

COMMITTEE WORKSHOP
BEFORE THE
CALIFORNIA ENERGY RESOURCES CONSERVATION
AND DEVELOPMENT COMMISSION

In the Matter of:)
)
Preparation of the 2007) Docket No.
Integrated Energy Policy) 06-IEP-1N
Report (2007 IEPR))
_____)

VOLUME II

CALIFORNIA ENERGY COMMISSION
HEARING ROOM A
1516 NINTH STREET
SACRAMENTO, CALIFORNIA

THURSDAY, JUNE 28, 2007

9:00 A.M.

Reported by:
John Cota
Contract No. 150-04-002

COMMISSIONERS PRESENT

Jackalyne Pfannenstiel, Presiding Member

James D. Boyd

Jeffrey L. Byron

John L. Geesman, Associate Member

ADVISORS PRESENT

Susan Brown

Tim Tutt

STAFF and CONTRACTORS PRESENT

Barbara Byron

Mike Gazzolo

Steven C. McClary, MRW & Associates, Inc.

Robert B. Weisenmiller, PhD, MRW & Associates,
Inc.

Lorraine White

ALSO PRESENT

William B. Jones, United States Nuclear Regulatory
Commission

Samson Lee, PhD, United States Nuclear Regulatory
Commission

Steven M. Olea, Arizona Corporation Commission

John S. Keenan, Pacific Gas and Electric Company

Gary L. Schoonyan, Southern California Edison

David A. Lochbaum, Union of Concerned Scientists

ALSO PRESENT

Rochelle Becker, Alliance for Nuclear
Responsibility

Richard Cheston, Unites States Government
Accountability Office

Jim Harding, Harding Consulting

Vasilis Fthenakis, PhD, Brookhaven National
Laboratory

Mary M. Quillian, Nuclear Energy Institute

Joe C. Turnage, PhD, Constellation Generation
Group

Thomas B. Cochran, PhD, Natural Resources Defense
Council

Lloyd Cluff, Pacific Gas and Electric Company

Doug McNea

Bob Woehl, Electric Power Research Institute

Ken Schrader, North American Young Generation in
Nuclear

Kristin Zaitz, North American Young Generation in
Nuclear

Robert F. Williams, Advocates for Clean
Responsible Energy and Williams Technical
Associates, Inc.

Edwin D. Sayre, Advocates for Clean Responsible
Energy

Tom McClean, Fresno Nuclear Energy Group, LLC

John Hutson, Fresno Nuclear Energy Group, LLC

Bruce Marlow, AREVA

Bryce Johnson

Steffen Kammler, City Solar AG

I N D E X

	Page
Proceedings	1
Welcome and Introductions	1
Second Day Opening Remarks	
Presiding Member Pfannenstiel	1
Ms. White	2
Ms. Byron	6
Panel 3 Discussion: Operational Issues for California's Operating Nuclear Power Plants	
Dr. Lee	15
Mr. Jones	21
Mr. Olea	54
Mr. Keenan	72
Mr. Schoonyan	102
Mr. Lochbaum	126
Ms. Becker	143

I N D E X

	Page
Afternoon Session	162
Panel 4 Discussion: Environmental, Safety, and Economic Implications of Nuclear Power	
Mr. Cheston	163
Mr. Harding	185
Dr. Fthenakis	206
Ms. Quillian	238
Dr. Turnage	272
Dr. Cochran	304
Public Comments	325
Concluding Remarks	353
Adjournment	354
Certificate of Reporter	355

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

2 9:05 a.m.

3 PRESIDING MEMBER PFANNENSTIEL: Good

4 morning, this is a workshop with the Integrated
5 Energy Policy Report Committee and other
6 Commissioners from the California Energy
7 Commission. I'm Jackie Pfannenstiel, the Chair of
8 the Energy Commission and the Presiding
9 Commissioner on the Integrated Energy Policy
10 Report Committee. To my left is Commissioner John
11 Geesman who is also on the Integrated Energy
12 Policy Report Committee. To his left is
13 Commissioner Jeff Byron. To my right is
14 Commissioner Jim Boyd and to his right is his
15 advisor Susan Brown.

16 With that we have a day of very
17 important and, I believe, very useful to us,
18 information. We will use the information gathered
19 from this workshop as fodder for our information
20 in the IEPR Report on nuclear power.

21 This is the second day of a workshop on
22 nuclear power. We covered a lot of ground on
23 Monday and as I think everybody in this room
24 understands there's a lot more ground yet to be
25 covered. And we'll get as far as we can today.

1 So why don't I turn it over to Lorraine.

2 MS. WHITE: Good morning, thank you
3 Chairman. My name is Lorraine White. I am the
4 program manager for the Integrated Energy Policy
5 Report proceeding for 2004, or pardon me, 2007
6 (laughter).

7 Just a throw back, sorry. Today is the
8 second day of our Nuclear Workshops. There is so
9 much material associated with this subject it was
10 necessary for us to spread it out over a two day
11 period. So we will begin.

12 Just a few logistical announcements,
13 information about our facilities for those of you
14 that are joining us for the first time.

15 Out the double-doors and to the left you
16 will find restrooms. You will also find another
17 set of restrooms behind our elevators.

18 For those of you seeking refreshments
19 throughout the day there is a snack shop on the
20 second floor under the awning.

21 In the event of an emergency please
22 follow staff out the doors. There's two exits,
23 one to our right here out the double-doors, which
24 most of you probably came in, and then one to the
25 left.

1 We will be reconvening across the street
2 at the park. And wait until you get the high sign
3 from staff that it would be safe to return before
4 you come back in the building.

5 The Integrated Energy Policy Report
6 proceeding is the Energy Commission's key activity
7 that is developed every two years to produce a
8 report outlining key issues facing the state
9 related to energy resources.

10 It also is dependent on input from
11 various parties. Your participation is key to the
12 development of this report and its findings as
13 well as policy recommendations.

14 To facilitate your participation not
15 only with you joining us in person we have also
16 accommodated remote participation in the form of a
17 call-in number 1-800-857-6618. The pass code is
18 IEPR. I'm the call leader.

19 And for those that would love to follow
20 along the presentations and view the slides and
21 hear the audio only you can do so on our webcast
22 service which is found on the Energy Commission's
23 website www.energy.ca.gov.

24 For those of you who are here in person
25 we ask that if you have questions or comments that

1 you please fill out a blue card. We'll be
2 collecting those and providing them to the
3 Chairman who will calling up people as
4 appropriate.

5 We will also be having opportunities for
6 questions of panelists and things like that
7 throughout the day.

8 As I said this is the second day of a
9 two day workshop. The first we covered an
10 overview of our consultant report, The Status of
11 Nuclear Power in California.

12 We also discussed issues related to
13 spent fuel storage and disposal programs. The
14 Federal Reprocessing Program and as part of our
15 second we're going to be delving into the
16 operational issues associated with the current
17 fleet of plants and their associated
18 environmental, safety and economic implications.

19 As I mentioned earlier we're seeking
20 public input as we go through this material in
21 order for us to develop the final status report
22 and any appropriate information that will feed
23 into the Integrated Energy Policy Report.

24 To give you some context about what is
25 required in this particular proceeding we are

1 tasked with assessing and forecasting supply,
2 demand and price to meet the needs of California.
3 As part of this, of course, nuclear generation is
4 a key component.

5 We also are looking at ways of improving
6 efficiency both in lighting and through land use.

7 We're looking at advanced technologies,
8 in particular we're focussing on what's happening
9 with coal.

10 And then we're looking at issues
11 associated with the cost of generation.

12 We're developing and we'll be
13 recommending various policies to address the
14 issues identified in this proceeding.

15 And as I have mentioned we are obtaining
16 information from not only market participants but
17 other stakeholders in the process. We're
18 consulting with our sister agencies at the
19 federal, state and local levels.

20 Our schedule for this proceeding is to
21 adopt an Integrated Energy Policy Report on or
22 about October 24th so that we may transmit it to
23 the Governor and the Legislature by the statutory
24 deadline of November 1st.

25 The information about this proceeding

1 and today's workshop is, in fact, found on our
2 website. If you would like to ask any kind of
3 questions about the general proceeding I welcome
4 you to contact me. My information is also on the
5 Energy Commission's website and also in the notice
6 that's available out front.

7 On nuclear power issues I would like you
8 to direct your comments or questions to our Senior
9 Policy Analyst Barbara Byron. She will be
10 speaking in just a moment to give a greater
11 context about nuclear issues in particular for our
12 proceeding. And her contact information is also
13 on the Energy Commission's website and in our
14 notice.

15 So if there are no questions I'd like to
16 pass it off to Barbara.

17 MS. BYRON: Thank you. My name is
18 Barbara Byron and I'm the Energy Commission's
19 Senior Nuclear Policy Advisor. I'd like to
20 welcome all of you to the workshops today
21 especially thanking our panel of experts for their
22 efforts to travel here to Sacramento and put
23 together their presentations for the Commissioners
24 today.

25 I also wanted to mention that all of the

1 panelists' presentations are posted on our
2 website. And transcripts from these workshops
3 will also be posted on our website.

4 Before we get started I'd like to
5 provide you with a brief context for these
6 workshops. As we heard on Monday California
7 relies on three nuclear power plants for about 13
8 percent of California's electricity supply. And
9 these plants are accumulating spent nuclear fuel
10 on-site.

11 The California Energy Commission's role
12 with respect to nuclear power includes that
13 Commissioner Jim Boyd is the Governor's appointed
14 state liaison officer to the US Nuclear Regulatory
15 Commission. In addition Commissioner Boyd and I
16 represent California on Transportation Advisory
17 Boards to the Western Governors Association and
18 the Western Interstate Energy Board. And we
19 coordinate California's comments on key federal
20 documents related to the Yucca Mountain
21 repository.

22 Two issues of concern for California
23 have been the potential groundwater and
24 transportation impacts in California from the
25 repository.

1 As Commissioner Boyd indicated on
2 Monday, we're concerned about some of the roads in
3 California being used for federal waste, nuclear
4 waste shipments to and from facilities in Nevada.

5 The Energy Commission over the past
6 several years has urged DOE in its Environmental
7 Impact Review of the Yucca Mountain Project to
8 evaluate route-specific impacts in California from
9 proposed shipments.

10 California's nuclear waste laws, which
11 were passed in 1976, prohibit land use for new
12 nuclear power plant construction in California
13 until the California Energy Commission makes
14 findings that the authorized federal agency has
15 approved and there exists a demonstrated
16 technology or means for the disposal permanently
17 of these high-level wastes and for reprocessing
18 spent fuel.

19 The Energy Commission evaluated the
20 status of waste disposal and reprocessing
21 technologies in 1978 and concluded that no
22 operational and approved federal waste disposal
23 options existed.

24 This finding was reaffirmed in the
25 Energy Commission's 2005 Integrated Energy Policy

1 Report to the Governor and Legislature as well as
2 in a comprehensive consultant report, Nuclear
3 Power in California: Status Report. Copies of
4 that report are available outside.

5 In 2005 the Energy Commission conducted
6 public workshops on nuclear power issues and we
7 contracted with our consultant MRW and Associates
8 to provide a status report on nuclear power in
9 California.

10 The Energy Commission provided
11 recommendations to the Legislature and Governor on
12 nuclear issues as part of the 2005 Integrated
13 Energy Policy Report.

14 MRW and Associates has updated their
15 Nuclear Issues Status Report and we provided a
16 copy of this report online for public review.
17 We're asking for comments on this draft report by
18 July 13th.

19 Future California Energy Commission
20 activities on nuclear issues will include
21 preparing the AB 1632 Nuclear Assessment Report
22 Assemblyman Blakeslee's bill that was signed by
23 the Governor in 2006 requires the Energy
24 Commission to report to the Legislature in 2008 on
25 the vulnerability of large plants to seismic

1 events and plant aging, costs of accumulating at
2 reactors and assess policy and planning issues
3 that will affect the future role of nuclear power
4 in California.

5 We also will be coordinating and
6 preparing California's comments on draft federal
7 environmental impact statements for the Yucca
8 Mountain Project. And we will finalize the
9 California status report on nuclear power and make
10 recommendations and findings in the 2005
11 Integrated Energy Policy Report.

12 And last we will also continue working
13 with western state and national groups on federal
14 nuclear waste transport policy development and
15 planning. And now it's my pleasure to introduce
16 the Energy Commission's consultant on nuclear
17 power issues Dr. Robert Weisenmiller and Steve
18 McClary.

19 They're with MRW & Associates. And I'd
20 like to thank them and their staff, particularly
21 Laura Norin and Heather Mehta, for their help in
22 preparing the draft report and organizing this
23 workshop. And we look forward to today's
24 workshop. Thank you.

25 MR. McCLARY: Good morning, my name is

1 Steve McClary with MRW & Associates and I think
2 this morning we will dive right in if we may. The
3 focus this morning is on the state's operating
4 plants, how they're performing and, to some
5 degree, the future plans for those.

6 The state does rely on three nuclear
7 plants for a key part of its resource base, Diablo
8 Canyon owned by PG&E, the SONGS plant with
9 majority ownership and operation from Southern
10 California Edison and the Palo Verde plant in
11 Arizona operated by Arizona Public Service but
12 with substantial ownership by California
13 utilities.

14 We'll hear from representatives or those
15 concerned with all three of those plants this
16 morning. They are regulated by the Nuclear
17 Regulatory Commission. And we have
18 representatives from NRC here today.

19 To start I'd like to say we have a
20 couple of changes to the agenda as posted. The
21 first is that our first speaker Kevin Crowley of
22 the National Academies was to join us by audio
23 conference from Japan. Unfortunately accumulation
24 of the time difference and his travel plans
25 frustrated our attempts to do that. And we thank

1 Kevin for making a heroic attempt. We also thank
2 the staff for making a heroic attempt to bring an
3 international call to us this morning.
4 Unfortunately that's just not going to be able
5 work.

6 From the Nuclear Regulatory Commission
7 the agenda did not identify speakers at the time
8 it was originally posted. But we do have two
9 representatives, one of whom, Bill Jones, is
10 actually caught in Dallas, I believe it is, by the
11 rain in Texas. If you've been following what's
12 been going on down there. So he'll be joining us
13 by conference call. His colleague Samson Lee is
14 with us this morning and will lead off.

15 So just to lead into that, Bill Jones
16 who I believe is on the line and is able to join
17 us.

18 MR. JONES: That would be correct.

19 MR. McCLARY: Mr. Jones is serving as
20 the Acting Deputy Director in the Division of
21 Reactor Safety in the Region IV Office for the
22 Nuclear Regulatory Commission.

23 Since beginning his career with the NRC
24 he has held progressively more responsible
25 positions including Resident Inspector, Senior

1 Project Engineer, Senior Resident Inspector,
2 Senior Reactor Analyst and as a Chief in a
3 Reactors Project Branch.

4 He holds a Bachelor of Science Degree in
5 Nuclear Science from Virginia Tech. He was able
6 to join us two years ago when we addressed these
7 issues originally and we welcome him back. He'll
8 be joined by Mr. Samson Lee who is here with us in
9 the room.

10 Mr. Lee is the Acting Deputy Director
11 for the Division of License Renewal, which is
12 obviously a key issue as well for our plants.
13 That division is responsible for the review of
14 nuclear power plant license renewal applications.
15 Mr. Lee has been with the NRC for about 20 years
16 and has a PhD in Mechanical Engineering from MIT.
17 And we're very glad he could join us today. Thank
18 you again.

19 Mr. Jones if you'd like to lead off I
20 will get your slides up and running and you can
21 give the signal as needed.

22 MR. JONES: Okay, thank you very much.
23 As I was introduced this is Bill Jones. I'm with
24 the Region IV Office in Arlington, Texas.
25 Currently serving as the Acting Deputy Director in

1 the Division of Reactor Safety. With me today is
2 Mr. Samson Lee the Acting Deputy Director,
3 Division Director for License Renewal.

4 Again, I'd like to thank the California
5 Energy Commission and the individuals that put
6 this together for giving us the opportunity to
7 talk before you. I realize the importance of this
8 workshop and we're very glad to be able to
9 participate in it.

10 The NRC is the federal agency with
11 responsibility to license and regulate the
12 nation's civilian use of (inaudible) materials to
13 insure adequate protection of public health and
14 safety, (inaudible) assure the protection of the
15 environment.

16 We accomplish this through the
17 implementation of the NRC's independent licensing
18 and inspection process. As a result of that we
19 are the agency that oversees commercial use of
20 nuclear power and license those from commercial
21 facilities.

22 Sam and I are both pleased to be with
23 you and we will be providing an overview of the
24 Nuclear Regulatory Commission's activities for
25 this Integrated Energy Policy Report workshop.

1 The NRC is involved in some litigation
2 in the areas that were identified as part of the
3 workshop scope. I think we may be limited
4 (inaudible) questions but we will try to answer to
5 the best of our ability in each of those areas.

6 First Sam will be providing an overview
7 of the NRC's license extension process for power
8 reactors. But right there I'd like to turn it
9 over to Mr. Samson Lee. Sam.

10 DR. LEE: Thank you very much Bill.
11 Yeah, I'm going to talk about license renewal,
12 power plant license renewal process. Can I have
13 slide two please.

14 The Atomic Energy Act authorized the NRC
15 to issue a 40 year license. And it also allows
16 for license renewal.

17 And the NRC has performed extensive
18 research and has held public workshops to regulate
19 plant aging. And it concluded that the adequate
20 management of the effects of aging of the
21 equipment can maintain plant safety as plants age.

