the ones that are being implemented at the plants today.

So this slide shows a summary of the Tier 1 activities, and they fall into basically three categories, the first category is Regulatory Orders that we issued back in March of

2012. The Orders that we issued are requirements that the NRC issues to our Licensees, and each Licensee is required to comply with the orders. The second category is a Request for Information. The requests that we send out are questions that we ask the Licensees to answer so that we can determine whether we need to modify the nuclear plant license for a given site.

The third category that we're working on are rulemakings, and our rulemaking effort is the process that we use to revise our current regulations, or to issue new regulations when necessary, and so I'll describe each of these items that you see on this slide in more detail in the next few slides.

So the first order is the mitigating strategies order to try to cope with external events. Early on in the event, one of the biggest contributors, we thought, to the accident was the loss of power, the fact that they lost all of their off-site power, as well as all of their onsite emergency power, contributed greatly to the fact that it led to the site deteriorating rather quickly. We wanted to be sure that we could enhance the capability of the U.S. plants

to cope with the loss of electrical power, to try to prevent the core damage during a severe natural event.

So the first order that I'm talking about here, we required a three-phase approach to maintain or restore core cooling and to try to preserve containment and the spent fuel cooling at the nuclear power plants. So instead of giving a rigid time of how long each of these phases must last, it's a performance-based approach that each Licensee, for their condition, has to tell us how their plant works, what is the timeframes that these phases will be. So in the initial phase, we expect the licensees to be able to survive on installed equipment, equipment that is already in the site, and in some period of time, typically six to eight hours, but each Licensee would have to tell us what that time is going to be for their site.

Once they get to the transition phase, this is the portable equipment sometimes referred to as the flex approach that you may have heard about that the industry has talked about several times, which allows the use of portable equipment that you have onsite and you can bring to bear

quickly to install, to make up for the loss of offsite power, and that's additional generators, or pumps, or hoses that you can hook up so that you have temporary ways to restore core cooling, or preserve the containment. In the final phase, we allow for offsite support, this is the Calvary coming over the hill, this is bringing more pieces of equipment, larger pieces of equipment to bear, more people to the site, and the way that the industry has designed this, there's going to be two regional support centers throughout the country, one will be based in Memphis, Tennessee, and one in Phoenix, Arizona. Each of these sites can provide equipment to any site in the country within 24 hours, that's the design, that's how it's supposed to work. We're still working through that to see how that's going to happen, but that is the purpose. And so once the offsite support comes, then they're supposed to be able to last indefinitely, for as long as it takes to get power back, if that's weeks or months, then so be it.

The next order of issues was to beef up our containment vending systems. For plants that are similar to those of Fukushima, and these are

the GE boiling water reactors that we have in this country, and specifies to the Mark-I and Mark II containment designs, these are some of the smaller containment designs that we have, and so we thought that it was important that we ensure that they could vent.

One of the problems we had at Fukushima as we watched that event was they could not vent their containments, and when they did finally vent them, we think that actually contributed to the vent once they did vent. So we want to make sure that our BWRs in our country are prepared for that.

COMMISSIONER MCALLISTER: How many of those are there in the --

MR. SKEEN: I think there's a total of 31 between the Mark-I and Mark II plants in this country, which is about a third of the fleet. You do notice that none of this is applicable to the California plants because both of the plants were PWR designs. So, again, we want to make sure that you can vent to try to control containment pressure by removing the heat from the containment, and it may also prevent the core damage if you can keep the hydrogen and the heat

from the containment. And also it's required to work after a loss of power.

One of the problems they had was trying to open some of these vents at the Fukushima vent and we heard stories that they sent operators into the torus room, which is around the bottom of the reactor building, and one worker that they sent in was trying to open the valve that switches on top of the torus and his boot was melting to the top of the torus at the time, so that was not effective. And then in another case, they tried to send a team of operators around to the other side where the vent valve was, but the radiation was too high, and their dosimeters stopped them about half way around, and it's about 180 degrees from where the equipment hatch was that they went into, and so they had to turn back, they couldn't get to the vent valve to open it. So, again, we want to make sure in this country that we're able to operate the valves and so the licensees are implementing it now at the Mark-I and Mark II containment.

The next one is spent fuel instrumentation. During the first few days of

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

times so that if there is an accident occurring, I'm not wasting time diverting resources or effort to try to fill a pool that doesn't need to be filled. So as a result --

COMMISSIONER MCALLISTER: Some of the pools did need to be filled, though, right? Or was that just the acting story at the time?

MR. SKEEN: No, let me clarify. There is boil-off, right?

COMMISSIONER MCALLISTER: Yeah.

MR. SKEEN: But most spent fuel pool events are slow moving events unless you make such a big leak in the pool that you lose inventory and then you uncover the fuel. Usually there's several hours before a spent fuel pool would boil off to the point that it would start uncovering the fuel. And so we did see some of that. You saw some steaming coming out of the units and that kind of thing. And so, yes, there was a need to actually put some water in there and they were doing that with -- they called them giraffes at the time, it's the large kind of like fire equipment that goes up high and that they can put the water down over the top. I think you probably saw some video of a plane trying to drop

water over the Unit 4 spent fuel pool at one time. So, yes, there was a need to do it, but it probably wasn't such a need that maybe we diverted resources from working on more significant issues at the time, trying to worry about putting water in there.

So, again, the thinking behind the order here in the United States is we want our Licensees to know all the time what the level of the pool is, even if you have a station blackout, have some kind of instrumentation that will tell you the pool level so you know if it's a problem that you have to deal with, or it's a lesser problem that I can put resources on something else and I don't have to worry about the fuel pool at the time. So that was the thought behind that.

So lets' talk about the Requests for Information for just a minute. So to ensure that the plants were adequately protected from seismic and flooding events, we asked all of the licensees to perform inspections, which we call "walk downs," at each of their sites and report the results back to us. And as you heard Dr. Munson talk about this morning, this was against

your current design basis and it was just to go out and see -- the thinking was do these walk downs quickly to see if there's anything that you can identify, maybe some conduit seals missing if it's a flooding issue, maybe there's some bolts missing, or maybe there's some seismic restraints that aren't in place, those kind of things, just to give us some confidence because we knew these longer term evaluations were going to take time, so we wanted to be sure that at least you're ready for your design bases type of events.

So Licensees did that, they gave us their reports back in the fall of this year, we've been reviewing those reports. In addition, we had our inspectors, our own resident inspectors perform some of the walk downs themselves, and they've written inspection reports and we're getting those in, as well, at all the sites. And we're actually performing some audits this summer. I think we're performing eight flooding audits and I believe it's six seismic audits, just to go out and see how did the licensees do with performing the walk downs, did they follow the guidance that we worked together to try to explain how to do it.

So those are ongoing now and we expect all those to be done by the end of this summer. I think the last one happens in August, so over the next few months we should get the results back from that.

So that was the first Request for Information. The second was and, again, Dr. Munson touched on this briefly, to use more up to date information. We've learned a lot about plate tectonics in the 30 or 40 years since the plants were designed, so to take some of this information that we've learned and that we're using a new reactor licensing, and apply that to the existing plants. So, again, as Dr. Munson said, these take time. Seismic PRAs are not something that you do overnight, it's resource intensive and the computer modeling that you have to do takes some time to build those models and do that actual analysis. So we knew that was going to take some time, but still we requested Licensees to go off and do that, give us the results, and that will help us determine is there something we need to do on a generic basis, or on a plant specific case-by-case basis, to have licensees enhance their protection against

seismic or flooding issues. So, again, that's ongoing now and all the Licensees are working to do that.

So finally, the third Request that we sent out, the last piece that we learned from Fukushima was some of the operators, once they lost all the power, they also lost all their communications. They were having to send auxiliary operators from the control room out to the field to try to do something, and they couldn't report back immediately, or they had to run back to the control room and try to tell the control room, "I can't do this," or "here's what's happening," and so, again, we wanted to make sure if this situation occurs here you have good communications between the control room and folks that can go out into the field to actually perform some of the functions that they need to perform during an emergency.

The other thing that we learned from Fukushima was the staffing. We never thought before that you could have multiple reactors at a site, get in trouble at the same time. We always considered a severe accident happened to one reactor at a site, but not the others. And you

actually counted on some of the other reactors to help the one that's in distress. Fukushima changed our mind on that. So, again, we asked Licensees to go out and say, "Suppose you have an event that affects multiple units, do you have appropriate staffing that could address an event like that?" And usually it's the thing that's going to happen at 2:00 on a Saturday morning when you're at minimum shift, right?

COMMISSIONER MCALLISTER: So a question -- I just rather than write them down, I like to sort of hit them when we're talking about it --

MR. SKEEN: Sure, that's fine.

COMMISSIONER MCALLISTER: So it's hard, you know, safety has to be our first concern, we know that, it really is, and I think that's the appropriate priority and it should be well above the other priorities.

MR. SKEEN: Yes, sir.

COMMISSIONER MCALLISTER: But at the same time, you know, we have to work through the whole system and look at the rates over at the PUC, and look at sort of the workability of the whole system and, you know, as we layer on back-up systems, requirements, and all the necessary

facilitation of making safety first, to making sure that when things happen we can deal with them effectively, does the NRC actually look at -- certainly the individual PUCs that are regulating the Purchase Agreements and the operators and everything, sort of the market context in any given plant's case, are going to be looking at this at that plant's level; but I guess I'm wondering if there's any sort of meta-consideration of how a lot of these additional needs that we're learning about and trying to put into place actually affect the overall viability of keeping some of these plants going, and sort of future plants that are going to have to be built with these lessons in mind. And it would be good to sort of -- I'd like to kind of lift the discussion a little bit to that level to sort of at least get it on the radar screen a little bit.

MR. SKEEN: Yeah, it's a great question. Let me give you some high level thoughts on that. Certainly, things that the NRC feels is needed for adequate protection of public health and safety, we don't consider cost there, we say if it's an adequate protection issue, that we think

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

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

Three Mile Island when we had that event, that we had a 10-year plan of things to do, and a lot of things we never did, and it was because a lot of issues got brought in that probably were not germane to the Three Mile Island accident itself, and probably could have been done in some of our other normal generic processes, it could have been worked through. So it was very important to the Commission that we try to stay focused, and that's why they split my group off and say "you guys focus on just Fukushima issues" and move forward that way. So I hope that gives you a little bit of flavor that we are thinking --

COMMISSIONER MCALLISTER: Yeah, thanks. I appreciate that.

MR. SKEEN: All right, so let's move on. So our rulemaking activities. We undertook three rulemakings that the Commission wanted us to do, the first was we started out with a station blackout rule and we have a station blackout rule in place now that we put in place in the '80s. That rule was meant to cope with a grid centered event. If you lost the grid for some period of time, could you cope with that event and be okay? It turns out we need to go much further than

that. We assume probably about an eight-hour event is what you had to work with, with the loss of grid in most cases. So we started out with a rulemaking that was just going to update that and say, no, you have to be able to last for a prolonged period of time, and maybe not necessarily a grid centered event. As we were working through that and trying to develop the basis for that rulemaking, we thought more and more about where we came out with the order, the Mitigation Strategies Order that says you have to include this portable equipment, you should be able to do all these different things.

So it turns out it became more of not just updating our original station blackout rule, but incorporating this Mitigating Strategies piece that we've issued in this order. So it's going to kind of combine what we want to do with a prolonged loss of offsite power and also make the requirements from the order that we're putting in place for being able to handle external events into one rulemaking. So we're kind of combining that. And, of course, the final rule on that is due by 2016. I think the Proposed Rule comes out either late this year or

early next year, and then our rulemaking process does take three to four years, that's because we have so much public engagement on a rulemaking. We want to make sure we hear everybody's views before we put that in stone and put it in our regulations. So that's normal. We do a proposed rule, that goes to the Commission, they have to approve that proposed rule, then it goes out, we get public comment on that, we take those public comments and feed them in, and then give the Commission a final rule, and then they vote on that and it becomes the law of the land for us. So, again, that's the first rule that we work on.

The second rule that came about and, again, this was something that we weren't sure of as we watched the Japanese event unfold, how well our emergency procedures would really work under extreme events. We thought the licensees do a pretty good job with the emergency operating procedures that we have in place, and those are required, but once we got beyond that into more after you've had core damage, and we get into what we call Severe Accident Management Guidelines, or even beyond that after 9-11, we talk about the Extensive Damage Management

Guidelines, we weren't sure how those all fit together and there was really no requirements on those as far as regulations. So the Commission determined that we should pursue that and, to make sure that there's smooth transition between the three phases as I go from my emergency procedures into SAMGs into EDMGs, and so that that was a smooth transition and that the Licensees could perform those. So we're working on that rulemaking, as well and, again, that is due to be final by the end of 2016.

The third rule that I want to talk about is now called the Filtering and Confinement Strategies Rulemaking, and when we issued the original order for the vents at the BWR Mark-Is and IIs, that was must to make sure that the vents were reliable and would work before core damage occurred. And as we thought about it, the Commission directed us to think about, well, what if you have had core damage, and now you have radiation and high temperatures and other things in these areas? And so we went back, we've revised the order that was just issued here a few weeks ago, to say not only do you have to have these reliable vents that you can operate, but

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

to go off and work on a rulemaking that would give those options, and so we're just starting down that path. We owe the Commission a regulatory basis, it takes us about a year to develop a regulatory basis so, again, we have to do some technical work, we have public meetings, we talk with stakeholders to understand what are the ramifications, and then we'll develop the proposed rule, and then we'll do the final rule. And because of that, that rule is going to take us out to 2017 before that one is done, so that's our rulemaking activities.

So just a quick -- this is just a good little chart to show you what our thinking process was as we developed this. What we did was take the accident at Fukushima, we had the recommendations from the task force, they thought about this, in addition we got a lot of help from other people. There were several international studies down not only in Japan, but from IEA, Europe did their own study of lessons learned from Fukushima, Congress had some good thoughts for us in our appropriations language, our own advisory committee on reactor safeguards had some thoughts on what they thought might be

recommendations we should look at --

COMMISSIONER MCALLISTER: Quick question. Did that review also include sort of the regulatory structure issues, you know, in Fukushima's case, I think in retrospect, the sort of right checks and balances, I think, weren't in place, and there's been a lot of sort of scrutiny on that and we have clearly a different system here, so I think -- I guess my question is, do we know what issues is our system already adequately equipped from a regulatory perspective to mitigate, or to get a good result on, to have adequate oversight? And are there any that sort of slip administratively or process-wise, or sort of a regulatory structure wise slip through the cracks, potentially?

MR. SKEEN: Yeah, that's a good question. I would say we haven't found any from the studies that we've looked at. And you're exactly right, each country does regulation a little bit differently, right? We're different from the European countries, different from the Russians or the Chinese or the Indians, for the Koreans, the Japanese, but you have to take those cultural and regulatory differences into account

when you look at the way that the accident unfolded and what happened in Japan. And so we think we've applied the right criteria to that. We haven't seen any gaps in the way we do our regulation at this point, that's not to mean that we won't find something, but we haven't seen -- in any of the reports that we've seen, there wasn't anything that we felt, "Oh, that's really a hole in our regulatory structure that we need to fix." So at this point, I would say we haven't identified that.

COMMISSIONER MCALLISTER: Thank you.

MR. SKEEN: So again, we looked at that, we took all the near term task force recommendations, as well as these other recommendations we got from a lot of folks, that resulted in the orders and the Requests for Information and rulemaking that we did, and now it's turning to the implementation piece by the Licensees. So, again, we will use our inspection procedures, our normal way of doing business when we have licensees make modifications to their plants, and verify that they do it the way that we want them to do it.

I think we have a good plan in place, it

will take a while to get all the implementation by all these different actions that were taken, but again, we'll follow it up with inspection and verify that whatever it is we've asked them to do gets done.

So probably of most interest to this group is the California plans, themselves. Certainly at Diablo Canyon, I think you heard Dr. Munson talk about this morning that the seismic and flooding reevaluations are due by March of 2015. I think also Diablo Canyon themselves were talking about that this morning.

The NRC orders for the spent fuel pool implementation and the strategies to mitigate the prolonged loss of offsite power, those are also to be fully implemented at Unit 1 at Diablo Canyon by the fall of 2015 and in Unit 2 by the spring of 2016, and that mainly goes with the refuel outages that they have. We tied them to the refuel outages because, in most cases you have to come in the first outage and do your measurements, figure out what it is you're going to do, go off and fabricate things, and put them in in the next outage in most cases. So that's why that worked out that way.

And in San Onofre, I used to have a schedule here for San Onofre, but after the last few weeks, I replaced it with this sentence that certainly that's an open question now. We know how to do these things, we've done it in the past, we know how to decommission sites. We have a few other units right now, the Crystal River Unit and the Kiwanis Unit are both shutting down, I would say, prematurely before their licenses are done. And it's a little bit trickier just in the fact that usually when our plant is going to decommission, they send us a decommissioning plan five years before they're going to decommission, but we can work through those. I mean, so I heard this morning you guys had a lot of questions, and that's the kind of questions that would be figured out in that five-year before any decommissioning plan, but because we don't have that opportunity we'll deal with it on a quicker scale, we won't take the five years to go through this.

But again, we'll meet with the licensee in a public way and we'll figure out exactly what we need to do with San Onofre. So with that, I 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.

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

So although the system structures and

related components performed very well during the Fukushima Daiichi event, one of the important lessons learned was that the plants are vulnerable to the natural phenomena such as flooding and, in turn, other plants can be significantly vulnerable to tornadoes, hurricanes, and so forth.

We also found that there's a great potential that both units can be affected. As Mr. Skeen had noted earlier, that the previous paradigm was that you would assume that only one unit was involved in any event, and that today we're looking at the fact that you had to consider multiple units involved at the same time.

Also it was important to understand that we needed to maintain fuel cooling during a loss of power or station blackout event, not only in the spent fuel pools, but also for fuel that was still in the reactor core. Also, the importance of being able to monitor spent fuel pool conditions in that level and spent fuel pools really is an important aspect in that you don't want to have the limited resources that may be on shift at Saturday at midnight focused on trying

to split their time between responding to events within the power block itself, and also dealing with questions of spent fuel pools.

And also, lastly, with the need to have very robust emergency response capabilities in that we need to be able to have the strategies in place ahead of time, we need to have had appropriate evaluations of staffing and understand what staffing minimums are required at all points in time and operation, and then what members of staff are responsible for providing what functions during an event. And then communication capabilities, that it was very critical that you have the ability to be able to effectively communicate not only externally, but to be able to communicate within the plant itself, to be able to dispatch crews and be able to validate the conditions of specific portions of equipment.

So for PG&E, one of the first steps that we did was that we established a dedicated team and assigned director-level oversight to be able to support first the evaluations of the orders and recommendations for the Nuclear Regulatory Commission, and then from there to be able to

form a team of critical individuals to be able to implement the actions required by those orders.