22 The license renewal rule is focused on
23 managing the aging effects of the plant equipment.

24 The NRC is also responsible under the
25 Plant National Energy Policy Act to consider

1 environmental impacts.

2 So far the NRC has granted renewal
3 licenses for additional 20 years for about half of
4 the operating reactors. Can I have slide three
5 please.

6 The license renewal will consist of two
7 parallel paths. License safety review, this is on
8 the aging of the equipment and the management of,
9 and the environmental review which is to determine
10 the environmental impacts.

11 Can I have slide four please. License
12 renewal again is focused on managing the aging
13 effects of plant equipment for license renewal.
14 And the current regulatory requirements and
15 oversight continue.

16 For example, emergency planning,
17 security and plant performance those are subject
18 to current requirements and that will continue.

19 If issues come up in these areas today
20 the NRC will deal with them now and NRC will not
21 wait for license renewal. And I also want to add
22 that there are now two petitions for rulemaking in
23 front of NRC to consider the impact of tourism on
24 spent fuel pool.

25 They've been filed by the California and

1 Massachusetts Attorney Generals. For the
2 Massachusetts petition the public comment period
3 has closed. And for the California petition the
4 public comment period will close in July.

5 The NRC will evaluate these petitions
6 and the public comments. Can I have slide five
7 please.

8 This is a simplified diagram of the
9 license renewal process. The top portion shows
10 the safety review and also shows an independent
11 review by the Advisory Committee on behalf of the
12 safeguards.

13 The lower portion of the curve shows the
14 environmental review and the dashed lines shows
15 that if a hearing had been granted the Atomic
16 Safety and Licensing Board will conduct hearings.
17 Can I have slide six please.

18 This shows the license renewal
19 principles. The first principle is that the
20 current regulatory process is adequate to ensure
21 plant safety.

22 The second principle is that the plant's
23 current licensing basis, that is the regulatory
24 requirements and any commitments, will continue
25 during license renewal with the added requirement

1 for aging management which is the focus for the
2 license renewal rules. Slide seven please.

3 For the safety review the staff will
4 review the application and we also audit on-site
5 documentation that supports the application. The
6 staff documents the result of the review in the
7 safety evaluation report.

8 And also NRC staff will conduct on-site
9 license renewal inspections. Separate from the
10 staff's review the Advisory Committee on Reactor
11 Safeguards conduct their own independent review.

12 This committee is actually specified in
13 the Atomic Energy Act and it consists of a panel
14 of experts and they report directly to the
15 Commission. Can I have slide eight please.

16 This shows the environmental review. As
17 far as the environmental review the NRC staff will
18 hold meetings with the public to gather the
19 comments on the environmental issues related to
20 the plant.

21 And the NRC staff will also consider
22 information from federal and state agencies. And
23 we document our results in the Environmental
24 Impact Statement. As I choose to be specific, we
25 are completing a generic environmental impact

1 statement. We will prepare a plant-specific
2 supplement to the generic environmental impact
3 statement. Can I have slide nine please.

4 This shows some typical milestones. And
5 it shows the opportunity for hearings. It shows
6 the environmental, safety and independent review
7 schedules, typical schedules. Can I have slide
8 ten please.

9 This shows the opportunity for public
10 involvement. We try to have a very open license
11 renewal process to the public. And these
12 opportunities are also open to the state and local
13 government.

14 These are lists of meetings that the
15 public can participate, observe and provide
16 comment. In addition, for the State of New Jersey
17 they also observe NRC license renewal inspections
18 through a memorandum of understanding with the
19 NRC.

20 And regarding the experience in license
21 renewal hearings, the public, including state and
22 local governments, that raise an issue in license
23 renewal applications. However most of these
24 issues are outside the scope of license renewal,
25 such as emergency planning and security.

1 Regarding once-through cooling system
2 for the Vermont Yankee Plant. The public had
3 raised an environmental issue relating to the
4 impact of thermal discharge of the once-through
5 cooling system.

6 And the Commission had determined -- has
7 decided to defer this issue to the state because
8 the state issues the national pollutant discharge
9 elimination system permit through the Clean Water
10 Act.

11 The first case that is starting on a
12 hearing relates to the issue of aging management
13 of the containment structure at the Oyster Creek
14 Plant. That'll be the first. Can I have slide 11
15 please.

16 The Commission makes a decision based on
17 the staff's review and the advice from the
18 Advisory Committee on the other safeguards and the
19 results of the hearing if a hearing is conducted.

20 Although NRC has a 40 year issue with
21 new licenses this is only one of the conditions
22 for the plant to continue to operate beyond year
23 40. For example, a utility may need state permits
24 for the national pollutant discharge elimination
25 system and coastal zone management.

1 In addition the state would have to
2 decide whether it is economical to operate beyond
3 year 40. And the Commission schedule is typically
4 22 months if there's no hearing granted and 30
5 months if there's hearings conducted. And that
6 concludes my presentation.

7 MR. JONES: Okay, thank you Sam. I'll
8 go ahead and proceed with my areas of discussion
9 and then Sam and I will take questions from the
10 Commission.

11 Again, this is Bill Jones. The areas
12 that I will be addressing are just to provide the
13 workshop with an update on California plants, San
14 Onofre Nuclear Generating Station and the Diablo
15 Canyon Power Plant as well as the Palo Verde
16 Nuclear Generating Station.

17 Some discussion of the design basis
18 threat, which was a vitiated rule in March of this
19 year.

20 Discussion of high-level waste, our
21 activities in that area.

22 Just a brief discussion on the Global
23 Nuclear Energy Partnership. Where we stand
24 relative to that. And a brief overview of new
25 reactors from an organizational -- the operating

1 life of the, the bottom line process.

2 The NRC's reactor oversight process as
3 it relates to the two facilities in California and
4 Palo Verde is actually the same process that is
5 used nationwide. It's referred to as our reactor
6 oversight process.

7 In 2005 when I had the opportunity to
8 talk before the Commission also I went into more
9 detail into our oversight process. I'd be glad to
10 do so but in respect to time I will just touch on
11 those aspects that reflect on the performance of
12 the two California plants and Palo Verde.

13 The NRC conducts independent inspections
14 of all the nation's commercial nuclear power
15 plants. The NRC has resident inspectors at each
16 of the licensed facilities, 104 power plants.
17 These individuals are responsible for the day-to-
18 day inspection activities at that facility. These
19 individuals live in the area and are part of the
20 community around each of these plants.

21 In addition these inspectors are
22 assisted by regional inspectors with different
23 specialties including emergency preparedness,
24 security and engineering disciplines, to form what
25 we refer to as the baseline inspection program.

1 This baseline inspection program is at each of our
2 licensed facilities.

3 The NRC has provided a process where the
4 inspection findings are available on the Internet
5 under the worldwide web.nrc.gov. Part of this
6 process is the NRC assessment of the licensee's
7 performance.

8 Information that is used in that overall
9 assessment process is also available on the
10 worldwide web at nrc.gov. So the public has
11 access to the same information the NRC is using to
12 make its regulatory decisions. How we classify
13 the performance on each of the nation's power
14 plants.

15 The NRC performs an assessment of, an
16 assessment at each of these licensees during the
17 end-of-cycle review and also during the mid-cycle.
18 And then on a continuing basis as needed during
19 the year.

20 This overall process is described in our
21 inspection manual chapter 0305. And that document
22 is also available publicly on the NRC website.

23 It's referred to as the Operating Reactor
24 Assessment Program.

25 With regard to Diablo Canyon, the NRC

1 conducted independent inspection activity and as a
2 result of those inspection activities the NRC
3 found that Pacific Gas and Electric had operated
4 Diablo Canyon in a manner that protected the
5 health and safety of the public and was assessed
6 to be performing in the licensee response column
7 of the NRC's regulatory action matrix.

8 This level of assessment provides that
9 the NRC will perform our baseline inspection
10 program, which as I indicated is performed at each
11 of the nation's power plants.

12 Previously the NRC had identified a
13 cross-cutting theme involving human performance
14 for the adequacy of design documentation and
15 procedures. Based on our latest assessment the
16 NRC has assessed that this cross-cutting theme
17 does not exist at the Diablo Canyon Power Plant.

18 In addition the licensee is planning
19 steam generator replacement for both units 1 and
20 2. Unit 2 is scheduled for 2008 and unit 1
21 scheduled for 2009.

22 NRC will conduct inspection activities
23 specific to the steam generator replacement to
24 ensure the integrity of the steam generators and
25 reactor cooling system and we will provide the

1 results of that inspection in our inspection
2 report which will be available (inaudible).

3 In regard to the Diablo Canyon
4 independent fuel, spent fuel storage facility.
5 The NRC issued a material license in 2004 for 20
6 years. The NRC inspectors observed the
7 construction of the ISFSI pad.

8 During this period a petition was
9 provided to the US Court of Appeals, the Ninth
10 Circuit Court of Appeals, to have the NRC consider
11 acts of terrorism in the environmental review.

12 The Ninth Circuit Court of Appeals did
13 find that the NRC cannot categorically refuse to
14 consider consequences under the National
15 Environmental Policy Act and remanded the case to
16 the NRC.

17 The Commission issued a memorandum and
18 order in February of this year directing the staff
19 to prepare a revised environmental assessment for
20 the likelihood and consequences of terrorism
21 activity or a terrorist act.

22 The NRC has completed this draft
23 environmental assessment and came up with a
24 finding of no significant impact were referred to
25 as a finding.

1 This document or this draft policy is
2 currently open with public comment closing on July
3 the 2nd of this year.

4 The results of the NRC's review in this
5 draft environmental assessment was that the staff
6 found the construction, operation and
7 decommissioning of the Diablo Canyon ISFSI, even
8 when potential terrorist activities on the
9 facility are considered, would not result in a
10 significant affect upon the environment.

11 with regard to the San Onofre Generating
12 Station the NRC staff found based on our
13 independent inspections and assessments that
14 Southern California Edison operated the San Onofre
15 Generating Station in a manner that preserved
16 public health and safety and protected the
17 environment.

18 The licensee was assessed to be in the
19 licensee's response column of our action matrix.
20 And this again provides for the baseline
21 inspection program as provided for each of the
22 nation's power plants.

23 In addition the NRC will provide
24 inspection of the plant's steam generator
25 replacement scheduled for 2009 and 2010 on units 2

1 and 3 respectively.

2 With regards to Palo Verde Units 1, 2
3 and 3. Palo Verde unit 1 and 2 were both operated
4 in a manner that preserved the public health and
5 safety and met the cornerstone objectives with
6 moderate degradation and safety performance.

7 Unit 3 was operated in a manner that
8 preserved the public health and safety and the
9 cornerstone objectives were met. However the
10 performance was then what is referred to as the
11 multiple repetitive degraded cornerstone. And
12 these terms are more definitively defined in the
13 manual chapter, inspection manual chapter 0305,
14 operating reactor assessment program.

15 Since the finding and the assessment was
16 that the performance was in the multiple
17 repetitive degraded cornerstone, the cornerstone
18 areas I should point out essentially lie in three
19 different areas of reactor safety, radiation
20 safety and safeguards. And in this case the
21 specific cornerstone that was affected was the
22 mitigating systems.

23 As the NRC found that the licensee was
24 in the multiple degraded or repetitive degraded
25 cornerstone we will be implementing what is

1 referred to as our supplemental inspection
2 process. Specifically we will be implementing
3 inspection procedure 95003. This is essentially a
4 diagnostic review of the licensee's performance
5 relative to unit 3.

6 However because many of these
7 performance aspects that resulted in unit 3 being
8 at this degraded cornerstone, multiple degraded
9 cornerstone, are (inaudible) to inspect Units 1
10 and 2, those units will also be included.

11 The NRC staff has conducted a public
12 interest on the 95003 inspection activities near
13 the site. Typically this inspection is to perform
14 an independent diagnostic review of the program
15 processes used by Palo Verde to operate the plant
16 and to determine the extent of safety,
17 organizational and programmatic issues.

18 The focus areas will include whether
19 Palo Verde can identify, evaluate and correct
20 performance issues, the adequacy of the Palo Verde
21 Program and processes to operate and maintain the
22 units, the causes and corrective actions for the
23 two performance deficiencies, the yellow and white
24 findings on unit 3 which resulted in being in the
25 multiple repetitive degraded cornerstone, and

1 establishing a site safety culture.

2 I'd like to point out that the site
3 safety culture is a very important aspect of the
4 NRC's review as part of our 95003 inspection
5 process. And that we have actually --

6 Following our meeting with the licensee
7 in the area of the facility as part of our
8 interest to this section activity The NRC has
9 issued a confirmatory action letter to Arizona
10 Public Service that specifically identifies five
11 areas for their action.

12 Within these five areas there were
13 additional sub-activities but I would like to at
14 least provide an overview of those five areas.

15 The first is to complete actions to
16 address the root causes and contributing causes
17 identified in their evaluation in response to the
18 yellow findings associated with the boiler
19 containment subsection for all three units, and
20 the white findings associated with the unit 3
21 (inaudible) generator electrical relay problem.

22 The second area is to complete
23 corrective action that will result in sustained,
24 improved performance in the cross-cutting areas of
25 human performance and problem identification

1 resolution. And inevitably it identifies specific
2 action (inaudible).

3 To complete an independent, third-party,
4 safety culture assessment by September 15, 2007.
5 As I indicated the NRC inspection team has already
6 begun our reviews in this area.

7 The fourth area is to incorporate the
8 results of their in-depth evaluation and of their
9 safety culture assessment prescribed per the
10 third-party review. And to submit the portions of
11 a modified improvement plan that impacts the
12 reactor safety strategic performance area,
13 including the safety culture improvement
14 initiative by November 30th of this year.

15 The NRC also held a town hall meeting in
16 the local area around the plant to gain insight
17 and to inform the residents and other interested
18 individuals of the overall activities of the NRC
19 and its involvement in Palo Verde.

20 Once the 95003 inspection is completed
21 the NRC will issue a modification to the
22 confirmatory action letter that I just referred
23 to, to identify any additional or modify any
24 actions that we've identified.

25 Now the NRC understands that all the

1 problems will not have been completed, corrective
2 action completed by the time we complete our
3 inspection to be associated with the 95003
4 inspection activity. However we do fully expect
5 to see that the licensee's improvement plan is
6 being implemented and that those actions are shown
7 to be effective.

8 A reasonable question would be what if
9 the licensee does not continue to show improvement
10 in this area? And although the licensee is
11 currently within the multiple degraded cornerstone
12 there are additional actions the NRC can take as
13 prescribed in the action matrix in the manual
14 chapter 0305, which includes the unacceptable
15 performance column.

16 An unacceptable performance represents
17 situations in which the NRC lacks reasonable
18 assurance that the licensee can or will conduct
19 its activities to ensure protection of the public
20 health and safety.

21 And such examples would include
22 multiple, significant violations of the facility's
23 license and technical specifications, regulations
24 or orders, loss of confidence in the licensee's
25 ability to maintain and operate the facility in

1 accordance with the design basis.

2 Now a pattern of failure of licensee
3 management controls to effectively address
4 previous significant concerns to prevent the
5 reoccurrence ordered sometime during the next --
6 we're going to process the licensee were to find
7 that they also should not be or choose to shut the
8 facility down.

9 The NRC does have a section, manual
10 chapter 030, excuse me, 350 process which
11 describes the NRC's activities associated with a
12 plant that is in a shut down condition. This
13 includes regular meetings of the NRC's senior
14 management officials to overview the licensee's
15 activities prior to restarting again at the
16 facility.

17 With that I'd like to move on to the
18 design basis threat. In March of this year the
19 NRC issued the design basis threat rule under 10
20 CFR part 73 which looked at the advisory,
21 adversary characteristics and the ability of a
22 private security force to defend against those
23 actions.

24 Part of the design basis threat review
25 involved the 12 points that were identified in the

1 Energy Act of 2005. And in the NRC's Federal
2 Register Volume 72, number 52, shown on pages
3 12705, each of those 12 points is specifically
4 discussed.

5 The NRC did make the modification
6 changes to the design basis threat but largely it
7 reflects the orders that the NRC had put out
8 following the September 11 attack on the country,
9 which includes areas such as additions to the
10 security plans, training qualifications and
11 continued the actions, as well as coordination
12 with local, state and federal enforcement
13 agencies.

14 From an overall standpoint the security
15 at the nation's nuclear power plants, although it
16 was substantial prior to September 11, has further
17 been strengthened through the orders that have
18 been issued as well as the actions or activities
19 associated with the design basis threat of rule
20 (inaudible).

21 Also I'd also like to point out that the
22 NRC has been involved in looking at activities,
23 terrorist attacks along nuclear facilities which
24 included loss of large areas and the mitigating
25 strategies associated with that. These factors

1 have been incorporated into the rule.

2 In addition, although the rules do not
3 specifically address the independent spent fuel
4 storage facilities, those facilities are covered
5 under the orders that had previously been issued
6 and as such the requirements for those facilities
7 are also (inaudible).

8 Moving on I'd like to briefly talk about
9 the High-level Waste Policy Act. In 1982 the US
10 policy act on high-level waste was issued. And
11 the act covered several areas in that the high-
12 level radioactive waste to be disposed of in the
13 underground in a deep geological repository. It
14 identified Yucca Mountain, Nevada as the single
15 candidate site.

16 The Department of Energy was identified
17 with the responsibility for developing the
18 repository. And EPA was responsible for
19 developing the environmental standard for this
20 repository. The NRC then is responsible for
21 developing the regulations to implement the EPA's
22 safety standards and for licensing this
23 repository.

24 As I indicated the NRC has the statutory
25 and licensing role as amended under the Policy Act

1 of 1982. The main responsibilities include to
2 serve as an independent regulator with oversight
3 responsibilities for Yucca Mountain, to set the
4 licensing criteria consistent with the US
5 Environmental Protection Agency's standards for
6 Yucca Mountain, to complete the safety review of
7 the Department of Energy license application, to
8 make a construction authorization decision on the
9 Department of Energy's license application in
10 three to four years, and to adopt the
11 environmental impact statement prepared by DOE for
12 Yucca Mountain to the extent practical.

13 And also we have been working to develop
14 and maintain the licensing support network and to
15 also performing the formal nuclear hearings in
16 regard to Department of Energy licenses.

17 It's important that the NRC has not
18 received an application from the Department of
19 Energy. The current timeline for that submission
20 as we understand it is June of 2008. With that
21 there will of course be the required review and
22 hearings associated with that before any decision
23 is made as to whether or not to license Yucca
24 Mountain.

25 With regard to the current storage

1 capacity. If Yucca Mountain were to be licensed,
2 essentially my understanding, it could cover the
3 current waste for the US facilities. And any
4 changes in US policy on high-level wastes,
5 including reprocessing, would affect that overall
6 capacity. But as I did indicate the NRC has not
7 received an application from the Department of
8 Energy although we have indications that we may
9 get it in June of 2008.

10 With regard to the Global Nuclear Energy
11 Partnership. This is the Department of Energy's
12 profit-developed systems. Technologies and policy
13 regimes to allow recycling of used light-water
14 reactor fuel and eliminate the -- (inaudible) fast
15 burner reactors. Overall we understand it like
16 it's a consolidated fuel treatment system, an
17 advanced burner reactor and advanced fuel cycle
18 fuel facility.

19 Commissioner Lyons provided a speech on
20 this topic in June of this year and it is publicly
21 available. Overall the NRC has not determined
22 what stage our involvement would be in this Global
23 Nuclear Energy Partnership. But the improvised
24 framework would be essentially to -- our
25 activities could possibly include the framework,

1 guidance, the training of qualified staff and
2 inspection activities.

3 In addition we're also looking at how
4 the National Environmental Policy Act would fit
5 into the Global Nuclear Energy Partnership.

6 Next I'd like to address the new
7 reactors. The NRC -- The Energy Policy Act of
8 2005, this act authorized for federal risk
9 insurance for the next six nuclear plants for
10 delays associated with NRC reviews. I believe
11 it's on the order of 500 million for the first two
12 and then 250 million for the next four.

13 Nuclear, it also provided for nuclear
14 energy production credits for the first 6,000
15 megawatt electrics for advanced reactors and
16 authorized approximately \$3 billion in nuclear
17 research and development to support the next
18 generation nuclear plant and Department of
19 Energy's Nuclear Power 2010 Program.

20 The NRC has been actively involved for
21 the last several years in providing a new reactor
22 organization. This is located in our headquarters
23 office, as well as providing for construction
24 staff and development of procedures in our Region
25 II Office.

1 These organizations are in place.
2 Mr. (inaudible) at the NRC has provided updated
3 standard review plans and is finalizing the 10 CFR
4 Part 52, which is the rule that would provide for
5 early site permitting, design certification and
6 the combined license.

7 The NRC has been working to improve the
8 overall licensing process. And this is available
9 also on site, excuse me, on our website. But it
10 looked at a design-centered review approach. It
11 raises the NRC issue that a regulatory information
12 summary 2007/08 which discusses our design-
13 centered review approach as a one-issue, one-
14 review, one-petition approach.

15 In addition the NRC has provided design
16 certification for four reactors. We're looking at
17 six early site permanent applications and possibly
18 19 combined license applications.

19 10 CFR 52 license rule provides for the
20 enhancement of the design certification early site
21 permit and the combined license process.

22 Overall on our public website the NRC
23 does provide an overall timeline for the combined
24 license review including the preliminary
25 activities associated with the early site

1 permitting, the activities associated with the
2 design reviews and also the combined license.

3 And in addition the NRC is currently
4 developing what is referred to as the ITAACs.
5 These are the inspection task analysis acceptance
6 criteria which will be part of the overall
7 certification of the construction of a facility
8 and for verification that the plant was built as
9 provided.

10 With that the NRC does have some
11 additional discussions, talking points on new
12 reactors. And as I indicated these -- the
13 process, the timeline and in many cases the
14 applications that are pending are provided on our
15 website at nrc.gov.

16 With that I'd like to conclude my
17 discussion and provide for any questions or
18 answers that we can.

19 MR. McCLARY: Thank you Bill.

20 PRESIDING MEMBER PFANNENSTIEL: Thank
21 you Mr. Jones and Mr. Lee. Very content full.
22 Questions from the dais? Commissioner Boyd.

23 COMMISSIONER BOYD: Again, thank you
24 Mr. Jones and thank you for again in two years of
25 testifying to our Commission. And Mr. Lee thank

1 you for your presentation. I have three areas I
2 want to cover.

3 First will be Palo Verde. And I want to
4 thank you for your detailed discussion of the
5 current situation there. It's complex both in
6 terms of the language we use in this business and
7 the citations to all the various codes and
8 chapters and what have you.

9 I just want to make a comment on this.
10 Of course as the State Liaison Officer for
11 California I've been following this rather
12 closely. And the events of the last couple of
13 weeks which you did detail, I appreciate that, I
14 just want to indicate to you and to folks here
15 that in simple terms the NRC moved Palo Verde,
16 particularly unit 3 from, what we say, column 4,
17 from column 3 to column 4. There's only one
18 column left. And that becomes as discussed,
19 unacceptable performance and possible shut down.

20 It's unclear to me whether this
21 potential shut down of unit 3 or the whole
22 facility. And I know there's a long process and
23 we're talking about many months into the future.

24 But unless indicated, for the first time
25 in the roughly five years I've been doing this I

1 contacted the management of the California
2 Independent System Operator to just suggest that
3 if they hadn't put this incident on their watch
4 list, which they had not although they were aware
5 of it, that they probably should because here in
6 California we worry about who's providing our
7 electricity supply present and future. And shut
8 down of one unit or shut down of the whole
9 facility would be a rather significant event.

10 So, while this is not meant to imply
11 there is an impending problem it's just meant to
12 inform our management here that we're being
13 cautious and thinking into the future. So I thank
14 you for being very complete in your discussion of
15 the fact that we do have an issue there that
16 hopefully will get better but it is an issue of
17 concern.

18 Secondly on SONGS, there has been a
19 recent incident. And I might not have brought it
20 up except this morning while watching the morning
21 news, more interested in what's happening up at my
22 beloved Lake Tahoe than anything else, there was a
23 banner headline across the, or I guess a footline
24 across the TV screen talking about the recent
25 SONGS incident and of course the cryptic language

1 of instant media was not very descriptive and
2 could lead the public to be a little concerned. I
3 wonder if you might want to mention what's going
4 on at SONGS.

5 MR. JONES: Certainly. As you indicated
6 there was an event at SONGS Unit 2 that involved a
7 loss of non-safety related air system.
8 Essentially a pipe associated with the air system
9 failed. This resulted in a loss of air to a
10 regulating valve that was feeding the or providing
11 the control for feed water to the big generator.

12 The licensee manually tripped the
13 reactor because of the loss of (inaudible) to a
14 safe condition. As a result of that event the NRC
15 has, as part of our inspection process, I
16 described the baseline section, we referred to the
17 supplemental inspection process which will remain
18 at Palo Verde.

19 In addition we have a reactive process
20 that we looked at. We performed a review of that
21 event to determine that we would be conducting a
22 special inspection at SONGS which is currently
23 underway. That special inspection will be
24 completed within likely the next week or so. And
25 from that the NRC will be issuing an inspection

1 report which will be put onto our public website
2 and available to all to look at.

3 It is an area of concern to us. We did
4 determine that the event was of a nature that we
5 did want to perform a special inspection. We have
6 initiated that inspection. In addition the
7 charter, the scope of the activities the
8 inspectors will be involved in is available
9 through our (inaudible) and that can also be found
10 at our website. Thank you for bringing that up.

11 COMMISSIONER BOYD: Thank you. And my
12 last question is either to you or Mr. Lee.
13 Mr. Lee referenced aging management or aging
14 deficiencies as we talk about the relicensing of,
15 potential relicensing of existing plants. And I
16 just want to ask kind of general question about
17 your experience since in this country in the last
18 few years we've hit the 40 year line for several
19 plants and there have been relicensing activities.
20 And undoubtedly California's plants are getting
21 near the end of their license lifetime.

22 I'm wondering in this area of aging of
23 components at facilities if you or your agency is
24 observing aging to be somewhat of a linear thing.
25 That is things just get old over time so to speak.

1 Or are you finding aging to be variable depending
2 upon individual components? Or are you finding no
3 consistency in what you see as aging of facilities
4 from plant to plant or from similar types of
5 equipment to similar types of equipment or
6 manufacturer to manufacturer?

7 DR. LEE: Yeah, Bill, I can try to
8 answer that. What we have seen so far is that
9 that is not, aging is not unique to license
10 renewal. So you have corrosion, you know, pretty
11 much, so you're kind of seeing that. So it's not
12 really unique.

13 For license renewal, for the age of
14 management what we have seen so far is a lot of
15 plants, they put in more inspections programs or
16 more maintenance programs. They might commit to
17 more replacement, more analysis. So it's not
18 really unique. But now they have to be more
19 careful. They need to, you know, keep an eye on
20 it.

21 COMMISSIONER BOYD: Okay, thank you,
22 That's all.

23 PRESIDING MEMBER PFANNENSTIEL: Yes,
24 Commissioner Byron had a question. Commissioner
25 Geesman.

1 ASSOCIATE MEMBER GEESMAN: I too want to
2 thank Mr. Jones and Dr. Lee for being here today.
3 I think that it greatly contributes to our efforts
4 to have a better understanding of the subject
5 area.

6 I have two general areas of inquiry to
7 Dr. Lee. You mentioned in your comments and I
8 believe you may have been speaking of the Oyster
9 Creek proceeding but you mentioned that your
10 commission would defer to the state in the NPDES
11 permit. Did I get that correct?

12 DR. LEE: That's correct. That is on
13 the Vermont Yankee case.

14 COMMISSIONER BYRON: And on a more
15 generic basis, meaning all of the plants that you
16 see, would it be your intention to defer to the
17 states in the NPDES permit issuing process?

18 DR. LEE: Actually if you read the
19 Vermont Yankee the decision, the Commission
20 actually made it very clear that they would
21 actually defer.

22 ASSOCIATE MEMBER GEESMAN: My reading of
23 the Riverkeeper Circuit Court decision would
24 indicate that, if in fact there is a conflict
25 between the safety requirements of the NRC and the

1 environmental requirements of the NPDES permit
2 that the NRC's concerns would, in fact, prevail
3 under those circumstances. So I wonder if you
4 could elaborate how you envision this deferral
5 process working.

6 DR. LEE: The deferral, the way I see it
7 is that this deferral relates to the environmental
8 impact. For safety there is a certain safety
9 requirement that the plant needs to meet. By
10 meeting the safety requirement but if it cannot
11 meet the environmental impact like the, the charge
12 permit then they can not operate.

13 ASSOCIATE MEMBER GEESMAN: So would it
14 be correct for me to conclude that a state has a
15 pretty free range of discretion in its NPDES
16 decision making as long as it does not come into
17 conflict with one of your safety requirements.

18 DR. LEE: It depends. They might be
19 different because the safety requirements is to
20 operate safely you need to meet this requirement.
21 But if you cannot get a state permit to operate in
22 that way you just can not operate. We do not want
23 an unsafe plant.

24 ASSOCIATE MEMBER GEESMAN: And do you
25 envision these decisions or determinations being

1 made on a plant-by-plant basis or would you
2 envision a more generic rulemaking process at the
3 NRC.

4 DR. LEE: I think this is in the
5 existing rules. If you read the Vermont Yankee
6 the decision. That's how the Commission is
7 interpreting the existing rule.

8 ASSOCIATE MEMBER GEESMAN: Thank you.
9 The second area that I wanted to inquire of you
10 relates to how your process intersects or overlaps
11 with the Institute of Nuclear Power Operation,
12 INPO. We were referred earlier this week in the
13 workshop that we held by Dr. Charles Ferguson in
14 our discussions of how we might create a better
15 international safety culture or level of
16 confidence in the safe operations of nuclear
17 plants around the world. Professor Ferguson
18 suggested INPO as a good model to develop that
19 confidence. And I wonder in your process what
20 intersection or overlap may exist with the INPO
21 process.

22 MR. JONES: Well.

23 DR. LEE: Yeah, Bill, you can talk about
24 that.

25 MR. JONES: This is Bill Jones again.

1 The NRC has a memorandum of understanding with
2 INPO as to how we will conduct our activities.
3 The NRC, of course, our inspection activities
4 looks at many of those activities that INPO is
5 also.

6 We do not directly follow INPO findings.
7 We don't necessarily follow up on those
8 activities. But we are aware of the type of
9 issues that are being identified. And to look at
10 it from the perspective of what type of issues
11 does the INPO evaluation for example of a facility
12 provide any other insight that we may not have.

13 We do consider that. Resident
14 inspectors are typically the point of contact for
15 that interface. In addition the, we don't follow
16 up specifically on the INPO findings but we do
17 make sure that we have an understanding of what
18 they're (inaudible).

19 In addition INPO has data available on
20 equipment performance and we do have access to
21 that through an agreement. That we can use then
22 for insight in inspections but we don't
23 necessarily refer to that specifically. You will
24 not or should not see specific references to INPO
25 documents in any of our inspections. We did

1 utilize some of that information in our planning
2 and moving forward.

3 The relationship has evolved over time
4 where licensees, excuse me, INPO does in-plant
5 evaluations. We don't get involved directly with
6 -- For example if they were looking at a
7 surveillance activity we would not look
8 specifically at that surveillance and allow them
9 to operate independently. And they do the same
10 for us is we're looking at specific surveillance
11 situations for example.

12 But we do understand and communicate
13 what the understanding the INPO findings, what the
14 significance of what they're looking at actually
15 is. But as I indicated there is a memorandum of
16 understanding. And the relationship has evolved
17 over time and has proven to be very effective in
18 that it does provide an independent review of
19 these licensees and we are provided with that the
20 information and the overall assessment. Does that
21 answer your question?

22 ASSOCIATE MEMBER GEESMAN: Yes it does.
23 I guess if I could follow up with a somewhat more
24 general one. What would be your advice to a state
25 regulator in terms of trying to establish a level

1 of confidence in either existing plants or the
2 prospect for license extensions in the actual INPO
3 results.

4 MR. JONES: That would have to be --
5 From a state regulator that would have to be an
6 agreement that you would have to talk to with INPO
7 itself. However, such as the state of Illinois
8 does have their own inspectors and we have a
9 memorandum of understanding where we share
10 information. They actually on occasion
11 participate in recovery inspection activities.
12 And those are agreements that have previously
13 we've worked out. And if the state of California
14 was interested in doing such a thing we'd have to
15 look at working out that type of agreement.

16 ASSOCIATE MEMBER GEESMAN: Thank you
17 very much Mr. Jones.

18 PRESIDING MEMBER PFANNENSTIEL:
19 Commissioner Byron.

20 COMMISSIONER BYRON: Thank you both for
21 being with us today. Dr. Lee I was wondering if
22 you could answer a few questions for me with
23 regards to license renewal of our nuclear
24 generating capacity that we rely on. I'm not sure
25 exactly, I think Diablo Canyon and SONGS are in

1 the vintage of about 25 years old right now. I
2 think Palo Verde is obviously a little newer.
3 Have you had any indication at this point for or
4 have you received applications for license renewal
5 from any of these nine units?

6 DR. LEE: We have not received an
7 application and they have not expressed an
8 interest to NRC.

9 COMMISSIONER BYRON: Okay. Do I have it
10 about right on the dates, about 25 years old.
11 Well I suppose we can get into these with the
12 operators as well.

13 DR. LEE: I think that's about right.

14 COMMISSIONER BYRON: You had indicated
15 about half of the operating reactors have received
16 license renewal, have been granted extensions.

17 DR. LEE: That is correct.

18 COMMISSIONER BYRON: Have any license
19 renewal applications been denied at this point?

20 DR. LEE: We have not denied an
21 application, however we have returned one
22 application because of the quality. And we also
23 delayed the review of one application because of
24 the support.

25 COMMISSIONER BYRON: Because of --

1 DR. LEE: Inadequate support on the
2 applicant.

3 COMMISSIONER BYRON: And can you tell me
4 typically when you grant a license renewal
5 extension or a license extension are there any
6 operating and maintenance requirements that are
7 imposed on the plants that might affect output or
8 its ability to be dispatched?

9 DR. LEE: The additional requirements
10 are on age management programs so they'll commit
11 to more inspections, more analysis. But I haven't
12 seen anything that affects the output of the
13 plant.