Our response is substantially different than many of the other plants that we benchmark in that we have a dedicated team of approximately 16 people with three of the individuals being past senior reactor operators, so provides a team that's not distracted by day to day operation of the plant and can focus our attentions on being able to appropriately address the orders and recommendations.

We also have a strategic partnership with a number of other utilities that we call the STARS Plants. With that, then, we're able to benchmark each other, we're able to also be able to share specific information, we're also able to leverage then the economy of being able to buy more as a fleet to whereby specifying similar equipment, we're able to be able to use that leverage to be able to get better deals with the various vendors. We've also partnered with Westinghouse as part of this STARS organization whereby they're performing a lot of the detailed analysis for what you'll see as flex equipment in a few slides, to be able to then make sure that

there's consistent approaches between the various plants, and it also helps then when it comes time to be able to respond to the Nuclear Regulatory Commission with updates on where we are within the performance of the requirements in these orders. By having the industry be able to develop templates that can describe effectively in concise terms makes it easier for the Regulatory Commission to perform detailed effective reviews.

We've also teamed with a number of external consulting firms that have expertise in specific areas such as seismic hazard evaluations, tsunami evaluations, and they're listed there as just a few of the organizations.

So I'm not going to walk through each one of these. These are the orders and recommendations that were addressed just in the prior presentation; but what I am going to do is step through each one of these and give you a little bit of information as to where we are in the process.

So flooding evaluations. As some of the key components of us performing a flooding evaluation is that we have to be able to re-do

our maximum precipitation evaluations that were originally developed as part of the licensing of the plant. We're just about finished with that form of evaluation, and have found that with our plant being termed more of a dry plant that we're within the bounds of what is assumed in the original evaluations during initial licensing.

For the Tsunami evaluations, as a utility we actually as part of our long term seismic program started reevaluating our tsunami hazard back in the 2005-2006 timeframe, so what we've done as part of the efforts with these new orders is that we've taken that information that was generated in 2005-2006 and used that as a starting point to re-characterize our tsunami hazard. We've contracted with two different organizations to remodel the tsunami hazard, in turn to evaluate the types of data that are available to make sure that we've characterized each of the types of surface landslides that can take place within the ocean on the Continental Shelf and other areas to make sure that we do have bounding assumptions for our tsunami. From there, we'll use the new modeling to be able to validate the tsunami hazards within the confines

of what our license currently requires. This work, as noted earlier, is required to be completed by March of 2015, and we're well along in that process and should be complete ahead of time.

Flooding walkdowns. The guidance required that we do a detailed assessment of the potential impact on flooding to the plant from external events. What we did was we developed a set of procedures and guidelines for how to effectively put together documentation packages first, and what material that you need -- do you need to be able to assess the various aspects of the plant? So with that, that was calculations, design drawings, other details that were appropriate for being able to assess the plant. We trained teams, we then put the teams out in the field with walkdown packages. The Nuclear Regulatory Commission Site Residence Inspector joined us in a number of these walkdowns, and we did detailed assessments of each of the specific areas that have a tendency to be impacted by flooding.

The types of issues that we found were really in the lines of some corrosion on various

components that were exposed to saltwater environment and two drains that were plugged. Outside of that, we were in very good shape and had no substantial issues that were reported to the Nuclear Regulatory Commission.

Seismic Evaluations. We've spoken a lot today about the SSHAC process, so you have a good oversight as to what's involved with that. So our schedule is that we are to complete that re-characterization of our seismic source and ground motions by March of 2015. I don't know if it was clearly noted earlier that, even though this was a requirement of these orders and recommendations, that PG&E had started the process substantially before that, and that was part of our long term seismic program. The actions to date are that we've made good progress and that we will be able to complete the re-characterization of our seismic ground motion in accordance with the due date of March 2015.

Seismic walkdowns. In this morning's presentation, you were told that each of the plants were required to select at least 100 of the critical components within the plant to walkdown. With us, our package included over 250

of our critical components. And it ends up being a lot more involved than just simply saying evaluate 250 safe-related components, in that we would develop a package that looked at a specific area and look at what we call two-over-one constraints to where if you have other pieces of non safe-related equipment that could potentially impact the safe-related component, then you have to expand that search and look at all of those components too. So what we did is we ended up breaking up the plant into specific areas and then looked at all components within those specific areas. And that involved pulling design change packages that were issued in the past for those areas, all the design drawings, design calculations, and had detailed packages that we were able to provide each of the walkdown teams. It's the first time ever in the plant that we actually took iPads and configured them with all the data in hand with checklists and so forth, so that the walkdown teams --

COMMISSIONER MCALLISTER: You didn't do that back in the '80s?

MR. STRICKLAND: Yeah, wish we could have.

COMMISSIONER MCALLISTER: I guess I had one question on that. So you get a handle on the components and then, you know, this is a complex system we've got, so then when you integrate those, that can play sort of from a reliability perspective in all sorts of different directions, and I guess what's the next step there to kind of appreciate the system impacts of the sum total of all those individual issues?

MR. STRICKLAND: That's a good point. So with that, it was critical to be able to review each one of these safe-related components as an individual component, initially, and then how it impacts and overall system if you find a specific issue. With our walkdowns, outside of finding a number of areas of corrosion that needed to be addressed and so forth, the one item that we found that was unexpected was that we had one of our electrical cabinets that didn't have all the anchorage in place that our design drawings required, and so with that that meant that the next steps were to be able to re-analyze the cabinet for the anchorage that was there, and be able to validate that and continue to maintain its operability in that configuration, and in

turn it then gave us the time to be able to go in and add the missing anchor bolt that was supposed to be part of the system.

So our walkdowns for the bulk of the plant were completed as required by the timeline by the Nuclear Regulatory Commission with the report issued on November 21st of last year. There were specific areas that we weren't able to address that you can only access during refueling outages, so in our refueling outage that we completed in the February-March timeframe, we completed the inspections in those areas and found no additional issues and, in turn, will complete the last phase with our next refueling outage.

This one ends up being a little more interesting, our Flex Program Requirements. As part of the response, we need to be able to provide a diverse and flexible means to prevent fuel damage while maintaining containment function for a beyond design base external event. So with this, what we're looking at is a loss of AC power and then a loss of being able to provide water to our ultimate heat sink, so that means you lose your aux saltwater systems and draft

water from the ocean and so forth to cool the units. So under this scenario, then we had to provide a flexible means to be able to repower electrical components that are critical and also to be able to provide coolant power to the plant. And so the initial response with this is that we would have extra portable equipment in a configuration that the NRC requires as the N+1, which means you've got two units, you have three sets of equipment, then in turn I can then store at various locations around the plant so that, if under a beyond design base event I lose one set of equipment, I still have two sets of equipment to be able to help with the plant. Part of the design of this process is to develop not only primary connection points for this portable equipment, but to have secondary connection points in case there's been damage in the plant for these beyond design base events, that would preclude me from using my primary connections.

Also as part of the program, we're developing training programs, maintenance programs, and appropriate staffing to be able to make sure that this equipment really is available 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

package that it can be brought in by helicopter. So what that means is that they have to be able to design it to be able to function in parallel instead of just one large generation unit, and so they have to be able to strain a series of smaller units to get --

COMMISSIONER MCALLISTER: So you could have a busbar with a bunch of plugs on it, basically, or something like that.

MR. STRICKLAND: In simple terms.

COMMISSIONER MCALLISTER: Yeah, okay.

MR. STRICKLAND: Yes.

COMMISSIONER MCALLISTER: I'm being reductionist, but you know, you get the idea. Thank you.

MR. STRICKLAND: Sure. So again, coping strategies, well, we're going to be able to maintain core cooling and heat removal, we'll maintain our containment integrity, we'll maintain reactor coolant system inventory control and maintain reactivity control, and then maintain spent fuel pool cooling. And we've got a number of scenarios to be able to maintain cooling of spent fuel pools.

The Electrical Support Strategies, we've

got a number of 120 volt vital DC buses for instrumentation and we have the ability to be able to define what loads are not required during a beyond design base event, and so the first step would be to strip those non-vital loads off our batteries, and being able to use that type scenario, we can survive for 24 hours without having to have external power provided to the plant, so I guess that's adequate time to be able to bring our emergency response organization into full staffing and in turn to be able to then move emergency equipment into place. We're also looking at being able to locally repower instrumentation using smaller portable diesel generators that we've already procured and have onsite, controlling lighting for control room and other vital areas, and then controlling ventilation, or reestablishing ventilation for battery rooms and control rooms.

Spent Fuel Pool Instrumentation. We've already entered into a contractual arrangement with Westinghouse. They've got a system that they call a Guided Wave, and in turn they're going through the design process for our site specific application. They're using that same

design at many other plants, so we're not going to be different than most facilities. The plans right now are that we will complete the design details this year and early next year with plans to have the system installed in 2014 and 2015.

For our emergency planning for communications and staffing, what we've done as a first step was that we looked at the ability to be able to communicate externally and internally, and found that under a stranded plant event-type scenario that we did have some areas that we could improve. With that, then, we've procured three communication trailers that are configured to be able to communicate with the rest of PG&E's service territory and also then communicate elsewhere using satellite type systems. We've also purchased a series of satellite phones that we call footballs, small cases that we're able to have stationed at various points in the plant and it enables operators in the control room to be able to take the transponder for the satellite phone and be able to run it out of the control room and set it outside and to be able to then have direct communication. We also have a number of other hand-held radio systems that we're

putting into place as additional backup to be able to give the operation's crews the ability to communicate within the plant.