14 COMMISSIONER BYRON: Okay, thank you.

15 PRESIDING MEMBER PFANNENSTIEL: Again I
16 want to express our appreciation for both members
17 of the NRC to be here and help us on this
18 difficult issue. Why doing I turn it back to
19 Mr. McClary and see where we're going here.

20 MR. JONES: This is Bill Jones I would
21 again like to express our appreciation for being
22 allowed to participate in this process from our
23 standpoint also. And also for you making the
24 accommodations to allow me to participate by phone
25 after my attempts to get to Sacramento yesterday,

1 the cancellation of my flight at 11:30 last night.
2 Your staff worked very well with me and I do
3 deeply appreciate it.

4 The NRC is involved in a lot of
5 activities, as you're well aware of. But from the
6 Chairman, the Commission, the senior management
7 and the NRC staff, although we're involved in new
8 reactors and activities and development of those
9 organizations, the staff's focus remains on
10 assuring safe operation of the nation's nuclear
11 reactors. And that includes San Onofre, Diablo
12 Canyon and Palo Verde. I see that day to day in
13 our discussions that the Chairman has with the
14 staff and meetings we have with the Commission.
15 And if our staff's performance are being the basis
16 (inaudible).

17 Again I appreciate the opportunity to
18 talk with you and I just wanted to let you know we
19 do take our job very seriously, working hard to
20 ensure the safe operation of those plants or take
21 action a is necessary to ensure that they're
22 operating safely or not at all. Thank you.

23 PRESIDING MEMBER PFANNENSTIEL: Well
24 again thank you Mr. Jones, especially for your
25 extra efforts to participate. It's very important

1 to us here. You're critical partners with us in
2 this evaluation.

3 COMMISSIONER BOYD: Mr. Jones, this is
4 Commissioner Boyd. Please give my regards to Bill
5 Maier of your staff there who's been a good,
6 excellent liaison with us here in the state of
7 California.

8 MR. McCLARY: Well thank you and with
9 that we'll return to individual plants, focus
10 there and we'll start off with Palo Verde. We
11 have with us today Mr. Steven Olea. He's the
12 Assistant Director of the Utilities Division at
13 the Arizona Corporation Commission.

14 He's been with the Commission since 1983
15 and Assistant Director of the Utilities Division
16 since 2000, represents the Commission on several
17 task forces and commission regional agencies. And
18 we're very glad to have him with us today to talk
19 about Palo Verde.

20 MR. OLEA: Yes, good morning Chairman
21 and Commissioners. Again, I'm Steve Olea of the
22 Arizona Corporation Commission staff. And I'm one
23 of two assistant directors there in the Utilities
24 Division. And I'd like to thank you for inviting
25 me to be part of this workshop today.

1 And let me get my glasses on to see what
2 slide is up for me. And if we could just go to
3 the third slide when you get there. The second
4 slide is just my disclaimer that I do work as part
5 of the staff there. And the Arizona Corporation
6 Commission is made of five statewide elected
7 officials. And in my capacity here today I am not
8 speaking for them. So any opinions you hear today
9 are mine and not those of the commissioners or the
10 staff.

11 In particular with the Palo Verde
12 Nuclear Generating Station it's made up of three
13 units. Units 1 and 2 currently have a capacity of
14 about 1,410 megawatts gross and 1,340 net. And
15 Unit 3 is at its original capacity of 1,300
16 megawatts gross and about 1,225 net. And those
17 are approximate numbers.

18 And the reason for the differences is
19 that on Units 1 and 2 they already have had their
20 steam generators replaced and Unit 3 is going to
21 have its steam generators replaced this fall. So
22 it will have an extended outage this fall. They
23 are estimating about 100 days to get all that
24 done.

25 Currently Unit 1 is down for a planned

1 refueling outage. And that's, currently the
2 refueling outage is without the steam generator
3 replacements. But going at about 39 or 40 days
4 and there about 20 to 25 days into that outage
5 right now. And units 2 and 3 are operational at
6 this point.

7 And as was discussed by Mr. Bill Jones,
8 currently at Palo Verde Units 1 and 2 are on
9 what's called column three of the NRC action
10 matrix and that's due to a degraded cornerstone.

11 Unit 3 is in column four of that action
12 matrix. And as was mentioned by Commissioner
13 Boyd, there's only five columns. So there's only
14 one more left to go. And they don't want to get
15 into column five.

16 But the reason they're in column four,
17 as was stated, is because of the multiple
18 repetitive degraded cornerstones.

19 And currently, and there's a large part
20 of my presentation that you've already heard from
21 Mr. Jones, but there's a piece of mine that gets
22 into a little bit more detail.

23 Currently the NRC has taken action and
24 they have initiated their inspection procedure
25 95003. They also have assigned an additional on-

1 site inspector at Palo Verde because of this.

2 And they are conducting quarterly public
3 meetings. And one was already done this last
4 month. And they're going to do these meetings
5 because with all of the publicity and all that has
6 taken place with moving Unit 3 into column four
7 they want to make sure that the public stays
8 informed as to exactly what's going on out there.

9 On June 21st the NRC issued what's
10 called a Confirmatory Action Letter. And I'll get
11 into details of that letter in a minute.

12 And even though it's only Unit 3 that's
13 in column four the entire site is being evaluated.
14 And that's because all three units are identical.
15 And you have the same upper management for all
16 three units. So if you've got some kind of site
17 culture that's going on in one of those units it's
18 probably going for all three units. So that's why
19 the whole site is being evaluated by NRC.

20 In the, and if we can go to the
21 Confirmatory Action Letter. There are five points
22 that are in that letter. And the first one has to
23 do with the site, addressing the root and
24 contributing causes for the four items that are
25 listed.

1 And that is that in the NRC's eyes at
2 Palo Verde there was ineffective resolution of
3 emerging technical issues, there was failure to
4 routinely question validity of engineering
5 assumptions for operability of the equipment,
6 there was inconsistent notifying of the
7 operations, of operation personnel of the
8 operability concerns, and there was inadequate
9 performance monitoring in measures to fully assess
10 corrective action effectiveness. And those are
11 the four pieces and that one point that the
12 management and the employees at Palo Verde have to
13 address in order to get out of that column four.

14 The next point is they have to complete
15 corrective actions to improve human performance
16 and problem identification resolution.

17 And there's the three areas that are
18 specific for that point there. And again, there
19 was a question in something that was sent to me by
20 Barbara Byron that at this workshop one of the
21 questions was going to be was there anything that
22 we learned as far as what's happened at Palo Verde
23 and how they got into column four.

24 And in my mind one of the primary things
25 we learned is that the employees and management at

1 a nuclear station can not get complacent. Five or
2 six years ago the Palo Verde Nuclear Generating
3 Station was probably the top performing plant in
4 the country. And today they're the worst as far
5 as, there's only one other plant in column four.

6 And a lot of that has to do and this is
7 from the meetings I've attended not only with the
8 NRC but with the Arizona Public Services that
9 management and the employees out there sort of
10 became complacent. And they knew they were at the
11 top and they kind of thought they were always
12 going to stay there just by and I guess just
13 because they were there.

14 And we've learned that you can't stay at
15 the top without working hard at it. And that's
16 why they're in column four today.

17 The last three points that were in the
18 letter from the NRC was as was mentioned earlier
19 was that they have to complete an independent
20 safety culture assessment by September 15th.

21 And that is one where I believe the NRC
22 based on the meetings I've attended and also the
23 management of Arizona Public Service felt that the
24 employees out there were again getting complacent.
25 And that the safety culture was going in the wrong

1 direction.

2 And everybody out there, all the
3 employees have to question everything that goes on
4 and make sure that everything is being done
5 properly. And if there's anything they see that's
6 not they have to bring it to the attention of
7 management and if that's not good enough they
8 bring it to the attention of NRC.

9 And so that's why the management of Palo
10 Verde has to do this assessment to make sure that
11 all of the employees out there have that attitude
12 and have that questioning attitude.

13 Now they also have to incorporate the
14 results of an in-depth evaluation and a safety
15 culture assessment into a modified improvement
16 plan. And they have to submit the modified
17 improvement plan that would impact reactor safety
18 by November 30th of this year.

19 Now what is Arizona Corporation
20 Commission doing with. At this point the
21 Commission is monitoring the plant's compliance
22 with the NRC to make sure they are doing
23 everything they have to do to get out of column
24 four and to do everything that the NRC is going to
25 ask them and also require them to do.

1 And also the Commission staff is
2 evaluating the 2006 outages at Palo Verde. And
3 that is because the Arizona Corporation Commission
4 is the one that sets rates for all of the
5 utilities in the state. And they want to make
6 sure that any outages that occurred at Palo Verde
7 were not the results of imprudence because if they
8 were the result of imprudence then those costs
9 that would be shared by Arizona Public Service
10 which is the one utility that owns a part of Palo
11 Verde that the ACC regulates those costs would not
12 be passed on to ratepayers.

13 And there was a recent Arizona Public
14 Service rate case that just concluded, in fact
15 it's still in the, it's not final yet because
16 there's a because after the Commission signs the
17 order there's a period of 20 days where that order
18 can be appealed. And we're still in that appeal
19 period.

20 But in that order Arizona Public Service
21 was ordered to work with Commission staff to draft
22 a nuclear performance standard for that station
23 that would be used by the Corporation Commission
24 in future cases.

25 Now there's nothing in the order that

1 says that the Commission would actually adopt that
2 standard. And that's because the Commission is
3 very concerned that they not do anything that
4 would interfere with the Nuclear Regulatory
5 Commission. But they at least want to see what
6 staff and the management of Palo Verde can come up
7 with that maybe the Commission could use in future
8 cases.

9 And the following slides, there's a set
10 of slides and they are very brief summary of a
11 very detailed presentation that management at Palo
12 Verde presented at the public meeting that I was
13 talking about. And this was on June 6th. And it
14 was in an old town called Tonopah which is about
15 50 miles west of Phoenix which is right where the
16 plant is located.

17 That slide presentation that was put
18 together by the management of Palo Verde was
19 probably about 100 different slides. And it was a
20 very detailed explanation of exactly the steps
21 that Arizona Public Service as the operator of the
22 station was doing to comply with what the NRC was
23 going to require them to do, all of the
24 assessments to get out of column four.

25 And I'll just briefly go through these.

1 And they have labelled this the Impact Project.
2 And the purpose of the project is to improve the
3 site safety culture. And as I mentioned earlier
4 that's critical to all this. Is that everybody at
5 that site, every employee has the same attitude
6 with regard to safety. That it's not just a few
7 people in the control room that have that attitude
8 but everybody has that attitude.

9 And they also have to identify issues
10 and corrective actions to enable Palo Verde to
11 improve performance. And they have to sustain
12 that performance for the long term.

13 And the assessments that they have to do
14 here are the independent safety culture assessment
15 as I said. They have to identify broad-base
16 safety, organizational performance issues. They
17 have to review programs associated with
18 identifying and assessing corrective performance
19 deficiencies. Perform an assessment of selected
20 performance deficiencies and associate
21 organizational issues. They have to determine if
22 actions related to the recirculation actuation
23 sump have been effective. And that one and the
24 next issue that have to do with the emergency
25 diesel generator. These last two bullet points,

1 those are the bullet points where they had the
2 problems that got them into column four. So the
3 have to assess what's happening there and what
4 caused that.

5 And they have a collective evaluation
6 they have to identify the primary areas that are
7 driving performance deficiencies at Palo Verde.
8 And they have to establish improvement actions to
9 achieve sustained high performance for the long
10 term.

11 And again, all that boils down to the
12 attitude of each employee and exactly what they're
13 doing and if they have that questioning attitude
14 and I've heard that term used by NRC at several of
15 the meetings that all the employees have to have
16 that questioning attitude as to and they can't
17 have the attitude well that' the way you know
18 that's the way we've done it for the last four
19 years so it must be right. And that's not the
20 case because that's part of the reason that
21 they're in column four.

22 And the results of all of this have to
23 be that the corrective actions to prevent
24 recurrence of issue that caused Palo Verde's
25 decline in performance. And for example they have

1 to address the organizational, the processes and
2 equipment and the cultures at the plant.

3 They have to have an integrated plant to
4 support and strengthen safety culture. They have
5 to sustain performance improvement for the long
6 term.

7 This next slide is a diagram of exactly
8 the process that the management at Palo Verde is
9 going to go through to get at least part way of
10 getting them out of column four. In the meetings
11 I've that attended the questions we're asked is of
12 the NRC and of the management at Palo Verde was
13 how long was it going to take to get out of column
14 four?

15 And the answer was a long time. And
16 that meant maybe three years, maybe two, maybe
17 four but somewhere around the three year period is
18 what they're expecting.

19 And there's no hard and set time frame.
20 But there has to be improvement that keeps being
21 shown. And I think that was mentioned by Mr. Bill
22 Jones. Is that at the end of this 95003 is that
23 they don't expect, well, they know that Palo Verde
24 won't have done everything it has to do to get out
25 of column four.

1 But they at least have to see that
2 they're starting to move in the right direction.
3 And that's what they expect to be seeing by the
4 end of the year. So this long diagram was talked
5 about at the management at Palo Verde in Tonopah
6 and it was a very detailed explanation of exactly
7 what they have to do to get to where they want to
8 be at least by the end of the year.

9 And the last slide has to do with this
10 is how the management of Palo Verde is looking at
11 what they have to do. And in one of the meetings
12 I went to with the NRC the three boxes that the
13 NRC was most concerned with, okay, and it's
14 obviously safety, but to get to the safe operation
15 is that there's the plant equipment, there's the
16 corrective action and the human performance.

17 Those were the three that the NRC felt
18 that the management at Palo Verde really had to
19 focus on. And there was one of the statements
20 that Dr. Bruce Mallet has made at several of the
21 meetings for NRC is that he kept stressing that
22 none of the units, 1, 2 or 3, none of those units
23 was ever operated in an unsafe manner.

24 But the reason that Unit 3 is column
25 four is because of everything that did happen.

1 NRC wanted to make sure that it never got to the
2 point where they were operating in an unsafe
3 manner.

4 And from everything I've heard at all
5 the meetings is that everybody expects Palo Verde
6 to get out of column four back into column three,
7 two and one. They expect that.

8 But I think as was mentioned, and again
9 by Commissioner Boyd, is that everybody has to be
10 cautious. But there's nothing that's eminent
11 that's about to happen that would be negative of
12 Palo Verde. But that doesn't mean that people
13 shouldn't be cautious and do everything they can
14 do to get Palo Verde out of column four and back
15 up into line into the other columns.

16 And that's the end of my presentation
17 and I hope it was helpful to what you're doing
18 here today.

19 PRESIDING MEMBER PFANNENSTIEL:
20 Extremely helpful, thank you. Questions?

21 COMMISSIONER BOYD: Only a comment that
22 you kind of confirmed my feeling that the recent
23 action by NRC was a very significant and close
24 shot across the bow to the operators of that unit
25 to the need to get their act together. So I, like

1 you, hope that they turn it around and get it
2 corrected.

3 And there's no question that we as a
4 species can get very complacent sometimes about
5 where we are. So good luck to you as a state
6 agency with oversight for that.

7 PRESIDING MEMBER PFANNENSTIEL:

8 Commissioner Geesman.

9 ASSOCIATE MEMBER GEESMAN: Yeah I want
10 to thank you for your presentation. What weight
11 does the Arizona Commission give to the INPO
12 rating for Palo Verde?

13 MR. OLEA: Well, okay, that's hard to
14 say and I know that it was considered. But in the
15 APS rate case it wasn't a major portion of the
16 rate case. But they did ask about it.

17 ASSOCIATE MEMBER GEESMAN: How good --

18 MR. OLEA: -- you know in that.

19 ASSOCIATE MEMBER GEESMAN: How good of
20 predictive indicator if the rating of future
21 problems at the plant?

22 MR. OLEA: Well, and again, this would
23 just be my opinion. But I guess not very good
24 because before this they were at a one rating and
25 now they're in column four of the NRC action

1 matrix.

2 And I think they were and I think the
3 Palo Verde Station was rated number one by INPO
4 for, okay I'm going to say close to 10 years.

5 And I think that's part of what got into
6 the complacency attitude out there is that they
7 were always at the top of the INPO rating. And
8 things kind of slipped away after that.

9 ASSOCIATE MEMBER GEESMAN: Is that
10 rating something that is accessible to your staff
11 and something that you monitor?

12 MR. OLEA: Not something that we
13 monitor, no.

14 ASSOCIATE MEMBER GEESMAN: But it is
15 accessible to you?

16 MR. OLEA: I'm going to have to say I
17 don't know because I know that was an issue.
18 Because I think the rating is accessible. But the
19 reasons that they get a certain rating were not
20 accessible.

21 ASSOCIATE MEMBER GEESMAN: So if you saw
22 the rating begin to decline and obviously there's
23 pretty significant financial consequences when
24 these plants don't operate as well as they are
25 hoped to but as you saw the rating decline you

1 wouldn't have the ability to penetrate the rating
2 and determine what it was that was causing that?

3 MR. OLEA: To be honest with you I don't
4 know. And I know that our legal division had,
5 there was legal questions there. So I don't know
6 the answer to that one.

7 ASSOCIATE MEMBER GEESMAN: Thank you.

8 PRESIDING MEMBER PFANNENSTIEL: My
9 question is similar but I'm just wondering whether
10 there's any, in retrospect, whether there's any
11 sort of early warning that you could have tracked.
12 When did you realize that there was significant
13 problems at Palo Verde. And is there some
14 guidance you can give us on what we should be
15 looking for.