For the staffing, we've been utilizing our simulator onsite to be able to run various scenarios that look at what happens if we have a beyond design based event. And with that, we're able to validate that we have appropriate staffing at 12:00 on Saturday morning that, you know, when you don't have the ability to be able to pull people in immediately, and so with that we've recently sent a report back to the Nuclear Regulatory Commission noting the types of staff that we have and validating that, yes, we do have the right resources in place. With that, too, then we'll be continuing to update our procedures and our policies internally to be able to potentially add additional staffing as minimums on shift to be able to add additional defensive depth for ourselves.

I was asked to give you some insight on cost, and so with this slide it just simply provides a high level overview that, if you look at it for Tier 1 projects, which are the only projects that we have in play at this point in

time, we're looking at a cost of approximately $47.1 million for capital improvements. In addition, for the expense-type projects that fall under studies for both seismic and tsunami and some of our other emergency planning staffing, we're projected to spend approximately $17.1 million. This is really in line with what we're seeing other plants spend at this point in that publication was just issued I think last week, that noted that the typical power plant will spend between $30 million and $40 million per unit, so we're right in line with that.

Then the Tier 2 and Tier 3, those are projections going forward and we had to put values within our rate case submittal to be able to recognize a potential for modifications to plant vents, or other actions coming out of the Tier 2 and Tier 3, and those are simply placeholders at this point in time with no specific plans to expend that money.

So in summary, the last points I want to make with this is that nuclear safety continues to be the top priority for Diablo Canyon, that above and beyond all aspects that safety will be number one, that cost, just not the constraint,

that we are committed to continue to learn from the Fukushima Daiichi event, and that in turn we take the issues there very seriously and we believe that we've been on the forefront of the utilities for being able to implement change, that we've established a dedicated team to implement our regulatory requirements, and the team is working very effectively. The partnership with STARS and Westinghouse has been effective, and that we're committed to complete the plant assessments, equipment procurement, and plant improvements within the timelines required by the Nuclear Regulatory Commission.

So with that, I can entertain your questions.

CHAIRMAN WEISENMILLER: I've got a couple. I mean, one of the things which we noticed in 205 was obviously in terms of spent fuel pools are fairly densely packed.

MR. STRICKLAND: Yes.

CHAIRMAN WEISENMILLER: And at that point we had some concerns and were certainly encouraging people to unpack them, particularly now with the interim fuel storage. So we don't 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

facility, so the design documents have been completed, we're currently out to bid, and the intent is that next spring, spring of 2014, that we'll add the additional five foundations that will add capability of about another 100 storage locations for the facility. And at that point, that will enable us to be able to reevaluate our current schedules and programs for continuing to move fuel from wet storage to dry storage.

CHAIRMAN WEISENMILLER: Okay, next question. Obviously we've talked a lot about this sort of implications of the Japanese accident. One of the other changes that is affecting all of us at this stage is foreign governments trying to -- basically the cyber security stuff. Foreign governments have certainly penetrated any number of our institutions, you know, fairly sophisticated entities, and at least my impression is that one of the things they're looking at is our infrastructure and, you know, particularly a nuclear infrastructure, so trying to understand where the NRC is on that, or PG&E is, in trying to deal with the cyber security threats.

MR. STRICKLAND: It's a very important

topic and that we have a very dedicated team now that deals with nothing but cyber security, and it's -- actually, it's two teams -- we have a team that is in the corporate office that looks at the overall infrastructure for PG&E, and then a team at Diablo that then interfaces with the corporate team. What we're looking at is that there's a number of different types of components within the plant, and I won't get into specifics, but components within the plant that would have the potential to be impacted by somebody with a memory stick, a jump drive, or some other device. And so we've gone through an exhaustive process of identifying components that may be at risk, and in turn implement a program to be able to then provide additional safety features and safeguards. And it's a first step in the process. This will continue to be an ongoing evolution as we continue to see different potential options that people that want to attempt to access plant systems and components, that we need to be able to be in a place to understand those new threats and be able to address them.

COMMISSIONER MCALLISTER: Okay, thank

you very much. Let's move on to our next speaker, Commissioner Geesman, welcome.

MR. GEESMAN: Good afternoon, Commissioners. I think I was invited here probably more because of the period I spent between my two assignments at the Energy Commission. As you know, I was the Executive Director from '79 to '83. Before I came back as a member of the Commission in 2002, I spent 19 years in the Bond markets as an Investment Banker, and I think the perspective that you were looking for from me today was focused on the business environment for these plants, in addition to my current role, where for the last year and a half my firm has provided legal representation to the Alliance for Nuclear Responsibility before State agencies.

Full disclosure: when I left the Commission in '83, I worked originally for a firm called FirstBoston which later became Credit Suisse; they put out a very important report in the securities markets the beginning of this year, pointing to the economic dilemma some of these aging nuclear plants face in today's electricity markets. And to sum that up, it's

what you read about in terms of the very low price for natural gas and the radically changed assumptions in the United States for the long term persistence of that low price of natural gas.

According to Credit Suisse, they're looking at sustained cost inflation in the nuclear plants of three to five percent a year, and that creates negative cash margins for most operating plants during off-peak periods. And in Credit Suisse's definition, off-peak was 50 percent of all dispatch hours.

UBS came out with a similar report, also beginning of the year, a little more precisely focused on merchant plants, and here I think you get a pretty quick appreciation of the context which Ted Craver faced at San Onofre. UBS's problem with merchant plants was focused on competitive market prices between $31 and $55 a megawatt hour. Well, even if SONGS 2 and 3 had operated at 90 percent capacity in 2012, they would have produced electricity at $57 a megawatt hour. That's because of the need for a regulated plant to fully account for its authorized revenue requirement. And as a consequence, you step down

from that both units operating at 90 percent capacity to Unit 2 successfully operating alone at 90 percent capacity, and you end up with a cost of $114 per megawatt hour. Now, we all know Unit 2 wasn't able to operate during 2012 after January 31st, but the repair plant for coming back at a 70 percent output level, assuming a 90 percent capacity factor during that period of trial operation, you had $163.00 per megawatt hour. So from a commercial operations standpoint, this repair strategy never really had much of a future, especially if you're trying to amortize all of your repair replacement costs during the nine years left on the San Onofre license.

COMMISSIONER MCALLISTER: Just real quickly, so those numbers would include in the amortization sort of built into whatever power production would have been produced?

MR. GEESMAN: No, those --

COMMISSIONER MCALLISTER: Oh, so those would be in addition?

MR. GEESMAN: Purely a revenue requirement, no projection for cost inflation. Now, importantly, 2012 gas prices -- 2013 gas

prices have come up as much as by 100 percent in some markets. As you see in this slide, that's not fully reflected in the competitive price of power. According to EIA, on a weighted average basis, that means in those hours where the trades were the greatest, the SP15 cost of 35 bucks a megawatt hour in 2012, remember, that's compared to a perfect San Onofre at 57 bucks; in 2013 through the end of last month, you see prices have come up, but they haven't doubled, natural gas prices have doubled between 2012 and 2013, electricity prices in either market region of California have not come up quite as much. Based on plats, if you look at 2012, assuming both units operating at 90 percent capacity factor, in SP 15 there were only six 16-hour blocks when those trades would have cleared the market. Say what you will about Ted Craver, he's got very sound business judgment.

Now, this is focused principally on merchant plants, and there is, of course, the notion that, well, the regulated plants, they don't really face that competitive pressure. I can tell you from the perspective of the guys 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

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

Fault.

This is from the NRC's reaction to PG&E's Shoreline Fault Study, PG&E's final study had been published in January 2011; of course, between January and August the Fukushima catastrophe happened, but the NRC staff in August of 2011, quite critical of PG&E's approach and, in fact, was prepared to write them up for a fairly significant license violation, went on to indicate that the so-called Double Design Earthquake, the more limiting largely because of its conservative damping assumptions and its conservative assumptions about soil structure interaction, the Double Design Earthquake, even though it's associated with an earthquake of smaller magnitude than the Hosgri, a Double Design Earthquake is actually a more demanding set of licensing requirements.

And the NRC staff in August of 2011 quite insistent that simply comparing Shoreline Fault information to that developed in the LTSP was not going to be sufficient to meet the license requirement. How did PG&E respond? This is a series of internal emails that my client has gotten through discovery at the PUC, and the

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

insurmountable difficulty was the conservative damping assumptions and soil structure interaction assumptions associated with that test. The Diablo Canyon license carries three separate design basis earthquake tests, 1) the Design Earthquake, 2) the Double Design Earthquake, and 3) the Hosgri Earthquake, they all have different damping assumptions. But from a compliance standpoint, the Licensee is supposed to be able to meet each and every one of those tests.

In October, the reality, I think, becomes fairly clear. The Hosgri probability -- and you heard a lot about probabilistic seismic analysis this morning -- the Hosgri probability is so small that simply relying on that would mask the issue in what this October 1st email calls "PRA space." And I should say, with respect to the bottom quote, CLB stands for Continuing License Basis.

Dr. Peck obviously made a bit of a pest of himself, he continuously pursued the notion that the shoreline information needed to be evaluated based on the Double Design Earthquake criteria -- the Double Design Earthquake is

specified in the license as the Safe Shutdown Earthquake -- PG&E attempted to say that, no, using the LTSP, which is more modern, more probabilistic, is a much more sophisticated approach; Dr. Peck clearly wasn't buying this and suggested that the NRC staff in NRR, which I believe is Nuclear Reactor Regulation, had been misled by earlier information that the LTSP was actually part of the license.

January 2011, remember, this is still pre-Fukushima, PG&E offered what I truly think is a sincere approach, that there is a difference between safety and licensing compliant, and I am not prepared to question the sincerity of those that think applying other tests than the Double Design Earthquake can still provide for a State facility, in fact, I asked this question to Dr. Robert Budnitz at the Diablo Canyon Independent Safety Committee last week, and he told me that, you know, he didn't want to address licensed compliance, that was not within his remit, but he had personally satisfied himself that the plant was safe, that the equipment can adequately perform. That may very well be, for all I know, but I can tell you that we operate in a system of

the rule of law, not the rule of men, and the only way in which our system can work is if the terms of licenses are objectively applied.

When I was here at the Commission, I was the Presiding Member of the Siting Committee and I know how difficult some of those siting cases can be. We authorized 23 power plants in the five and a half years I was here. And you develop a compliance program with respect to every license. You don't ask the inspector to exercise his personal judgment as to whether something is safe or not, you ask the inspector was the license complied with. If the license needs amending, change the license, there's a process for doing that, but you don't have ad hoc judgments take precedence over what the license actually requires.

PG&E, first instinct, I think legally the correct instinct, was if you don't want to do the test, amend the license, and that's what produced the August 1st write-up by the NRC staff. PG&E was, I think, quite candid in their November 2011 10-Q and I think from a regulatory standpoint, you know, in the hierarchy of credible information coming from utilities, the

very top of the pyramid is that which there is a securities lawyer's review before it's disclosed to the market. This bottom bullet is, I think, the pertinent point because the stakes are very high, the NRC could order the utility to cease operations until modifications are made, or the utility could voluntarily cease operations if it determined that the modifications were not economic or feasible.

And I want to tell you what I heard from Dr. Munson this morning was pretty disconcerting in that context because what I heard, consistent with what Dr. Peck was saying as early as September 2010, was that the NRC staff doesn't expect these 2015 evaluations that PG&E is going to be doing to be able to satisfy the Double Design Earthquake standard. And that's a pretty long period of forbearance from enforcing the requirements of a license. And I think from the standpoint of your contingency planning responsibilities, you probably ought to get to the bottom of this information, get the information from PG&E as to just how broad an exceedance is there between the Shoreline Fault information, the Los Osos Fault information, the

San Luis Bay Fault information, and the Double Design Earthquake. If you don't get that information, how else are you going to have a handle on the prospect of a sudden shutdown?

The next section of this, I think, is even more troubling. It's PG&E's notes, and I'll tell you as a lawyer, they're hearsay, they're not evidence that the Branch Chief, Neil O'Keefe, actually said this, what they are evidence of is this is the way PG&E wrote up the call report. And from my perspective as a former Regulator, I think it verges on what I'd characterize as inappropriate coaching. His advice is that we eliminate the Double Design Earthquake as our safe shutdown earthquake. His opinion is that, by leaving it in, it appears as if we are covering something up. I'll tell you, that's a red flag. The simple story won't stand on its own if we leave the Double Design Earthquake in. Neil's greatest concern is that we cannot provide a good argument for why the analysis using the Double Design Earthquake can't be done. He made the comment that it is better to be legally clean than legally correct, but confusing. I don't think I ever saw anything like this when I was at

the Energy Commission either as its Executive Director, or as a member of the Commission. I can't say the NRC and its Licensees have the same culture that we had, but I think from the standpoint of the State of California, it should be a matter of profound concern.

Even after the call, that persistent Dr. Peck continued to stress his view that PG&E cannot use the alternate analysis method. Now, look at this, if he is correct -- and that means if Peck is correct -- and we can't use that approach, we have to apply Shoreline using the Double Design Earthquake approach, that would almost certainly result in exceeding Code allowable limits that would require us to get NRC approval to continue to operate.

Dr. Peck graphed the difference between these damping assumptions -- I'm sorry that the graph is difficult to read, it comes from a non-concurrence filing, meaning that he was dissenting from what became the NRC Management's position, and I have to tell you that is a relatively rare event to have your Senior Resident Inspector dissenting from what Management decides to do. This is his graph of

the containment building at I think the 88-foot level. His point in the narrative of his Non-Concurrence is this is where the air coolers are that the facility depends upon in mitigating a loss of coolant accident and main steam line break.

Neil O'Keefe was Dr. Peck's supervisor. This is how he responded to the Non-Concurrence: "The actual facts are not in dispute. While this concern has overtones of safety, the actual questions are procedural." Well, from a procedural standpoint, it's hard not to regard this lengthy period of forbearance from license enforcement as a de facto license amendment, and those of you familiar with the ASLB decision on San Onofre know what a large role the phrase "de facto license amendment" plays in determining whether there's a right to public hearing before that type of change is put into effect. Under the licensing provisions, the State of California is supposed to be consulted before that type of change is made.

There is a lot more to this story which my client will address in the testimony it will be filing in PG&E's general rate case on June

28th. I will also submit that to your docket and would be happy to respond to any questions.

CHAIRPERSON WEISENMILLER: Well, thank you. Obviously, I was going to suggest PG&E respond, you know, since obviously there are different snippets here, to the dates when the comments are due as opposed to trying to respond at this moment.

I guess just sort of shifting gears for a second, obviously you're trained as an attorney, and also in the securities area, and so one question we're struggling with is when we look at the economic damage that occurred in Japan and try to figure out the abilities of anyone to deal with that type of event, is that something that's ever discussed in the financial disclosures?

MR. GEESMAN: Well, it's akin to both the liability insurance that in this country goes under the Price Anderson rubric, or the responsibility for permanent waste disposal that is absorbed by the Federal Government. These are sums that very quickly get to such large magnitude that they're passed off to the taxpayers because there's really no other way to

do it. So as long as those legal provisions exist, or as in a wildfire, or flood, Hurricane Katrina-type situation, if your contemplation is, well, of course the Government would have to step in to address that, from a securities analyst standpoint, that's an easy risk to jump over, not try to quantitatively evaluate, discuss it qualitatively, depending on your perspective, either lament it or celebrate it, but don't dwell on the numbers too closely because they quickly cascade.

CHAIRMAN WEISENMILLER: Thank you. Commissioners, any other questions?

COMMISSIONER MCALLISTER: Yeah, I guess, I mean, that was an interesting play-by-play and really appreciate all the digging on that. Obviously, I think there's a lot to discuss there. So at this moment I don't necessarily want to dig into it, but I certainly feel that the sort of dynamic, I asked about it before a little bit with respect to, you know, does our regulatory structure kind of capture the ability to work through these issues in a fairly relatively responsible, transparent way, and I 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

country we would not expect a single nuclear accident because we have only 104 nuclear power plants before San Onofre's proposed shutdown.

However, within the last several decades, we do see three major nuclear accidents, Chernobyl, Three Mile Island, and Fukushima. With that data, the new estimate now may be -- you see the question mark there -- once in 2,000 years. What does that mean? That means do we expect to see a nuclear major accident every five years? Because now we are at about 450 nuclear reactors operating in the world. And even with only 100 nuclear reactors in this country, with a once in 2,000 year frequency, we are talking about two percent probability of a nuclear accident happening for a plant within its 40-year lifetime.

Now let's talk about successes here. How do we so far prevent nuclear accidents? These two slides are really self-explanatory. For those of us in the Nuclear Safety business, we really practice application of fundamental safety principles, of redundancy, diversity, and physical separation. We pay attention to design, manufacture, installation, operation, and

maintenance of critical equipment. There is a role for Federal oversight. There is continuing Licensee vigilance. And we have industry group participation, international cooperation, and State agencies involvement. An example to be given is the Diablo Canyon Independent Safety Committee, we have three committee members, we have three appointed by the State Governor of California, appointed one committee member, the State Attorney General appoints another one, and the State of California Energy Commission appoints another member. And then we do have continuing operational experience analyses and feedback.

Now let's talk about Causes and Compounding Factors, which is a diplomatic way of talking about failure. You are looking at a complex and unforgiving technology. You are dealing with intricate system interactions. You are talking about numerous human and machine interfaces. You are talking about safety systems with large capacity on standby. The system is basically idle until you need it, and when you need it you need it in an hurry, and these are large systems. You are pushing against the

envelope of the limits of the law of physics. And then you talk about equipment unavailability and failure and this is related to equipment aging. Each and every plant in this country is almost middle aged. You're talking about an average age of about perhaps 20-years-old. And then you talk about human errors and errors of omission, errors of commission and operation in repair and in tests. And then we are talking about beyond design basis external events.

And then you're talking about numerous potential accident initiators, and how about many vulnerabilities. How about unpredictable accident sequences? And then last, but not least, what about a long and unknown or unknowable developments.

Within the Federal agencies that regulate nuclear power, it used to be an impermissible attack on agency regulation if you talk about malicious acts, and the agencies' old criteria was unforeseeable events. And of course, after 9-11, the landscape had changed, but still the last bullet is important because there are things that we may not know and be able to predict.

Let me show you a typical picture of a typical 2-Loop Pressurized-Water Reactor, courtesy of the United States Nuclear Regulatory Commission. You see a pristine structure, you see a simple elegant design, it tells you this thing works. Another picture also conveys the same language. Yes, indeed, through the proponent, nuclear technology has served us well. We have not had a major accident that has caused any human fatality, including Fukushima, no member of the public ever died from a major nuclear accident, so this technology has served us well through the proponent.

Now, this is a 35-year-old picture from NRC training manual. Now, at that time when the picture was drawn, a steam generator -- it's forced steam generator there -- because a steam generator was about $5 million at that time, today a steam generator at San Onofre cost about $100 million or $250 million.