16 MR. OLEA: Well for the Commission
17 staff, we don't have anybody on the staff that
18 knows how to operate a plant or that has that kind
19 of experience so what we rely on a lot is on the
20 NRC. And we get, in fact I do, I get copies of
21 everything that's issued by the NRC for that
22 plant.

23 And so when we see something coming from
24 the NRC that shows that they're having questions
25 or they're having concerns that's when we have

1 those same concerns. And we try to work with the
2 NRC and with the management at Palo Verde to keep
3 track of what's going on.

4 But we follow mostly the NRC and not
5 INPO.

6 PRESIDING MEMBER PFANNENSTIEL: Thanks.
7 Anything else? Thank you very much for being
8 here.

9 MR. McCLARY: Okay, we'll now turn to
10 Diablo Canyon and PG&E. And our next panelist is
11 Jack Keenan who's Senior Vice-President for
12 Generation and Chief Nuclear Officer for Pacific
13 Gas and Electric.

14 And in that capacity he oversees
15 generation overall not just nuclear but also
16 specifically the operations of the nuclear reactor
17 at Diablo Canyon. He is relatively recent with
18 PG&E but has been in the generation, and
19 specifically, the nuclear generation part of
20 utility operations throughout his career on the
21 east coast with Northeast Utilities and Progress
22 Energy.

23 MR. KEENAN: Thank you, good morning.

24 PRESIDING MEMBER PFANNENSTIEL: Good
25 morning.

1 MR. KEENAN: I'm pleased that you
2 invited me here to discuss PG&E's Diablo Canyon.
3 And I look forward to having an interchange with
4 folks and I hope to be very educational.

5 We have sent previously a paper
6 answering the Commission's workshop questions so I
7 will not be covering all those questions during my
8 presentation. First slide please.

9 This is a picture of Diablo Canyon.
10 That's on 12,500 acres of beautiful coastline here
11 in California.

12 It supplies a large part of our electric
13 supply to our customers which I'll talk more
14 about. But it's basically a base-loaded and we
15 run as often as we can. And it's a low-cost
16 supplier at this point.

17 Diablo Canyon has very minimal impacts
18 to the environment in this area as I think you can
19 probably see. And we continue to monitor that.
20 And it does emit no greenhouse gases in the
21 generation of its electricity.

22 The other important fact is that we do
23 have decommissioning funds available to return
24 that venue to its original condition as the
25 surrounding areas are in.

1 A little bit of data about Diablo Canyon
2 would be that it's a Westinghouse pressurized
3 water reactor, pretty standard in the industry of
4 those built at the time.

5 It did start commercial operations as
6 referred to earlier in the mid 80's for both Unit
7 1 and Unit 2. And you can see that we produce
8 over 2,000 megawatts of clean power for California
9 which satisfies almost a quarter of our customers'
10 needs at PG&E.

11 And it represents approximately 10
12 percent of native California generation at that
13 site.

14 We were licensed by the NRC to operate
15 for 40 from the dates that you see above.

16 And also PG&E has a very rich history in
17 the, early on in terms of nuclear power operations
18 with receiving the first Atomic Energy Commission
19 license number one in 1957 at Vallecitos and then
20 '63 we licensed Humboldt Bay and, of course,
21 Diablo Canyon.

22 For PG&E and Diablo Canyon safety is a
23 core value. Our number one responsibility is the
24 public health and safety. We take that very
25 seriously.

1 One of the ways we do that is through
2 our emergency planning. We have an extensive
3 emergency planning effort ongoing. It obviously
4 meets all NRC requirements. In addition we work
5 very closely with many agencies.

6 We regularly train with those agencies,
7 have drills and exercises which are critiqued.
8 And from those critiques we usually have
9 considerable amount of lessons learned that we
10 continue to go back and take corrective actions to
11 correct.

12 And we continuously upgrade our
13 facilities to become more modern and have all the
14 latest equipment in order to be prepared for an
15 emergency.

16 Plant security is certainly another way
17 that we ensure the safety of the public. We have
18 a very, very, well-trained and highly skilled
19 armed force at Diablo. We're very proud of those
20 individuals. And we have significant equipment at
21 the site both active and passive to prevent any
22 type of terrorist attack or undetected individuals
23 coming to our area.

24 If you've had an opportunity or can get
25 an opportunity to visit Diablo Canyon I think

1 you'd see what I'm talking about. We are
2 certainly the most well-defended industry in the
3 United States.

4 We have a significant long-term seismic
5 program. We have some of the most distinguished
6 individuals in this area that understand the
7 geosciences of the earth and to continually
8 monitor what's the latest what's going on with the
9 Earth and around us and around the whole world
10 actually to understand and update our seismic
11 situations in California.

12 And our commitment to safety we're very
13 committed to the safety of our workers. It goes
14 down to many levels. I wanted to show you in this
15 graph the type of safety that we have within our
16 workers at Diablo Canyon. We've continued to
17 improve the safe work conditions and the safety
18 culture of people who work at Diablo Canyon and
19 that includes not just our employees but of people
20 that come as contractors to work there.

21 You can see this trend and I know it
22 sometimes these rates are hard to understand. But
23 we basically recently have reached the level of
24 .05 and that would be an injury rate of lost-time
25 accidents per 200,000 hours.

1 And to give you an example of what that
2 might mean better to understand is that if a 100
3 employees worked for 20 years we'd have one lost-
4 time accident with that rate.

5 Looking at it from a scale compared to
6 some other industries that rate for our industry
7 is actually at .25 overall for nuclear power
8 plants. And that compares to electric utilities
9 the work that they do to about two. And the
10 manufacturing sector at about 3.6.

11 And I think you'll see later in the
12 presentation this is 2004 statistics that the
13 latest statistic have actually shown that the
14 nuclear industry has improved down to about .12.
15 So it's even getting better than this.

16 So it's basically one the very, very
17 safest industries in the world to work in. It's
18 comparable, if not better, than working on Wall
19 Street or in real estate (laughter).

20 Talk a little bit about the
21 environmental benefits. Obviously I mentioned
22 that Diablo Canyon is carbon-free in our
23 generation. And we're very proud of that at PG&E.
24 And, in fact, our generation portfolio is 90
25 percent carbon-free. Obviously with the other

1 major generations being hydro.

2 Our overall portfolio even given the
3 electricity we purchase for our customers we're
4 over 50 percent carbon-free.

5 So the nuclear plant itself if we had to
6 replace that actually with generation today would
7 have to be probably gas generation and it would
8 produce eight to ten million tons of carbon
9 dioxide annually.

10 So we believe that Diablo is critical
11 and nuclear power is critical to meeting the goals
12 that California has.

13 On used fuel, I'm not going to speak too
14 much on that. I know you're having other
15 presentations and have had other presentations and
16 on used fuel. But I just want to say that used
17 fuel is really not a technical issue.

18 The storage and transportation of used
19 fuel has been, the technical issues have been
20 solved. We can store it safely. And it's been
21 transported throughout the world and through the
22 United States safely without injury to anybody.
23 It's a proven technology.

24 And seawater cooling we have been using
25 that a long time as other people have. It's

1 thoroughly studied and understood. We continue to
2 monitor our affects on the environment. They are
3 minimal.

4 And, in fact, if we had to use other
5 cooling methods we would find that the impact to
6 the environment would probably be greater.

7 And as I mentioned earlier we're fully
8 funded to restore the site to what we call a
9 greenfield so that you would not know that it was
10 there at the end of its lifetime.

11 In mentioning the used fuel, we have at
12 Diablo Canyon you can see on the right a picture
13 of a spent-fuel pool, one of the spent-fuel pools
14 at Diablo. Obviously again as I mentioned it's
15 safe and secure in the pool. We've been storing
16 fuel like that for in commercial power plants for
17 in the 50 year range.

18 We consider these systems temporary
19 though because the DOE is committed to take the
20 fuel. Obviously that's another issue that you're
21 looking at a lot harder then. So I won't go into
22 that.

23 But we believe that we obviously have
24 prepared to ship fuel when the DOE is ready to
25 accept it. You can see in the lower picture, and

1 I did want to mention that the capacity of our
2 pools is about 75 percent. And that is all the
3 fuel that Diablo Canyon has made in over 20 years.
4 So it's all in one pool and certainly is a small
5 amount of fuel given the amount of power that has
6 been generated.

7 You can see in the lower picture the
8 dry-storage facility which is going to be complete
9 in early '08. It is, that is a picture of it
10 there. It's well on its way to being complete.
11 It's a robust design. The industry has been using
12 this for over 20 years. And we feel very
13 comfortable that that will be very safe storage of
14 our fuel based on the experience and design of
15 those casks. And again they can be shipped to the
16 DOE when they're ready to receive the fuel.

17 One of the things that obviously this is
18 a very controversial spent-fuel is probably the
19 most controversial issue when it comes to nuclear
20 power. I personally feel that nuclear power since
21 we have spent-fuel is in some ways a very positive
22 because the fuel that we use to generate
23 electricity we still have it. It's in our hands.
24 We can deal with it. When you use fossil fuels
25 the by-products are end up spread across our

1 environment, clearly cause damage to the
2 environment and have proven to cause human
3 suffering.

4 This right here we can deal with it,
5 store it safely and I know you're going to talk,
6 you have talked probably about reprocessing.
7 That's certainly a good option to reuse the fuel.

8 Talk a little bit about Diablo Canyon
9 and our performance. We've had very strong
10 performance at Diablo Canyon.

11 We recently had a refueling this year.
12 And we completed that refueling in just under 30
13 days which was the shortest for that particular
14 unit. And is a very good outage, it's very safe.

15 We have a number of parameters that we
16 use to measure how safe we do things at the plant
17 such as our unit performance monitors, safety
18 monitors in terms of whether it's planned events.
19 And this was the safest outage in all those areas
20 that Diablo has ever had.

21 Talking about the online performance for
22 a minute. We have about an 18 month cycle in
23 terms of the period of time that the units are
24 online.

25 In the last two outages, the Unit 2

1 outage in '06 and the Unit 1 outage in '07, both
2 units ran over right about 500 days. One was just
3 under. But basically ran the whole 18 months from
4 the time they started up from the previously
5 refueling to the time they shut the unit down.
6 The units were running continuously.

7 So that adds to the safety and
8 reliability of these units and the low cost.
9 Obviously the longer they're running the more
10 they're running the lower the cost.

11 So you look at the next slide you'll see
12 trends that we have ongoing at Diablo since the
13 beginning of starting up the plant. And the
14 industry as it has matured is learning how to do
15 shorter outages.

16 The first graph is the length of the
17 outages. And as you can see we started off with
18 longer outages, the industry did. And we've been
19 shortening those outages accomplishing all of the
20 work we need to accomplish to assure the unit
21 could run safely until the next outage. That's
22 our goal when we shut a unit down and refuel is
23 that we, all the maintenance that we need to do
24 and restore all the equipment to make sure that
25 unit is in safe condition to run for the 18

1 months.

2 And you can see we're getting that. And
3 we're shortening the outages on top of that. That
4 overall is bringing the cost of electricity from
5 not only Diablo Canyon but the industry the costs
6 are dropping per kilowatt hour from nuclear
7 plants.

8 ASSOCIATE MEMBER GEESMAN: Could you
9 explain what the horizontal axis is?

10 MR. KEENAN: That's the days, that's how
11 long the outage is on the top one.

12 ASSOCIATE MEMBER GEESMAN: Okay.

13 MR. KEENAN: So we started up over a 100
14 days with the first outages and now we're
15 approaching the 30 day range which is getting to
16 be best in industry, not quite, but we're getting
17 very close to it.

18 ASSOCIATE MEMBER GEESMAN: I was
19 unclear. That was the vertical axis. What's the
20 other?

21 MR. KEENAN: Oh, I'm sorry. Oh, that's
22 the refuel outage. That's refuel outage number
23 one, refuel outage number two.

24 ASSOCIATE MEMBER GEESMAN: Oh, okay.

25 MR. KEENAN: The first number is the

1 unit, Unit 1, refuel one, Unit 2, refuel one.

2 ASSOCIATE MEMBER GEESMAN: Okay.

3 MR. KEENAN: Sorry I, okay. The second
4 graph is our operating capacity factor. And
5 that's capacity factor for when we start the unit
6 up to when we shut it down.

7 And you can see at Diablo those numbers
8 have been continuously improving, and in fact,
9 since the third refueling outage we've had an on-
10 site capacity factors above 90 percent. And we're
11 now actually in the 100 percent range because of
12 the continuous operation.

13 ASSOCIATE MEMBER GEESMAN: You appeared
14 to have had a little blip on cycle number 12 in
15 both graphs.

16 MR. KEENAN: That's correct.

17 ASSOCIATE MEMBER GEESMAN: When would
18 that have been?

19 MR. KEENAN: That would have been about
20 four to five years ago because they're 18 month
21 cycles.

22 ASSOCIATE MEMBER GEESMAN: Okay, thanks.

23 MR. KEENAN: Okay. Okay so looking
24 again at the economics overall our projection for
25 this year was about 3.8 cents. And that's what we

1 used when we looked at how we're going to operate
2 Diablo Canyon and how we will, would impact our
3 customers. And that includes all costs of fuel,
4 operations and maintenance and capital and
5 depreciation costs.

6 And certainly that's less than our in
7 our market price reference of eight cents. We
8 actually believe that as we're going through this
9 year and having a very good year we'll come in
10 around three and a half cents at Diablo Canyon.

11 And that actually will make us make
12 Diablo Canyon the cheapest generation that we
13 have. Hydro on a good year will be a little bit
14 cheaper than nuclear. This year is not a good
15 year for hydro so it will be more expensive than
16 nuclear.

17 We continue to invest in our nuclear
18 plant. As you can see a number of investments
19 there with the turbine rotor replacements which
20 are done, the dry-cask storage, steam generators
21 coming up and reactor head coming up. And those
22 are fairly expensive modes that we're either doing
23 or going to be doing in the future.

24 But overall we make sure that Diablo
25 Canyon has the proper maintenance and equipment in

1 place to be a safe and reliable plant.

2 One of the things that the nuclear
3 industry is benefitting from is the improvement in
4 materials that have happened over the last 30 or
5 40 years since these plants were built. We have
6 much better materials now.

7 The steam generators, for example, are
8 not like replacements. They have better materials
9 in them. They'll last much longer. They'll be
10 easier to take of. Reactor heads that they're
11 making today are one-piece reactor heads. There's
12 no, there will be no weld segments and our reactor
13 head will be one-piece forging. Again, much
14 better material and will perform very well for us.

15 So material improvements have made a big
16 difference. And it really has generated a lot of
17 the modifications that we do at nuclear plants is
18 because we can put in material that will be less
19 maintenance and it'll last longer.

20 We, on the average, have been spending
21 up to now which is going to be increased about \$70
22 million a year at Diablo Canyon to improve the
23 conditions of the plant and make sure that we
24 maintain the equipment safe.

25 Even with the amount of future

1 improvements you see here we expect that our
2 overall costs per kilowatt hour to generate
3 electricity will not be much over four cents.
4 It'll probably just creep up over four cents.

5 So from the 3.5 to 3.8 we're going to be
6 this year somewhere in between there. Future
7 years after 2010 after these things we expect
8 we'll be 4.1, 4.15 something in that range.

9 And you can see obviously we provide
10 significant economic benefit to the local area.
11 It's what you see on the study here which was done
12 in 2004. I'm sure that has increased.

13 Taking a look overall in the US and the
14 world perspective, in the US nuclear is 20 percent
15 of the energy right now. We've been running about
16 20 percent for quite some time.

17 And that's without really adding any
18 more nuclear power plants. And the reason we'll
19 be able to maintain the 20 percent number as the
20 usage in the United States has gone up is that the
21 performance of the nuclear power plants has
22 improved such that we're generating more safe,
23 reliable energy. So we're maintaining that 20
24 percent.

25 Right now in the US utilities have

1 announce actually over 30 new reactors that they
2 plan to build. And a number of those utilities
3 are working on applications to the NRC for
4 licenses to construct and operate nuclear power
5 plants.

6 The International Atomic Energy Agency
7 is anticipating about 60 new plants in other
8 countries over the next 15 years.

9 So nuclear power is certainly still
10 going to be active and going to be relied upon for
11 energy throughout the world.

12 I think the main reasons for that is the
13 fact that the many countries are looking for
14 energy independence and diversity in fuel.
15 Obviously oil and natural gas have had limitations
16 and place considerable price fluctuations. And,
17 of course, global greenhouse gases have
18 significantly placed a big part in the world in
19 the last certainly five to ten years and seems to
20 be growing every day.

21 Recent studies including the Keystone
22 Center Report which I believe you're familiar with
23 indicate that nuclear power needs to be kept as an
24 option and available for us in the future to solve
25 our energy needs.

1 And I've just put some data down here on
2 reliance on nuclear power from some other
3 countries that you can see.

4 So in closing I want to make a few
5 facts. And that's that we work very, very hard to
6 ensure the safe, reliable, cost-efficient,
7 baseload generation at Diablo Canyon for our
8 customers of California.

9 We believe that without nuclear we would
10 have a significant, difficult time maintaining
11 lower costs to our customers. And we would
12 significantly increase in our global gases that we
13 would generate.