Now, what about the consequences? This slide is self-explanatory. For truly nasty major nuclear accident, you are dealing with potential human fatalities and latent health hazards. You will be looking at immense environmental impacts

from radioactive material releases and dispersion. You talk about huge financial burdens. And then you talk about long term post-accident management for years or decades. Why? Let's look at radiation hazard before we go to the next slide. If we talk about large inventories at the reactor core or the spent fuel pool, or at the dry cask storage site, you talk about lethal doses, you talk about different pathways, you are talking about some very long half-life isotopes, and then some radioactive isotopes act like potassium or calcium to the human body. If they act like calcium, they will go to the human bones, potassium would be widely dispersed in human tissues.

Now let's talk about lethal doses. The last item on this slide refers you to the Greek figure, Medusa. Medusa is one that you look, you die. Now, the lethal dose of 50% of the population is roughly about 500 rems. Rems is a unit of measurement of doses to human body, it's same for Roentgen Equivalent Man because man comes in different sizes and shapes and gender and age. Now, about 500 rem will kill 50 percent of the people who are exposed to it, that's what

LP50 means. Now, the contact dose of a fresh brand new spent fuel -- now the fuel has been sitting in reactor core for maybe three years, four years, if you remove it from the reactor core, the contact dose is about Bundle is about 1,000,000 rem per second, or 10,000,000 rem per second. Okay? Within a split second, it would deliver thousands of times of a lethal dose to human being.

Now, let's talk about the Decay Heat Removal. In any accident consequences, you're dealing with a dose and then you're dealing with a decay heat. The simple illustration here is about long term decay heat is less than 0.1 percent. For major nuclear power facility, you're talking about 1,000 kitchen ovens and within the confined space that you're dealing with, that heat needs to be removed.

And what is the problem? The problem is facing two fundamentally conflicting technical demands, to release the decayed heat, you need to open the system. To contain the radioactivity damage to that alignment and to your fellow human being, you need to close the system. And then you need to do that for years or for decades, and

then you need to do that also -- to be really successful, you need to move people away, and then you need to deny them of the land use, and then you need to find money.

Now, the policy consideration here is, 1) is compliance alone with Federal Regulations sufficient? 2) Do Federal design basis accidents cover all the important accidents? Now, this is an important consideration. In performing my duty as the Chairman of Independent Safety Committee in Diablo Canyon, in response to public inquiry, some of my response is framed this way: I for one am persuaded that Diablo Canyon complies with all important Federal Regulations; that, I can testify to. But are the Federal Regulations adequately developed and implemented? That is another matter.

Now, the third bullet is, is the technical analysis that the experts have done, are they complete? Now, in this business, completeness is not only important, but it is difficult for anybody who ever tried to do accident analysis, you're talking about numerous sequences, you're talking about unpredictable development, you're talking about material

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

The next example I like to offer you is

on adequacy of Federal rules related to the pressurized thermal shock rule. Now, I for one consider the pressurized thermal shock accident one of the major accident sequences that deserve our undivided attention. It has nothing to do with Fukushima, it has been on our books for years. Now, in the old NRC rule on the PTS rule, there were seven nuclear power plants that were not eligible for license renewal for another 20 years. The new rule, which was developed after decades of intensive research, it's been offered to the Licensee, it's not mandatory, it's voluntary, you don't have to choose it, you don't have to comply with it, but if you do choose to comply with it, it would now make all nuclear power plants in this country for additional 20 years of license extension.

Now, the proponents' argument would be "Hallelujah, this is a clear demonstration of elimination of unnecessary Federal, restrictive Federal rules." It demonstrates a more realistic assumption on neutron damage to the Reactor vessel. The opponents' argument would be "Well, I don't care about who is going to be eligible for license renewal, the new rule obviously

introduces a relaxation of safety margin." And of course, there's a standing assertion on the table that the new rule may be politically motivated.

And then the third example of Federal rule adequacy has to do with something in Japan. Now, everybody is aware that the Japanese nuclear industry has been using most of our regulatory framework and system for how they regulate the nuclear power industry, not to mention the design of General Electric, the design of Westinghouse we have, for example. Now, near Tsuruga Reactor Unit 2, it was just recently discovered -- now, I cannot testify to the validity of that discovery because I only read it in the ups news article, that the reactor in Unit 2 was sitting on an active seismic fault. Now, assuming that is factual, then I'm proposing to you, the proponents' argument would be "Oh, don't worry, the plant has been sitting there for so long, a major seismic event would be unlikely. Besides, one can always develop effective remedies." Now, the opponents' argument would be, "Hey, for that case, you site a plant there? And telling us it was safe?" Now, if I may also offer you

entertaining question, is, as much as I have a great deal of respect and admiration, and a great deal of deference to our seismic scientists and engineers who practice this trade for so long, and try to protect the safety of public among many other things, in my humble opinion, the seismic science is not in a mature state to be able to answer this fundamental question: "If you know so much about seismic activity, please tell me when and where and how big the next earthquake will come from. And I give you plus or minus and leeway on your predictions of the size of the earthquake, and I give you plus or minus 10 miles from the epicenter." This is just an assertion that I hear numerous times in the public meetings.

And now may I conclude my observations? On accident prevention, as we all are working towards making sure the existing power plants are safe, it's not only prevention of recurring accidents, as much as I, again, respect the amount of effort being done on Fukushima, to me, it does not give me comfort if you tell me, "I'm no Fukushima, I'm 80-feet, I'm 200-feet above sea level. I do everything that would save a station

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

power safety.

And then the second bullet is what I had offered to you for consideration on adequacy of Federal rules, and then the post-accident management difficulty, really well known, and they are self-explanatory. And thank you very much for your attention.

COMMISSIONER MCALLISTER: Thank you very much. Just to comment, I guess we've had from various angles, we've had some relatively pragmatic discussion, I think, about the particulars of the plants we have here in California, looking at the various regulatory kind of processes that are in place, the studies, the technical -- you know, I often -- I liked the way, Mr. Lam, you set up sort of on the one hand, on the other hand, what the proponents would say and what the opponents would say about any given issue, and I think it does highlight the fact that this relatively difficult to understand or complex set of issues really does get pretty quickly back to individual world views. What you think about this in a lot of ways boils down to what you feel like our society ought to look like in order to support a technology like this. It

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

reactors has copper weldments and so the PTS issues could be relevant there? Is that true?

MR. LAM: Yes, indeed, Chairman Weisenmiller. And not only is it relevant, the plant has been focusing on that, you know, because the Independent Safety Committee's inquiry recently, and they have been focusing on that for a long time.

CHAIRMAN WEISENMILLER: Yeah, I remember before Diablo started operating, PG&E was starting to come to grips with that, the copper weldments, at that stage.

MR. LAM: Right. And their coupon program has been very adequately planned and implemented. And based on the latest, I was onsite about a month ago, my inquiry has to be, you know, the general features of the plant, but specifically they had some coupon that has been extrapolated to 60 years of fast fluence exposure. Assuming that fact is not disputed, assuming there's no dispute there, then that may demonstrate the reactor vessel, at least that coupon is good enough for 60 years. The reason I hedge is, well, you had the coupon, but the vessel is huge, and you're telling me the coupon

will survive for 60 years. Well, the question remains, is the coupon representative of the vessel? Or does it just something that happens to be the strongest, I mean, when you get that coupon 40 years ago, who observed selecting of that coupon? Are there any things that may happen to your vessel while it's being constructed? Right? I am, you know, belong to the old school like President Regan say "trust, but verify." None of these questions and inquiry, it has nothing to do with saying somebody may have done something wrong, I'm just saying let us make sure that, you know, I am persuaded the coupon will survive for 60 years of operating because it has been demonstrated, but does that mean the vessel would, too? Is there anything else that may come into play? I, for one, have no expertise, somebody who has expertise in material and in testing and manufacturing needs to come in and provide further examination of this important issue.

CHAIRMAN WEISENMILLER: Thank you.

COMMISSIONER MCALLISTER: I appreciate the Chair bearing with me on my waxing 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

three trillion cubic feet of gas, and 65,000 tons of uranium can be equaled by 6,600 tons of thorium properly burned.

What I'd like to say is what Mr. Lam was mentioning earlier about many of the issues with safety, I will get into later and I would like to talk about how abundant this energy source is for the world, and how conflict energy will be a thing of the past if we approach it sensibly.

One ton, one gigawatt, one city, is all it takes to power. It has a low cost, it's a proven technology, it was developed in Oak Ridge National Labs in the 1960's and ran for 20,000 hours; ironically, it was said to be on a nuclear bomber during the Cold War because it was so compact. The issue is that it wasn't viable for making nuclear weapons. We're talking safety issues with nuclear power plants. This is low pressure, high temperature reactor, it's a molten salt, it has roughly 1,000 centigrade operating temperature range of its molten nature. It can't run away, can't melt down, it can't blow up. It doesn't mean a billion dollar containment building. It's efficient. It burns 99 percent of its fuel versus one percent on a solid fuel

rod system. It has very little by-products, we're talking a couple of decades for a majority of its waste stream versus hundreds of thousands of years. Because it's high heat, it can be very compact generation sets. It can burn our nuclear waste. MIT's Transatomic just got an energy award for a waste annihilation reactor system. Thorium can burn our nuclear waste. It's carbon-free energy, of course. It has heat properties to convert garbage, biofuels, and in a conversation with the chief chemist from the Naval Research Lab, they're working on a process of making jet fuel for their aircraft carriers out of sea water, actually taking the CO_2 out of the water and converting it, cracking the water, and making jet fuel, and doing it at a lower cost than they can deliver it to their ships.