14 We also believe it's an important option
15 certainly for California to maintain, certainly
16 want to maintain the generation that we have in
17 California and an important option in the future.

18 We need to look at how we're going to
19 meet California's energy needs and the global
20 greenhouse gas goals that California has set for
21 it. And we believe that nuclear power has to be
22 considered as part of that.

23 We do recognize as you've heard today
24 that the 104 reactors that operate in the United
25 States from time to time there are some

1 performance issues. At Diablo Canyon we are on
2 guard for those performance issues.

3 In my 37 years mostly in nuclear I've
4 been through some of those and seen some of those.
5 I spent two years on loan to the Institute of
6 Nuclear Power Operation doing evaluations of other
7 plants.

8 And I have a good understanding of what
9 can cause performance issues at nuclear power
10 plants. I can assure you that we are on guard to
11 make sure that doesn't happen at Diablo Canyon.
12 And we will not let that happen.

13 I think that brings me to the end of my
14 presentation. Are there any questions?

15 PRESIDING MEMBER PFANNENSTIEL: Thank
16 you Mr. Keenan. Questions, Commissioner Boyd.

17 COMMISSIONER BOYD: Yes, thank you for
18 your presentation and Diablo is indeed impressive.
19 In the discussions we've had today of Palo Verde
20 and I want to just bridge over to Diablo Canyon
21 and you are justly proud of your safety record and
22 a good record, what do you do to address the
23 culture and complacency issues that we discussed
24 with regard to Palo Verde and to perhaps avoid
25 falling into that same regime.

1 MR. KEENAN: That's a great question.
2 First of all I make sure I have people that as
3 well as we might do say this refueling outage
4 which we thought we did very well. We set a
5 number of stretch goals, very stretch goals for
6 safety and a number of other areas.

7 And, in fact, for personnel safety we
8 had a goal of zero injuries this outage. We
9 didn't achieve those goals. So when we don't
10 achieve our goals we look at why we didn't achieve
11 our goals and what corrective actions we need to
12 put in place to get better than where we are.

13 So we don't measure ourselves of what we
14 just did. We measure ourselves against stretched
15 goals that are often not able to be achieved.
16 That way there we can fight complacency by always
17 trying to get better regardless of our
18 performance.

19 So I like to be proud of our performance
20 but not satisfied. So I make sure that the people
21 we have in place have that kind of culture that we
22 have not achieved where we need to go. And I
23 think that's really where INPO in studying other
24 power operations comes into play.

25 When they evaluate us they evaluate us

1 to excellence. And, of course, when you're
2 evaluated to perfection you don't always come out
3 so good. And that allows us to be continually to
4 strive to get to the places that are look like
5 excellence and look like the very best in the
6 industry and still then we're not going to be
7 where we want to be.

8 So it's having that continuous
9 improvement and not being satisfied with our
10 performance that prevents complacency.

11 COMMISSIONER BOYD: Thank you. Another
12 question, on your spent-fuel facility ISFSI as we
13 affectionately call them. How rapidly do you, if
14 you can talk about this, how rapidly do you think
15 you will get fuel transferred into that facility
16 such that your spent-fuel pool gets closer to the
17 original goal only maintaining the spent-fuel for
18 roughly five years was the figure, I think, that's
19 been standard before DOE was to take it away.

20 MR. KEENAN: Well, we presently plan to
21 complete this facility next year. And given
22 things that are going on that I don't know exactly
23 how they'll end up in terms of maybe legal issues
24 et cetera, but it would be our plan to when we
25 complete the facility if everything else is in

1 place to start loading the ISFSI next year.

2 COMMISSIONER BOYD: And you predict how
3 long it would take to evacuate your pool down to a
4 lower level. Do you figure about 75 percent
5 capacity now. Do you have a goal of, and a
6 timetable to get to a lower level in the spent-
7 fuel pool?

8 MR. KEENAN: We do. I actually can't
9 speak to that now but I can get you that answer.
10 We do have a goal to continue to move the fuel
11 into safe, dry storage and reduce the size of the
12 amount that's in the pool. I do not have those
13 numbers with me but I'm sure we can get those for
14 you.

15 COMMISSIONER BOYD: Thank you. That's
16 all.

17 ASSOCIATE MEMBER GEESMAN: Mr. Keenan I
18 want to thank you for being here today and if
19 nobody else in the California regulatory process
20 has done so to welcome you to California.

21 MR. KEENAN: Thank you very much. I
22 appreciate it. And again I'm glad to be here.
23 And I'm learning a lot.

24 ASSOCIATE MEMBER GEESMAN: I would also
25 compliment your company. I found that the

1 completeness and candor in written materials that
2 PG&E provided us to be a big improvement from two
3 years ago. And to the extent that you contributed
4 to that at all I certainly want to say that's
5 progress in the right direction.

6 MR. KEENAN: Great, thank you. I think
7 openness is incredibly important. And we will
8 certainly continue to do that. And if you have
9 questions at any point in time any of us,
10 especially myself, I'd love to discuss them with
11 you.

12 ASSOCIATE MEMBER GEESMAN: We appreciate
13 that. I wonder if you would expand a bit on your
14 professional experience at INPO and describe to us
15 what INPO's role is and how that may be
16 potentially of relevance to a state regulator.

17 MR. KEENAN: Well, you know INPO was put
18 together by the utilities, executives of the
19 utilities after Three Mile Island recognizing that
20 industry events have a very negative impact on our
21 industry.

22 And safety events are something that we
23 do not want to have happen. So we decided that we
24 wanted our own regulator so to speak, an industry
25 regulator. And that we would start after a lot of

1 work trying to figure out what the right thing to
2 do was, our own, quote, regulation. And that's
3 how the Institute of Nuclear Power Operation got
4 started.

5 And basically there was some key
6 executives that were put there and some industry
7 experts that were put there to form the basis of
8 INPO. But they do bring a lot of people in like
9 myself who have a lot of industry experience.

10 At the time I went into INPO I had been
11 over 20 years experience, I had been a plant
12 manager for seven years and they really have a set
13 of high standards that we use to go out and
14 evaluate the plants on.

15 So basically they wrote up some
16 performance standards. And these were written
17 against excellence what you would expect to see.
18 And they continually modified those standards such
19 that as they learn more and see issues as they
20 happen in the industry those standards are lessons
21 learned get fed back into those standards such
22 that they're changing.

23 And so basically when I got there I was
24 trained to the level of those standards, put with
25 teams and, of course, the first couple of teams I

1 went out with was to be trained and we evaluated
2 plants under training with experienced evaluators.

3 And when we looked at them we looked at
4 them from those standards of excellence. And so
5 it just made a lot of sense as we evaluated plants
6 that we gave them lots of information on how they
7 could improve.

8 And the other thing in just, it's not
9 just errors from proven it's also strengths. And
10 so some plants that they saw they were doing
11 things really well they wanted to make sure they
12 documented that strength because one of the main
13 things about INPO is to share the information.
14 Okay, so strengths get shared among other plants.
15 And lessons learned get shared.

16 So if you're really focussing on what's
17 going on at INPO and utilizing their strengths you
18 can make your plant one of the very best plants.
19 Now part of doing that is having people obviously
20 that are some of the very best people.

21 But if you implement the strengths from
22 INPO that they've seen out in the 104 different
23 sites that they go to different plants you can get
24 an awful lot out of that at any particular plant.

25 So we continue to loan people there.

1 We've got at least one person there right now.

2 We're looking at getting a second person there.

3 I'm actually, they have people they call
4 a reverse loanee and I've actually asked INPO to
5 have a reverse loanee which means one of the INPO
6 people come and take a job in my plant for a
7 period of time and they help us with what they've
8 learned at INPO. And they become one of the
9 members of my team.

10 And so we're working with INPO to
11 actually have a reverse loanee. And that person
12 also gets to see actual industry experience in
13 addition to sharing what he's learned at INPO.
14 He's one of the permanent people not one of the
15 loanees now I'm talking about.

16 So the INPO has come about with really
17 how do we make the industry the top performers,
18 the excellence and I believe has had a lot to do
19 also and with the NRC to really raise the bar and
20 it's the reason you're seeing the industry with
21 much better performance and much less there's
22 very, very few safety related incidents if any in
23 our industry any more. I mean the number of
24 reactor trips and other things that have happened
25 have been greatly reduced.

1 And I think it has a lot to do with the
2 INPO being and also being backed by the NRC.

3 ASSOCIATE MEMBER GEESMAN: How frequent
4 is the plant review cycle?

5 MR. KEENAN: Basically if you're a
6 strong performing plant a one or a two typically
7 it's every two years, every two years. And I
8 believe some of the lower-rated plants I think
9 it's 18 months. They come out more often.

10 ASSOCIATE MEMBER GEESMAN: And INPO then
11 establishes an index?

12 MR. KEENAN: There is an INPO index.
13 That's correct. And that is based on goals that
14 they want to achieve, the industry to achieve
15 further away. Like right now in 2005 they put out
16 the 2010 goals and that has goals in terms of
17 safety system performance, has goals for safety,
18 personal safety, has goals for radiation exposure.
19 There's about 10 fuel performance, those types of
20 things. There's about 10 significant issues.

21 And if you can meet their goal you can
22 get enough points to get to 100. That is the
23 maximum you can get. If you meet all of these
24 goals for 2010 you get 100 points. Diablo
25 presently is 96, I think, point something.

1 ASSOCIATE MEMBER GEESMAN: Ninety-six
2 point nineteen according to the written material
3 you've provided.

4 MR. KEENAN: Thank you.

5 ASSOCIATE MEMBER GEESMAN: Now the
6 written information suggests that that's up from
7 82.5 in 2002. How long have these ratings been
8 given by INPO?

9 MR. KEENAN: That index, I can't tell
10 you exactly but I guess was started probably in
11 around I'm guessing around the 90s the early 90s.
12 They didn't always have that. That was something
13 new they came up with. So they didn't have it
14 originally.

15 ASSOCIATE MEMBER GEESMAN: So do you
16 know if from PG&E's standpoint it's been a steady
17 drive up since the early 90s or have there been
18 some dips along the way?

19 MR. KEENAN: It was actually a very good
20 increase through the 90s. Diablo as you see has
21 been a good operating plant. There were some
22 small dips which I can get you. There were some
23 dips maybe back into the upper 80s in the 2000 to
24 the 2002 time frame.

25 ASSOCIATE MEMBER GEESMAN: What

1 information is public and what's private in terms
2 of the INPO process.

3 MR. KEENAN: Well the INPO evaluations
4 are private. The INPO index we don't publish it.
5 But it seems to be more widely known. But the
6 evaluations and the ratings are considered
7 private. But I believe we're working to share
8 those with you based on our relationship with
9 INPO. So we can get agreement on how we can share
10 them and make sure they're protected if we share
11 them.

12 ASSOCIATE MEMBER GEESMAN: Thank you
13 very much.

14 COMMISSIONER BOYD: Thank you Mr.
15 Keenan. I also share with my fellow
16 Commissioners, it's very much appreciated that
17 you're here today.

18 MR. KEENAN: Thank you.

19 COMMISSIONER BOYD: That you would take
20 the time to be here. I'm curious with regard to
21 the dry-cask storage that you're doing at Diablo
22 Canyon regardless of what and when the DOE takes
23 fuel are you able to provide on-site storage for
24 40 or 60 years?

25 MR. KEENAN: The present design would

1 get Diablo Canyon through the end of its licensed,
2 present license time frame and be able to load all
3 fuel in the ISFSI.

4 COMMISSIONER BOYD: As I recall I think
5 you're also taking fuel from Humboldt. Is that
6 correct?

7 MR. KEENAN: No we're not bringing the
8 fuel from Humboldt down to Diablo Canyon. We're
9 building a separate ISFSI at Humboldt. In fact it
10 started just last month or two to store the fuel
11 in the ISFSI at Humboldt.

12 COMMISSIONER BOYD: Okay. Maybe that's
13 what I'm confusing is that they're both being
14 done, they're both being held at the same time.

15 MR. KEENAN: That's correct.

16 COMMISSIONER BOYD: Given the low cost
17 and excellent operating history of these units am
18 I correct to assume that PG&E will likely apply
19 for a license renewal application?

20 MR. KEENAN: Well, as you know that's
21 what the feasibility study is all about. It's
22 certainly, if the feasibility study goes well we
23 certainly would think that would be a potential
24 outcome is that we could extend the life of those
25 so that we could serve our customers at low cost.

1 And without no greenhouse gases. But the study
2 will really tell us whether that makes sense.

3 You know the economics need to obviously
4 work out too. But right now they look pretty
5 good.

6 COMMISSIONER BOYD: Okay. When will
7 that study be done?

8 MR. KEENAN: I believe that study is
9 done in '09.

10 COMMISSIONER BOYD: Okay.

11 MR. KEENAN: We're just going to get
12 ready to start it.

13 COMMISSIONER BOYD: Again, thank you.

14 MR. KEENAN: Okay, thank you.

15 PRESIDING MEMBER PFANNENSTIEL: Mr.
16 Keenan I don't have any specific questions. I do
17 want to thank PG&E for having you as a Senior
18 Nuclear Officer come here. As I said before it's
19 real important for us to take a look at nuclear
20 power and its importance to California.

21 It always has been and I think now in
22 the post AB 32 world it's even more so. So we
23 appreciate your taking your time to come and help
24 us struggle through this. Thank you very much.

25 MR. KEENAN: Anything I can do I

1 appreciate it.

2 PRESIDING MEMBER PFANNENSTIEL: You'll
3 hear from us I'm sure.

4 MR. KEENAN: Okay, thank you.

5 PRESIDING MEMBER PFANNENSTIEL: Steve.

6 MR. McCLARY: We now turn to Southern
7 California Edison and the San Onofre plant.
8 Representing Southern California Edison today is
9 Mr. Gary Schoonyan who probably needs no
10 introduction to the Committee.

11 Mr. Schoonyan is the Director of
12 Regulatory Affairs for Southern California Edison
13 and represents the company to this Commission.

14 MR. SCHOONYAN: Thank you, thank you
15 Commissioners. If we could move to the second
16 slide please.

17 I will be -- I'm Gary Schoonyan. I'm
18 from the Southern California Edison Company. I
19 will primarily be talking about SONGS 2 and 3. I
20 believe between Bill Jones and Steve Olea pretty
21 much the Palo Verde discussion has taken place
22 today.

23 However I would say as a minority owner
24 in those three facilities we're definitely
25 concerned with regards to Palo Verde. And at

1 least particularly with the ratings that they're
2 presently at particularly Unit 3.

3 But at least the indications that we
4 have seen that they're starting to take the
5 necessary steps to try and return performance to a
6 higher level and hopefully get back to a one sort
7 of a level. And we're going to do all we can to
8 make sure that such occurs.

9 If we could turn to the next slide.

10 COMMISSIONER BOYD: Could I rudely
11 interrupt with a question on that point Gary
12 before you move on. You raised a question in my
13 mind about being a minority owner what role do you
14 have in the operation of Palo Verde and in
15 addressing the questions that you indicate you're
16 concerned about there.

17 MR. SCHOONYAN: Well as far as the
18 physical operation of the facility we basically
19 provide guidance and insight. We're not the
20 operating agent.

21 But as an owner we have a distinct
22 influence over the things that do occur with
23 regards to budgets and the way things are
24 performed.

25 Furthermore we have as I'll get into a

1 little later a very good record at San Onofre 2
2 and 3 with regards to operations. And I think
3 there's a number of things that we have done and
4 will, as best we can, share with the operators at
5 Palo Verde to try and instill a safety culture
6 that appears to be one of the key fundamental
7 areas that of concern with the NRC.

8 COMMISSIONER BOYD: I will presume
9 that's not been the practice in the past.

10 MR. SCHOONYAN: It has been the practice
11 per se however to the degree of that, I mean, as
12 has been mentioned the facility at Palo Verde has
13 been operating as one of the higher ranking
14 facilities in the nation for some time.

15 How it got complacency or wherever the
16 case may be to the situation where it's at now
17 that is something that needs to be debated and
18 reviewed. Because there will be lessons learned
19 from that in and of itself.

20 But it's not that we have tried to
21 basically involve ourselves in trying to do the
22 necessary things to keep it at the higher level.

23 COMMISSIONER BOYD: Thank you.

24 ASSOCIATE MEMBER GEESMAN: If we can
25 stay on Palo Verde for a minute. And again from

1 the perspective of a minority owner what weight to
2 you attach to the INPO rating? How good an
3 indicator is that as to problems at the plant?

4 MR. SCHOONYAN: From our perspective
5 it's a fairly good indicator. I mean, it's,
6 they're frequently reviewed. I mean taken in the
7 context with what the NRC does it's basically NRC
8 as was explained primarily focusses on safety,
9 environmental and those sorts of issues which are
10 paramount to a nuclear power plant.

11 The INPO reporting at least as I
12 understand it and what I've seen, it's involved
13 also into other areas, efficiency and other
14 things. And so it does provide some additional
15 information that typically the NRC reporting does
16 not.