It has magnitudes less waste. For a uranium reactor, you're talking 800,000 tons of ore mining versus 200 tons with thorium. You're talking huge waste streams with uranium versus thorium. It must be looked at. It can be built modular in the 50-100 megawatt range, which means you can put it where the power needs to be, you could do desalinization and power for coastal

cities instead of having to have large generating plants and do massive distribution systems. And they can be built much much quicker in terms of two to three years' range for one Canadian firm -- full disclosure -- I represent Thorium Power Canada that is looking for the funding to do its first demonstration plant in the next two to three years. They can be built on a assembly lines just like Boeing builds a commercial airliner, which is a highly complex machine. It can be very inexpensive to deploy, good payback, and one of the ironies of this technology is, during the Cold War, it was put on the shelf at Oak Ridge National Labs because it wasn't a good source of bomb making material, you had to go through way too many steps than what you can do with a typical fission reaction with uranium. It's a fertile material, it's not a fissile material.

So you're dealing with a system that can't melt down, can't blow up, there's tons of it everywhere in the world, thousands of years of sustainability, and what I'm hoping to get out of this session is to be invited back with a full 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

it during the Cold War, there wasn't really an issue, a need to throw money at a great power source.

COMMISSIONER MCALLISTER: So you're saying that the down side to this technology is that it can't produce bomb making material?

MR. HORSTING: Yes. And it will also burn our nuclear waste.

COMMISSIONER MCALLISTER: Right.

MR. HORSTING: From our plants.

COMMISSIONER MCALLISTER: So maybe I missed something on the technical side, so basically since it's not a fission basis, it's basically producing lots of heat to run a steam cycle? Or --

MR. HORSTING: Well, it's a fertile material, not a fissile material, so it needs a starter seed of uranium to start creating neutrons that convert it into 235.

COMMISSIONER MCALLISTER: Oh, okay. Thank you very much for being here.

MR. HORSTING: Thank you very much.

MS. WALTER: And finally, our last panel is the Public Interest panel discussion with Rochelle Becker of Alliance for Nuclear

Responsibility and Kendra Ulrich with Friends of the Earth.

COMMISSIONER MCALLISTER: Thanks for coming. First up?

MS. ULRICH: Commissioners, Chair, first I just want to say thank you for the opportunity to be here and, I have to say, when I received the invitation from Joan Walters to be here, I had a very different idea of what I would be speaking to you about. It changed drastically on June 7th, as you know our interest has been primarily San Onofre here in the state. First, I just want to applaud the CEC for your leadership and forward thinking in calling for a Plan B for a Southern California without San Onofre.

I also just want to say, as my dear friend and colleague Dave Freeman has said frequently, that California is no longer one power plant away from rolling blackouts and I think that San Onofre really demonstrates the fact that, you know, the ISO, the PUC, the CEC, has been able to respond very rapidly to the loss of a major power plant, and last summer and this summer really demonstrate the fact that we don't need these incredibly centralized, dirty, and

dangerous old nuclear facilities.

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

was, in fact, a nuclear experiment, and that this was in fact a de facto license amendment process. That was on the 13th of May, three weeks later San Onofre, Ted Craver announced that they were shutting down San Onofre, citing the ASLB decision as the decisive factor in that decision.

And I just want to say that this isn't a case of regulation overburdening a utility, this is a case in which the facts were weighed by technical staff, by engineers, and by scientists, based upon the technical evidence that Friends of the Earth had been able to submit due to our expert consultants that said that this is in fact an experiment with Southern California, so we were obviously delighted that it is shut down.

As far as San Onofre going forward, we just want to say that we fully support the CEC's position that the spent fuel pools are over-packed, that they need to be thinned as quickly as possible, and in the case of San Onofre that the spent fuel needs to be transferred into dry cask storage and hardened onsite storage as quickly as possible, and that's just from a public safety perspective that that needs to happen.

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

COMMISSIONER MCALLISTER: Thanks very much for being here, that's helpful. Any questions?

COMMISSIONER FLORIO: Just a question on the issue of thinning out the spent fuel pools and moving to dry cask.

MS. ULRICH: Uh-huh.

COMMISSIONER FLORIO: Edison indicated this morning that they thought it would be seven to 12 years before the assemblies could be -- the last one into the pool could be taken out. Do you have any different information? Or do you agree with that assessment?

MS. ULRICH: Yeah, the timeframe for cooling fuel that's recently been removed is five to seven years. Obviously, the spent fuel pools are packed with fuel that's been in there for quite a long time, that can be quickly removed. With San Onofre's shutdown, I mean, the nuclear threat in California is definitely reduced, but we've got 1,200 tons of high level waste onsite in a seismic zone, in highly vulnerable spent fuel pools. And so in the interest of public safety, like what we're seeing at Fukushima, the spent fuel pool is a crisis at these reactors in

Fukushima, and we certainly don't want to still have that kind of nuclear threat sitting on the shores in between two of the largest cities in the state.

COMMISSIONER MCALLISTER: Thanks.

MS. BECKER: Actually, before I begin, I was wondering if Kendra might mention your ASLB Petition because I'd like to have the Energy Commission support that, but I'd like you to explain it, so….

MS. ULRICH: Sure. So that's the petition that I was talking about earlier, was the petition that we filed on June 18th last year with the NRC, was deferred on November 8th into two different processes, one before the Atomic Safety and Licensing Board that was looking at the restart plan and one before a Petition Review Board, which is a 2206 petition. The Atomic Safety and Licensing Board was looking specifically at the NRC's Confirmatory Action Letters, so this was their return to service conditions that they had to comply with in order to get NRC approval for restart. The problem at San Onofre was that the equipment was so severely damaged and so drastically different that they

couldn't comply with the terms of the CAL while still in compliance with their license. So our contention was that this is, in fact, a de facto license amendment process which entitles the public to a public hearing. The Atomic Safety and Licensing Board agreed with that wholly. As I said before, these were not like-for-like replacements, that this was in fact a nuclear experiment and that this was in fact a de facto license amendment process which required the public hearing. Edison, in the face of actually having to go through the proper regulatory process, Edison chose to shut down instead. You know, but the fact remains that if they had had to go through this process before, many of these design flaws would have likely been caught and unfortunately the lives and livelihoods of 8.7 million people were unnecessarily jeopardized for the time that the reactors were operating with that defective equipment in place.

COMMISSIONER MCALLISTER: Thanks. Can I ask a question about --

CHAIRMAN WEISENMILLER: No, I was going to say I did follow same at the NRC and the points made were, before the decision of Edison

to shutdown, 1) was that the NRC had to decide determine it was safe before it was restarted, and 2) that there had to be a public process to basically review that. I did not get into all the intricacies of the different procedural aspects at the NRC, and frankly I know my own procedural stuff here, but I'm always hesitant to jump into another commission that has a pretty intricate legal system and take a guess on what is the best mechanism there.

MS. ULRICH: And I just want to say that I did see your comments and we very much appreciated the State weighing in and saying that safety needs to be put first, and public process needs to be put first, and that's really the case in the State of California, as well as throughout the country.

COMMISSIONER MCALLISTER: So that's a good segue to my last question here. So on the spent fuel issue, and sort of the local issues around San Onofre, how does that link to any work that you're doing at the Federal level on the fuel issue more generally? I mean, this is not just a problem at this one plant, but it's one of the perennial problems here for the nuclear

industry, so just any comments you have about that and what the path you're working on actually is.

MS. ULRICH: Well, our position right now, because the spent fuel issue is a problem nationally, as you mentioned, but it's also a decades old problem where the nuclear industry has been waiting around for some fantasy permit solution while packing spent fuel pools, saying that eventually someday there's going to be a final repository for this stuff. Our position is that, at the present moment, the safest possible thing is hardened onsite storage without transferring high level waste on the nation's highways, etc., at this point. So our position is that it needs to be secured onsite.

MS. BECKER: Yes, thank you. I'm glad to close this very long day and actually a very long road for many of us. Many of the questions and the issues brought before us today are questions and issues that were brought forth in the 1980's when my face was younger than that face there. So it's nice to see the young face and it's nice to hear us really seriously talking about some of these issues -- a bit too late, but

better late than never.

I started with the Energy Commission in 2005 testifying as a public voice, I have probably been the only consistent public voice at every one of your IEPRs, and will continue to be so until we have no more nuclear plants in California because we can't afford them. However, there were some issues that were brought forth today that I find rather puzzling.

PG&E said that they were quite prepared if there was a seismic event onsite. Well, most of my community does not live onsite. And if they are concerned about roads and bridges not being available to them, you could imagine how we feel about roads and bridges not being available to us. When they first wanted to license Diablo Canyon, we asked them to consider an earthquake and a radioactive release at a nuclear power plant and the Nuclear Regulatory Commission told us, no, that was too remote and speculative; there might be a radioactive release, and there might be an earthquake that could affect bridges and roads, but that the two would not happen. Many lessons have been learned and that is one of 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,

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

nuclear power plants we are dealing with a millions of tons of radioactive water and soil that they don't know what to do with. And Diablo Canyon lives on the same Pacific Rim, just the other side, and there's no less seismic activity on our side of the Pacific Rim than there is on Japan's side of the Pacific Rim.

These are important questions. And they have impacts to our lives, and they have impacts to our livelihoods, not just the people sitting in this room because many of us are getting older, but our children and our grandchildren, long after that last megawatt blows out of that plant, as we're learning at San Onofre, we're going to be paying for power that we're no longer getting. We need to consider the full lifetime cost of nuclear power. We needed to consider them in the 1980's. We've had many heads up, and the next heads up could be California, and then it's too late. Thank you very much.