17 ASSOCIATE MEMBER GEESMAN: How much of
18 an advanced warning did it provide that Palo Verde
19 was headed off track?

20 MR. SCHOONYAN: I do not have an answer
21 for that. I will get that.

22 ASSOCIATE MEMBER GEESMAN: Do you know
23 what the current INPO rating for the plant is?

24 MR. SCHOONYAN: I do not.

25 ASSOCIATE MEMBER GEESMAN: If you could

1 get that and some historical perspective from
2 INPO's standpoint on Palo Verde. I think what's
3 difficult for us to determine is the extent to
4 which it's purely a rear view mirror view or
5 perhaps more of a coal miner's canary that can
6 actually provide some usefulness to a state
7 regulator. And I certainly appreciate any
8 information you can share with us.

9 MR. SCHOONYAN: Okay. If we could turn
10 to the next slide or are we there, pardon me.

11 SONGS 2 and 3 are baseload resources and
12 have been operating safely. I mentioned before
13 that as far as the NRC goes, and as Bill Jones had
14 indicated, there are three key performance areas
15 and 19 different cornerstones.

16 We basically have registered green which
17 is the highest rating in all 19 of those areas at
18 San Onofre and are currently in the column one
19 position with regards to that facility.

20 There was some mention today of the
21 instrument air malfunction that occurred last
22 Thursday. And as a result of that as Bill Jones
23 indicated as there are a couple of inspectors out
24 there reviewing the facilities right now.

25 At least from my understanding this

1 inspection was triggered or is triggered whenever
2 an outage occurs that affects multiple safety
3 systems. And this particular air malfunction does
4 have an impact on safety systems. As was
5 indicated all of those systems reacted and
6 performed as expected and everything was fine.
7 However that's what triggered the inspection.

8 And here again, although you do not
9 things of this nature to occur there's always
10 lessons to be learned. And to the extent with
11 those lessons you can incorporate and do an ever
12 improving job going forward.

13 With regards to reliability the facility
14 has been very reliable over the years. There was
15 a comment made on Monday, something about the 2006
16 being lower than normal. That was predominately
17 scheduled outages. That we had 176 unit days of
18 scheduled outages on both of the units combined,
19 Units 2 and 3.

20 That right alone encompasses about the
21 equivalent of a 24 percent capacity factor. On
22 top of that there was Unit 2 was delayed in
23 returning to service. We had a forced outage on
24 Unit 3 to basically result in the 72 percent
25 capacity factor that was reported in 2006.

1 However as I mentioned the vast majority
2 of that was scheduled outages and I might add one
3 of the scheduled outages for Unit 3 we actually
4 took some extra time. We brought the unit down
5 prior to the summer. It was when the normal cycle
6 of refuelings occur. We're on roughly a two year
7 cycle at SONGS. And it would have occurred in the
8 summer. So we did some things early to make sure
9 that the unit was brought back in the summer, it
10 was. And then it went down a little bit later in
11 the year.

12 Cost effectively, the unit is operated
13 very cost effectively. Our costs are under four
14 cents a kilowatt hour, loaded, fully. Every year
15 as PG&E had indicated will increase with the steam
16 generator replacement and the costs as those get
17 rolled in. But even with those we're looking at
18 operating costs substantially below alternative
19 costs.

20 And as was mentioned there's no directly
21 emitted greenhouse gases. Obviously on a
22 lifecycle basis there are some. There are various
23 estimates with regards to what these are. But I
24 think in all instances they're quite low compared
25 to other generating technologies.

1 And I think as the report, the draft
2 report points out is when you do talk about these
3 lifecycle comparisons what's really important is
4 that the comparisons compare apples to apples.
5 Like I said there's a wide range of numbers. But
6 usually that's a result of the assumptions that
7 went into the assessment.

8 And in closing on this particular slide
9 that we look at continued value of these units to
10 the extent that license renewal is pursued. I
11 will get into that a little bit later.

12 However there is a high likelihood that
13 we'll be requesting funding to study that similar
14 to what PG&E did as part of this upcoming GRC.
15 We'll be filing the NOI and that I think in a
16 month or so.

17 Turn to the next slide. On steam
18 generator replacement, and I do want to indicate
19 that there's an error on this. It's up in the
20 title. It's really to be completed in 2010 and
21 2011. And I will give the office an updated slide
22 so your files are correct on that.

23 PRESIDING MEMBER PFANNENSTIEL: Thank
24 you.

25 MR. SCHOONYAN: All the other literature

1 we had and responses indicate that 2010, 2011.
2 I'm not going to spend a lot of time on this
3 particular slide other than the fact that
4 everything is progressing satisfactorily at this
5 point in time.

6 We're replacing the steam generators
7 which were made of the inconel 600 metallurgy with
8 the inconel 690 which should last an extremely
9 long time once replaced. And that replacement is
10 completed in 2010, 2011.

11 I might also add that we're similar to
12 what PG&E is doing going to be replacing the
13 reactor vessel heads. That will occur at the
14 conclusion of these steam generator replacement
15 outages probably the year following is what we're
16 currently planning on schedule. So we're looking
17 like at 2012 to basically to commence that
18 particular effort.

19 With regards to that we did make some
20 repairs already to the reactor vessel head, I
21 believe, on Unit 3 in 2004. Turn to the next
22 slide.

23 Regarding spent fuel storage, from our
24 perspective there's adequate facilities available
25 for the safe storage on for existing facilities as

1 well as new plants to the extent that they come
2 into play elsewhere.

3 However this does not mean that we
4 shouldn't proceed sooner rather than later with a
5 permanent geologic depository. Even if you go
6 with the reprocessing route you still need the
7 permanent geologic repository.

8 It was brought up last year that we were
9 one of the originators or original participants in
10 that private fuel storage. We still have a very
11 small interest in that. We ceased providing
12 additional in 2001 primarily because of the
13 decommissioning of SONGS 2 and the dry-cask
14 storage. We decided to go with that approach on
15 as far an interim as concerned.

16 We presently have 31 canisters of dry
17 storage on site. Twenty-five are loaded. The
18 site is capable of, well will be capable of
19 handling 93 which will carry us through at least
20 the operating licenses that exist now, which is
21 2022.

22 The canisters that we've designed are
23 dual storage and transport canisters. And in fact
24 from our perspective they could be used for
25 directly storing the fuel in a permanent storage.

1 However it's our understanding that the
2 DOA (sic) is yet to finalize their design nor has
3 the NRC approved the final design of what that
4 storage is. But at least the canisters that we
5 have are capable of not only storing the fuel on-
6 site for an extended period but be used to
7 transport to the permanent facility.

8 One added thing on there. We are in the
9 process of developing additional pad expansion at
10 the site to basically accommodate the full 93
11 total canisters that will be required.

12 Turn to the next slide. As far as the
13 benefits of SONGS and license renewal because I
14 know that that's seem to weigh heavy on the minds
15 of this Commission as well as others is what's
16 going to happen. Basically the existing
17 regulatory processes provide the oversight from
18 our perspective for the continued operation and
19 protection of the public.

20 The CPUC will obviously consider the
21 role of SONGS 2 and 3 in meeting Californians'
22 needs in the future. As far as the license, any
23 sort of a license renewal process have to go
24 before them. The Energy Commission, obviously as
25 you're doing now, will conduct assessments via its

1 IEPR processes and what have you.

2 PG&E has indicated they've already
3 started the process as a result of the Commission
4 decision and have to address various issues of
5 cost effectiveness, the address aging as well as
6 other sorts of things.

7 We're most likely, high likelihood of
8 requesting funding to do similar and planned based
9 upon satisfactory completion of that to basically
10 proceed with a study and an assessment based upon
11 any positive results of that received with the
12 license renewal of SONGS 2 and 3.

13 I'd like to also on this slide although
14 I didn't provide one, just a little bit of
15 discussion in regards to once-through cooling.
16 That's obviously an issue.

17 At San Onofre and working with the
18 Coastal Commission Edison has done a number of
19 things from our perspective that mitigate any
20 adverse impacts associated with entrainment,
21 impingement or even thermal impacts with regards
22 to the once-through cooling.

23 Not only did our original design have
24 features including mid-water intake equipped with
25 velocity caps, angled screens, fish returns

1 associated with it. We've also began the
2 restoring of a 150 acres of wetlands in the San
3 Diego area to be completed next year.

4 Basically the Coastal Commission has
5 indicated this fully compensates for organisms
6 entrained in the plant.

7 In addition to that we're helping to
8 fund a white sea bass hatchery in the San Diego
9 area. And we're completing the design and
10 hopefully start construction March of next year
11 for a 150 acre of coastal, reef habitat to
12 basically mitigate a lot of the discharge
13 concerns. So from our perspective we've fully
14 mitigated all of the issues associated with the
15 once-through cooling.

16 However there are continued studies. I
17 know even this Commission has had correspondence
18 with the State Lands Commission with regards to
19 the use of dry cooling or wet cooling. I think as
20 this Commission indicated that dry cooling is does
21 not appear feasible. And even with cooling towers
22 it would be very expensive and represents very
23 significant engineering challenges.

24 The challenges even go beyond that from
25 our perspective. I mean in essence at San Onofre

1 there really isn't any real estate to, for lack of
2 better words, to house cooling towers. And there
3 really isn't any water. We would need about 50
4 million gallons of water a day needed. So you'd
5 have to go to seawater and there's all sorts of
6 environmental concerns with the saltwater plumes
7 and everything else.

8 So even if you got through the
9 engineering difficulties associated with putting
10 up cooling towers and the financial commitments
11 necessary to do that it would be from our
12 perspective extremely difficult to even license
13 the thing due to the environmental impacts
14 associated to the area.

15 With regards to decommissioning Two
16 while I'm still on this slide. We're pretty well
17 funded with regards to decommissioning with
18 anticipation of continued funding that we're
19 getting. We presently have about \$2 billion in
20 our decommissioning fund for SONGS 2 and 3. And
21 over 700 million for Palo Verde. And there's a
22 little bit left for San Onofre 1.

23 Turn to the next slide. And I think
24 this is the final one. And this gets to more of a
25 planning perspective both from a renewal license,

1 license renewal perspective but also the future.

2 And one of the concerns we have is it
3 appears there's some discussion with regards of
4 removing nuclear as an option going forward with
5 regards to serving the state's needs. And as a
6 state we should not be limiting our options. This
7 isn't to say we should sacrifice anything or be it
8 sound or reasonable oversight or anything along
9 that line.

10 But the wedge that we discussed last
11 Monday, it's going to take a lot more than just
12 any one or two options to do that. It's going to
13 take a full portfolio of options. I doubt that
14 even a group of options would be sufficient to do
15 what's required by if you hoped to get to a point
16 of 2050 with regards to that.

17 So the state from our perspective needs
18 to start at least considering opening the door a
19 crack to considering as a potential option down
20 the road. Not only to the extent that license
21 renewal makes sense with regards to the existing
22 facilities but there may be situations down the
23 road where you would want to start developing
24 options. If nothing more than potentially
25 consider maybe an early site permit with the NRC

1 which is a very extended process in and of itself
2 to get a site certified that it might be
3 worthwhile to consider doing something along those
4 lines to have a site in place at such point in
5 time if the designs, this kind of standard designs
6 comes to fruition and other things that make it
7 sensible to move forward. We can move forward a
8 little quicker. Thank you.

9 PRESIDING MEMBER PFANNENSTIEL: Thanks
10 Gary. Questions?

11 COMMISSIONER BOYD: It's not so much a
12 question perhaps just a comment. Thank you Gary
13 for being here. I appreciate you mentioning the
14 once-through cooling. I appreciate you mentioning
15 lifecycle analysis of not only the greenhouse gas
16 emissions climate change issue but lifecycle
17 costing, lifecycle analysis of environmental
18 footprints those are issues that here in the 21st
19 Century as you know we talk about on a regular
20 basis.

21 So when it comes to dealing with the
22 attributes of nuclear there's no denying in a
23 nuclear plant operating doesn't put out any
24 greenhouse gas emissions. We are now in the world
25 of in the realm of in the business of looking at

1 cradle to grave and all the consequences thereof.

2 So that's something this agency has to
3 deal with. And I appreciate you mentioning that.

4 Other than that I just would like to
5 follow up as you indicated on the Palo Verde issue
6 and probably have some more dialogue with your
7 company about how you see that situation and where
8 we might be going on that mainly just to fulfill
9 my role as State Liaison Officer I have been
10 alerted to all of this. Thank you very much.

11 MR. SCHOONYAN: And in following up on
12 that, Commissioner Boyd, we'd be more than willing
13 to have our representatives that actually work
14 with the plant to meet with you at your
15 convenience.

16 PRESIDING MEMBER PFANNENSTIEL: Yes,
17 Commissioner Byron.

18 COMMISSIONER BYRON: Mr. Schoonyan thank
19 you as well for being here today. On your last
20 slide, you were here as well on Monday correct?

21 MR. SCHOONYAN: Correct.

22 COMMISSIONER BYRON: Your last slide
23 indicates California should take appropriate steps
24 to maintain a nuclear option. Do you have any
25 specific recommendations for this Commission?

1 MR. SCHOONYAN: Well, I mean in essence
2 and I think I got to it a little bit with my
3 discussion on that. There will potentially and
4 fairly likelihood be renewal proposals that come
5 before the state. And they need to be seriously
6 considered. I think they will be.

7 But it also gets to the fact that it's
8 more from a planning perspective here is that we
9 should not just remove nuclear as an option going
10 forward. Obviously there's legislation, there's
11 statutory requirements that need to be addressed
12 by this Commission and by the state with regards
13 to permanent fuel storage and what have you. But
14 there may be things that could be done to move
15 forward and cut some of the lead times down while
16 these other things are occurring. And I guess the
17 only thing I'm suggesting is that there at least
18 need to be a consideration of that by this
19 Commission.

20 COMMISSIONER BYRON: Thank you.

21 PRESIDING MEMBER PFANNENSTIEL: Gary is
22 Edison investing in that? Is Edison investing in
23 future nuclear in California like for example
24 doing some site studies or any potential --

25 MR. SCHOONYAN: At this point in time,

1 no. However at our general rate case we did
2 receive some funding for project development work.
3 And as part of that --

4 PRESIDING MEMBER PFANNENSTIEL: For
5 nuclear, I'm sorry nuclear projects?

6 MR. SCHOONYAN: No, no, this is just in
7 general. It's some of the funds that we use to
8 basically do this hydrogen project that with the
9 proposals we have at the Utilities Commission
10 right now. As part of that project development
11 there has been some very cursory assessments of
12 this with regards to background, what's the art of
13 the possible, nothing looking at sites per se.
14 It's more trying to get a feel for the lay of the
15 land. Not only in California but elsewhere. But
16 it's minimal amount of work --

17 PRESIDING MEMBER PFANNENSTIEL: Well
18 your recommendation is the state should do that.
19 I'm wondering shouldn't the utilities make some
20 investments if it looks like something that might
21 be a future prospect for you.

22 MR. SCHOONYAN: That's where it
23 basically has to originate from however proceeding
24 down these lines is it takes a little bit of money
25 too and in all instances what would happen is most

1 likely there'd be proposals to the Utilities
2 Commission for funding providing the scope of work
3 and what have you to basically pursue this.

4 Because just getting an early site
5 permit is a substantial effort. It takes a
6 substantial amount of time, effort and money to
7 proceed with something like that.

8 And obviously the state would be
9 actively involved in that.

10 PRESIDING MEMBER PFANNENSTIEL: May I
11 ask Mr. Keenan whether PG&E is investing in that
12 way at this point.

13 MR. KEENAN: At this point basically
14 what we're doing is looking at how we're going to
15 serve our customers out into the future. And
16 typically as you know that's kind of a 10 year
17 window we look at. But as deciding what sources
18 of energy we're going to use we need to look
19 further than 10 years.

20 So we've recently had a study ongoing
21 that looks out about 25 years and how we're going
22 to serve our customers. And in that study we have
23 included nuclear. The one of the things in
24 building new nuclears is that it would take
25 somewhere in the ballpark of nine to eleven years

1 to actually if we said today I want to have a
2 nuclear plant producing for our customers we
3 believe that it will be nine to eleven years
4 before we'll get our first megawatt from that
5 plant.

6 That's why we extended our study and
7 tried to look at what resources we need. And
8 obviously we're going to do everything we can with
9 the right, using the right order with demand
10 control and renewables et cetera. But when we
11 look at that it leaves us not fully satisfying the
12 ability to serve our customers.

13 And some of that is based on trying to
14 project an accurate load growth. And one of the
15 things you're hearing more about today is plug-in
16 vehicles. So the load growth is a little harder
17 to predict because if plug-in vehicles are going
18 to become one of our major sources of reducing
19 greenhouse gases if you do produce that energy
20 with natural gas it does reduce greenhouse gases a
21 certain extent. But if you're able to produce
22 that energy with nuclear you'd have a tremendous
23 improvement in greenhouse gases in California.

24 So we're trying to make sure we're doing
25 the study in a manner that takes into account our

1 fuel diversity. Again, to get from becoming very,
2 very dependent on natural gas as we move forward.
3 And how we're going to supply our customers at a
4 reasonable cost and greenhouse gases as we move
5 forward.

6 So nuclear is in that study and we
7 certainly at some point in time and I believe
8 similar comments that you just heard believe that
9 we need to keep that option open to us. One of
10 the concerns that we have is that we don't want to
11 wait too long to maybe start that option in and
12 assess it as we go along.

13 It may be that getting a permit may take
14 five years. Well three or four years from now you
15 might say there's been technicalological
16 breakthroughs and renewables are the way to go
17 because we can store energy or the costs are
18 coming down. It's something that has to be
19 constantly looked at. And we are looking at it
20 very hard. And we believe also that the nuclear
21 option should be remain open in California. But
22 if it isn't the other question might be can we
23 import some nuclear option into California.