COMMISSIONER MCALLISTER: Thank you very much. I appreciate all your efforts through the years, that consistency helps our process.

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

might recall that the first time I came before the Commission I came and did so because I had spoken with your staff about whether or not we could close the nuclear power plants in California, and they had informed me that we could. And then the next day they retracted that. And then I returned to CAISO for the information and found out that they had quite a different view of it. Well, since then, as you know, your staff has been proven correct; we can do without San Onofre, without rolling blackouts, and without the associated costs. I'm here for the same reason today. I want to talk about what those potential benefits of nuclear power are.

The potential detriments you covered very thoroughly, but what a state needs to consider, what our Legislature needs to consider, what our Governor needs to consider, and our citizens and the other agencies, all of which you report to about our energy situation in California, what we need to consider in choosing our energy sources is the benefits versus the risk, that's the classic analysis. Listening to what was presented today basically all I heard 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.

Given that, it seems like -- oh, I want to mention one more thing from a past -- one of the things you referred to me as an agency in our past discussions of the benefits of nuclear power, there's a report done in 2008 that discussed if we closed both nuclear power plants, how much would it affect rates in California. And I believe it came to $.2 per kilowatt hour or something, it was a very small amount in any event, it would have translated into about $3.00 per average ratepayer. That's certainly gone down from everything I can see now. We can close the nuclear power plant without going into our surplus and why are we operating it, then? I think the long and the short of it is, I'm asking you, is there any evidence at these proceedings, was there any evidence produced today that I did not notice that shows any benefit to nuclear power? Is there anything that shows our rates would be significantly affected if we closed Diablo Canyon today?

CHAIRMAN WEISENMILLER: Well, I'm sure PG&E would have been happy to put a bunch of stuff in the record on this, we did not specifically ask those questions, I suspect they

may or may not respond later in their written comments, but we didn't specifically say to PG&E, "Come in and demonstrate." You know, so -- but as I said, I'm sure they're likely to respond to you.

MR. DAVIS: Well, then might I see just that you should because when you report to the Legislature and the Governor and the citizens of California as you intend to do with this IEPR, so that we can make our energy choices, what we need to do is balance the benefits and the risks. You haven't shown us any benefits, all you're showing is just risks.

CHAIRMAN WEISENMILLER: Well, in the 205 IEPR report, I think we did note that nuclear power was providing carbon-free power in that it's going forward cost -- just looking at fuel cost -- was relatively attractive and that at the same time, I'm trying to recollect the various pieces, certainly there are a lot of people that get jobs from that. So, there are other benefits, you know --

MR. DAVIS: In 2005 is what you're --

CHAIRMAN WEISENMILLER: What I'm 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

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

of the events that took place? But we decided to let the Safety Committee, of whom Dr. Lam you have heard from, tackle this question for us. So if you could please roll the tape, that might help explain more.

(Video is played)

COMMISSIONER MCALLISTER: Thanks for bringing that to our attention.

MR. WEISMAN: And I regret, I looked around to see that I guess Dr. Munson has left for the day, so….

COMMISSIONER MCALLISTER: So it is now on our record, but you know, we obviously don't have jurisdiction over that. But thanks for bringing it to our attention.

CHAIRMAN WEISENMILLER: -- transparency would help, I guess, you know, presumably this was ratepayer money and it gets to some of the PUC challenges.

MS. KOROSEC: All right, our next commenter is Martha Sullivan from Coalition to Decommission San Onofre.

MS. SULLIVAN: Good afternoon. My name is Martha Sullivan and I'm a representative of 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

marketplace, it's where our economy is transitioning to, and we need to help those workers to make this economic transition just as in past transitions between industry and technology, and so forth.

And then finally, I wanted to reinforce a couple of people who made this point earlier and I want to really reinforce it from a local perspective, of the people who live in the shadow of these plants. This point was made during the wonderful seminar in San Diego a couple weeks ago where former Prime Minister Kan and former NRC Chair Jaczko and another former NRC Commission member, and then Arnie Gundersen who is an expert witness who has been working for Friends of the Earth, and Arnie shared a slide which really sort of captures a key key point that we need to keep in mind, which is that the NRC's probabilistic risk analysis claims basically one meltdown in 200 years, a 200-year event; but history shows that there have been five meltdowns in 35 years. So I think that really highlights the weakness of probabilistic risk assessment, and I think we all need to bear that in mind. And it's something that former Chair Jaczko commented on, as well,

that he believed it's time to move past that and not use that as our standard for determining what an appropriate level of planning and preparation should be for an accident or a disaster at one of these plants. That's going to continue to be a factor for the people who live within these plants, even as they're decommissioned because that spent fuel is going to be there for the foreseeable future, we don't have any other plan for it.

And then finally, I just wanted to emphasize that we're very glad to hear Edison today talking about aggressive use of preferred resources which in California means renewables and energy efficiency. But we want to caution about, you know, continuing with this idea of new fossil generation as a "backstop." Our experience is that, when there's new fossil generation, that's not a backstop, it becomes an obstacle to the full development and deployment of available technologies for renewable energy and for energy efficiency. And so, you know, necessity is the mother of invention, we've shown that in the last year and a half with the outage 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

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

impacts of quakes on emergency planning. Some of the things to consider, you might want to talk about broken overpasses that might block evacuations in the 10-mile zone, workers might not be able to get to the plant to prevent a meltdown. Outside the 10-mile zone where people are supposed to shelter in place, the windows might all be broken and quake-damaged buildings might collapse on them. Hospitals that are only marginally prepared for radiological emergencies, what if they're flooded with earthquake victims, as well?

At the Coastal Commission hearing, PG&E was asked what would they do if the Earthquake study showed that a quake would be beyond Diablo's design basis. What did they respond? Nothing. They wouldn't do anything. I'm really not sure why we're spending all this money on earthquake studies, you know, it's a good thing to look at earthquakes, but nobody can predict them, the USGS website says nobody can know the magnitude of a fault because it can change after the quake begins. We already know there's earthquake faults right near these plants. Tōhoku, the quake in Japan, was 100 miles away

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

that these plants are extremely complex, even the valve that got stuck at Three-Mile Island, I don't know if you ever looked at it, I couldn't even understand this valve, it's so complex it's unbelievable, it's almost more complex than the whole plant, and this was the one that was stuck. People, humans over-estimate our ability to get things right. This is what it comes down to. We think we can get things right real easily. This came out when software designers first started to make Fortran language and so forth, they realized it was really hard to get the programs right, it was hard to get all the bugs out -- really hard, really hard. A good example: San Onofre; they started to design new steam generators and there was no earthquake, there was no tsunami, there was nothing, no disaster, they just couldn't get it right. So what makes us think all the rest of it will be right? It's very impossible to believe this.

Now, safety is one of our key issues that you guys are supposed to be chartered to deal with, all government agencies are, we've got police, military, we spend a lot of money on 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

from Fukushima. We would like to see that put into legislation. It's not that we don't trust the PUC, it's just that the PUC has not always been worthy of our trust, and therefore, as much as I like Commissioner Florio, I'd like to see the PUC itself support this, so they don't have any wiggle room. PG&E applied for a license a little prematurely once in 2010, and they hadn't finished their AB 1632 requirements, and the PUC didn't say to them, "Take your application and go home when you have," they said, "Here, waste 18 months of everybody's time and we'll dismiss it." Well, let's not do that again, let's make sure that they have to answer these questions. So I'm leaving copies of SB 418 and a fax sheet. I know that you have channels that some of you have to go through, but not all of you have to go through to get there, and so I really would appreciate it if you would expedite those channels and support this legislation. Thank you.

COMMISSIONER MCALLISTER: So I'll just point out --

CHAIRMAN WEISENMILLER: I was going to say, the Energy Commission does not take 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

logical sense to me at all. I was hoping somebody can answer that. And I have information on the SanOnofreSafety.org website that gives the backup for the statements I'm making about the USGS quotes if anybody is interested. And I have another question, I don't know if it fits in here or not, but I understand in Baldwin Park they are doing fracking right on the Inglewood Newport Fault, which runs right by San Onofre, and is that an issue that the Commission plans to address? I guess that's question. That's all I have right now.

COMMISSIONER MCALLISTER: So on that final question, we're not the agency that would be looking in that particular issue, that would be probably over at the Department of Oil and Gas Resources where they actually look at fracking and the associated environmental impacts of that.

MS. GILMORE: Well, that might be the case, I don't think they're looking at the impact on the nuclear plants.

COMMISSIONER MCALLISTER: They actually do regulate the fracking activity and I guess I don't know whether that would fall within their 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

might be some checks and balances, kind of like one of the oversight boards.

CHAIRMAN WEISENMILLER: Well, some of us keep nominating that to be Phase 5 in Commissioner Florio's case.

MS. SAVAGE: (Laughs) Okay, thank you so much.

MS. KOROSEC: All right. We're opening the next line. Are there any comments on the phone? Okay, the lines are open. Going once, going twice, any last comments on the phone? All right, I think we have gotten everybody.

COMMISSIONER MCALLISTER: Thank you, Suzanne.

MS. KOROSEC: We did have the written comments, I don't know if you wanted to -- a gentleman did request to have them read into the record.

CHAIRMAN WEISENMILLER: As long as they're short.

MS. KOROSEC: It's three short paragraphs. All right. This is from a Mr. Frank Brandt, who asked our indulgence. We don't normally do this, but he is 91-years-old and it's 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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