24 PRESIDING MEMBER PFANNENSTIEL: And so I
25 just want to make sure that I'm getting the same

1 answers I got from Mr. Schoonyan, you're looking
2 at keeping it open but you haven't invested any
3 money at this point. But you might be willing to
4 do so in the next few years.

5 MR. KEENAN: I believe --

6 PRESIDING MEMBER PFANNENSTIEL: Whether
7 it's for a site selection or license or something
8 that's possible. I'm trying to figure out whether
9 you're at that point of putting some shareholder
10 money into this or as Edison I think is saying is
11 you wouldn't put shareholder money into it but you
12 would see if you could get the PUC to approve some
13 ratepayer money.

14 MR. KEENAN: Well that certainly is, we
15 have not made that decision yet. That's an option
16 as to put shareholder or ratepayer money into it.
17 But we have not made that decision yet in moving
18 forward. But we are studying it very hard. And
19 we have not made a decision on expending funds
20 from either source at this point in time.

21 PRESIDING MEMBER PFANNENSTIEL: But you
22 might look out of state also you said.

23 MR. KEENAN: That's correct.

24 PRESIDING MEMBER PFANNENSTIEL: And Mr.
25 Schoonyan how about Edison. Are you looking out

1 of California for the possibility of additional
2 nuclear that you could import into the state?

3 MR. SCHOONYAN: Not actively but here
4 again I don't want to foreclose any options.

5 PRESIDING MEMBER PFANNENSTIEL: Thank
6 you. Other questions? Steve where do we go at
7 this point. Should we bring up the next panelist
8 or do you think we need to break for lunch now?

9 MR. McCLARY: We have two more
10 panelists.

11 PRESIDING MEMBER PFANNENSTIEL: For the
12 morning session.

13 MR. McCLARY: For the morning session,
14 yes. And I'm not sure if they have schedule
15 constraints themselves but I would anticipate if
16 we went ahead we would probably finish 12:15 to
17 12:30.

18 PRESIDING MEMBER PFANNENSTIEL: Then
19 let's proceed.

20 MR. McCLARY: All right. Our next two
21 panelists are more a general overview of nuclear
22 plant operations and considerations. We first
23 have Mr. David Lochbaum who's the Director of the
24 Nuclear Safety Project for the Union of Concerned
25 Scientists.

1 Mr. Lochbaum has been with UCS since
2 1996. Prior to that he spent over 17 years in the
3 commercial nuclear industry in a range of
4 operations from start up testing, operations,
5 licensing, training at by my count something like
6 13 different nuclear plants across the country.

7 He has a Bachelor of Science in Nuclear
8 Engineering and has been a member of the American
9 Nuclear Society since 1978. Mr. Lochbaum.

10 MR. LOCHBAUM: Good morning, on behalf
11 of the Union of Concerned Scientists and the 20
12 percent of our members residing in California I
13 greatly appreciate this opportunity to share our
14 perspectives during this workshop.

15 UCS has monitored safety levels at US
16 nuclear power plants for more than 35 years. We
17 are as concerned today about the risks and
18 reliability of this energy source as we ever have
19 been.

20 Nuclear power plants have many risks and
21 I'll outline just four of them today. Like real
22 estate key being location nuclear plant
23 reliability depends on management or lack thereof.
24 Slide three please.

25 Before I outline our concerns I need to

1 explain the standard we apply when judging nuclear
2 power plant safety levels. We do not apply an
3 unrealistic standard of absolute safety. Instead
4 we apply a reasonable standard of what's
5 acceptably safe. Slide four please.

6 If there is ever a nuclear plant
7 disaster the federal government will likely take
8 steps to prevent the next disaster. If that list
9 of steps is long then the federal government has
10 let the American public down by not taking some of
11 those steps to prevent that first disaster.

12 So what we strive for is a shorter list
13 of things to do should that disaster occur. Then
14 the things that should have been done to prevent
15 it. Slide five please.

16 The risk of aging at nuclear power
17 plants is defined by what is called the bathtub
18 curve due to its shape. Risk is initially high
19 early in life due to infant mortality or the
20 break-in phase. Risk drops lower during peak
21 middle health period but not to zero. And then
22 risk climbs again as the product enters the wear-
23 out phase. Slide six please.

24 All of the nuclear power plants
25 operating in the United States today are moving

1 towards, if not already in, the wear-out phase of
2 the bathtub curve. Two among many examples of
3 wear-out failures include the February 2001
4 electrical breaker failure at San Onofre Unit 3
5 that caused the unit to be out of service for
6 months. And the March 2002 discovery of a very
7 serious near-miss at the Davis-Besse plant in Ohio
8 caused by leakage through a worn out part. Slide
9 seven please.

10 It may seem incongruous, incongruous, it
11 may seem odd (laughter) I went to school at the
12 University of Tennessee, I shouldn't use multi-
13 syllable words (laughter). But aging nuclear
14 power plants can and do experience break-in
15 failures. Like tires and batteries in cars parts
16 of nuclear power plants are routinely replaced
17 hopefully before they wear out.

18 In fall of 2004 all 36 pressurizer
19 heaters at Palo Verde Unit Three Plant in Arizona
20 were replaced. The problem was that the
21 replacements were the wrong size causing 25
22 percent of them to fail right away and the reactor
23 to be shut down the following summer to replace
24 the replacements.

25 In May 2005 the cracked and worn out

1 steam dryer at Quad Cities Unit 2 in Illinois was
2 replaced. Within a year its owner was repairing
3 the replacement because of a manufacturing defect
4 in the replacement steam dryer. Slide eight
5 please.

6 Many reactors like the sodium-reactor
7 experiment here in California did not get out of
8 the break-in phase without experiencing a meltdown
9 or a serious accident. So far we haven't
10 experienced a meltdown during the wear-out phase.

11 But there's a long list of things that
12 the Nuclear Regulatory Commission is not doing to
13 prevent such disasters. That long list includes
14 how the NRC protects against wear-out failures.

15 It's impractical to test and inspect
16 every foot of piping or every inch of cable. So
17 the NRC requires plant owners to examine the most
18 vulnerable parts of the plants on the theory that
19 if the most vulnerable parts are okay then the
20 rest is too. But in practice time and time again
21 we learned that either the most vulnerable parts
22 are not being properly identified and therefore
23 monitored or that the most vulnerable parts are
24 being monitored but inadequately.

25 If you're looking in the wrong places

1 with the right monitors or if you're looking in
2 the right places with the wrong monitors the
3 result is the same, inadequate protection against
4 aging. Slide nine please.

5 A couple of examples, the workers at the
6 Quad Cities Nuclear Plant in Illinois inspected a
7 plant component called the jet pump hold down
8 beams. The beams had broken in the past and the
9 NRC required workers to inspect the beams to guard
10 against future failures. The workers at Quad
11 Cities were looking at what they thought were the
12 most vulnerable spots of the beams instead of the
13 whole beam. But the beams were uncooperative in
14 that they broke somewhere else and the inspections
15 did not find them before they broke.

16 Today the NRC only redraws the
17 boundaries between what is looked at and what is
18 not when such surprises occur.

19 The right thing to do would be to
20 periodically examine areas outside of those
21 boundaries to hopefully confirm that you've drawn
22 the boundary lines in the right places or to
23 proactively identify any shortfalls and correct
24 them before they become tomorrow's surprises.
25 Slide ten please.

1 Another example involves the Summer
2 Nuclear Power Plant in South Carolina where
3 workers inspected the welds connecting the largest
4 cooling pipe to the reactor vessel. They looked
5 at that vulnerable weld on that pipe but their
6 detector was uncooperative it lifted off the
7 surface of the welds as it scooted across
8 different size components and therefore it did not
9 indicate cracks that had been there for a while.
10 The result was the reactor restarted without the
11 cracks being identified and repaired. And the
12 plant experienced a serious leak, another
13 surprise.

14 Likewise a serious accident at Indian
15 Point Unit 2 Plant in New York in February of 2000
16 was caused by workers examining the steam
17 generator tubes in 1997 with a technique that
18 failed to identify the cracks that were there at
19 the time.

20 Workers attempts to use highly reliable
21 inspection methods but misses continue to occur.
22 The best way to limit the frequency of misses is
23 to use more than a single inspection method. When
24 diverse highly reliable methods are used the
25 chances that all of them miss signs of damage is

1 minimized. Slide 11.

2 Safety culture problems have chronically
3 plagued the nuclear industry, appearing far more
4 often than the cameo appearances by seven-year
5 locusts.

6 And the safety culture measured at the
7 Nuclear Regulatory Commission which I'll allude to
8 in detail a little bit more later is worse than
9 that measured at Point Beach, Davis-Besse,
10 Millstone or any other nuclear plant in the depths
11 of their despair.

12 There is good news to report on this
13 front. Last year Southern California Edison
14 provided the NRC with the results of a voluntary,
15 periodic, safety, culture survey at its San Onofre
16 Nuclear Power Plant. The results were very good.

17 They reported numbers that Point Beach,
18 Salem and the NRC would love to have. But instead
19 of patting themselves on the back for producing
20 such good numbers Southern California Edison
21 rolled up their sleeves and went to work on
22 improving what were already really good numbers.

23 They essentially demonstrated in
24 practice the short-list approach that we've
25 advocated. Slide 12 please.

1 Turning to the security risk. Last year
2 the United States Government Accountability Office
3 reported that it appeared the NRC established its
4 post 9/11 protective measures on what plant owners
5 could afford to spend and not on what the
6 terrorist threat level was.

7 For example, it's been reported that the
8 NRC staff recommended to their Commissioners that
9 plants be protected from attackers using rocket-
10 propelled grenades. The nuclear industry heavily
11 lobbied the Commissioners behind closed doors and
12 the Commissioners refused repeatedly to meet with
13 members of the Republic on this subject.

14 At the end the Commissioners voted
15 against the recommendations from their own staff
16 in a post 9/11 world and opted instead for the
17 cheap fix. Slide 13 please.

18 The General Accounting Office also
19 observed a post 9/11 security test run at a US
20 nuclear power plant and reported that the mock
21 attacks value was deflated by the defenders having
22 advance knowledge of where the attackers were
23 going to go.

24 Cheat and cheap should not main
25 ingredients of a post 9/11 security scheme. Slide

1 14.

2 Earlier this year the NRC revised its
3 regulations to require that plant owners defend
4 their facilities from an attack by up to X number
5 of outside persons aided by one insider.

6 Yet those regulations still allow one
7 insider to escort up to twice that number of
8 people with minimal background checks inside the
9 security fences. And to escort that same number
10 of people right into the control room of a nuclear
11 power plant with minimal background checks. Slide
12 15.

13 And those NRC regulations updated after
14 9/11 provide no limit whatsoever on the total
15 number of visitors with minimal background checks
16 that can enter a nuclear power plant.

17 Just five workers could escort ten times
18 as many visitors inside a nuclear power plant as
19 the NRC's post 9/11 revised DBT level protects
20 against. This may not be the stupidest regulation
21 in history but it's got to rank among the top
22 five. Slide 16 please.

23 Exelon operates the largest fleet of
24 nuclear power plants in the United States. Exelon
25 reports spending six to seven percent of its

1 annual nuclear budget on security. Wind turbine,
2 solar panels, biomass furnaces and the like do not
3 need protection against terrorist attack. The
4 absolute cheapest way to protect an energy source
5 from terrorist attack is to construct one that
6 doesn't have a hazard to exploit. Slide 17.

7 The common denominator for the risk from
8 aging, safety culture and security is the federal
9 regulator. A federal regulator that establishes
10 and enforces adequate safety regulations, who will
11 manage those risks to an acceptable load level.

12 The NRC is not now, and has never been
13 the kind of regulator the American public deserves
14 and expects.

15 In November of 1984 the NRC allowed San
16 Onofre Unit 1 to restart with known safety
17 problems via a process that the NRC's own lawyers
18 said was legally indefensible. The Commission did
19 it for purely financial reasons.

20 Twenty years later the Commission Davis-
21 Besse in Ohio to continue running with known
22 safety problems via a process that violated its
23 own procedures and policies. They did it for
24 purely financial reasons. Slide 18.

25 In the years 2000 and 2001 the NRC

1 deliberately pulled its inspectors away from
2 Davis-Besse so that those people could approve
3 power uprates and other business activities of the
4 nuclear industry on time.

5 With hardly any looking the NRC
6 inspectors found nothing wrong at Davis-Besse and
7 issued that company an all-green report card,
8 found no problems in any area. Slide 19.

9 In April of 2000 one of the few NRC
10 inspectors to visit Davis-Besse was handed this
11 photo showing damage to the reactor vessel head at
12 Davis-Besse. That inspector merely filed it away.
13 The plant restarted and operated for two more
14 years. Slide 20.

15 In the fall of 2001 concerns about
16 potential reactor vessel head damage prompted the
17 NRC to consider ordering Davis-Besse to be shut
18 down for a safety inspection. They went as far as
19 to draft and order requiring that to occur.

20 This the NRC's own slide from that
21 decision making process with my highlights in red.
22 The NRC applied five safety criteria and
23 determined that Davis-Besse did not meet any one
24 of the five criteria. Slide 21.

25 Apparently zero percent is close enough

1 for the NRC because they opted not to issue the
2 order requiring a safety inspection and allowed
3 Davis-Besse to continue running. Slide 22.

4 Returning to the safety culture issue.
5 The NRC's own safety culture is worse than at any
6 nuclear power plant I have ever seen. In a 2002
7 survey of the NRC staff half of the NRC's worker
8 force feeling not free to raise safety concerns.
9 The regulator's staff doesn't feel safe or feel
10 free to raise safety concerns.

11 By comparison the NRC forced Point
12 Beach, Salem, Davis-Besse, Millstone and others to
13 fix safety culture problems when surveys showed
14 ten to fifteen percent of the work forces at those
15 sites being unable to raise safety concerns.
16 NRC's numbers are epidemic levels compared to
17 those plants.

18 Four years later in a 2006 survey, the
19 most recent one that was done, there's very little
20 improvement in the NRC's safety culture. Whether
21 it's a long list or short list the top item on the
22 list has to be fixing the safety culture at the
23 NRC so its workers feel free to voice safety
24 concerns. Slide 23.

25 Shifting from risk to reliability let's

1 take a look back at the numbers. Two hundred and
2 fifty-nine nuclear power reactors were ordered or
3 proposed in the United States since day one. One
4 hundred and twenty-seven of those reactors were
5 cancelled at various stages up to 90 plus percent
6 constructed. One hundred and thirty-two reactors
7 were also licensed by the NRC or its predecessor
8 the Atomic Energy Commission, 28 reactors have
9 been permanently shut down leaving 104 reactors
10 currently operating.

11 Over that time 41 of those reactors have
12 had to remain shut down for a year or longer, 10
13 of them actually did it twice, for a grand total
14 of 51 such year-plus outages to restore safety
15 margins to minimally acceptable levels before they
16 could resume operation. Slide 24.

17 What do those numbers mean? History
18 tells us that only half of the nuclear power
19 plants ordered actually go into operation.
20 Billions of dollars were wasted on the other half
21 that didn't generate a single watt of electricity
22 in return.

23 Of the nuclear power reactors that did
24 operate, less than 70 percent of them have avoided
25 one or more year-plus outages to restore safety

1 margins to minimally acceptable levels. Billions
2 of dollars were wasted during those year-plus
3 outages when not a single watt of electricity was
4 produced in return. Slide 25.

5 Where did those year-plus outages,
6 reactor safety outages occur? From sea to shining
7 sea. You'll note that Nevada, Idaho, New Mexico,
8 Utah, Montana, Wyoming, Indiana and West Virginia
9 did not have nuclear power plants experiencing
10 year-plus safety outages.

11 To be fair, they cheated. No nuclear
12 power plants operated in those states. Slide 26.

13 What was the costs of these year-plus
14 outages? It turns out it was approximately \$82
15 billion give or take a nickel. While the
16 Tennessee Valley Authority's Browns Ferry reactors
17 account for the lion's share of that waste these
18 other outages typically cost in the one to two
19 billion dollar range. Slide 27.

20 What were the causes of these costly
21 reactor safety outages? Four of the outages were
22 needed to repair damage caused by accidents like
23 the 1966 meltdown at Fermi Unit 1 and the 1975
24 fires at Browns Ferry. Eleven were caused by the
25 replacement or repairs to single large components

1 like steam generators.

2 But the lion's share, 70 percent of the
3 year-plus outages were caused by an accumulation
4 of safety problems over time that required an army
5 of workers over a year to undo.

6 In a bizarre, nuclear, groundhog day
7 this cause recurs again and again and again.
8 Forty-five times since the reactor meltdown at
9 Three Mile Island in 1979 this has occurred.

10 It's wrong for the plant owners to allow
11 so many safety problems to build up. It's equally
12 wrong for the NRC to allow safety margins to drop
13 so low that it takes more than a year and nearly
14 \$2 billion to restore. Slide 28.

15 As I mentioned we apply a short list
16 standard to nuclear safety. There's a very long
17 list of things the NRC needs to do about safety
18 and security.

19 As a result of not doing these things
20 nuclear power is less safe, less secure and more
21 costly than is necessary simply because the NRC is
22 not doing its job adequately.

23 We must not wait until American lives
24 are lost in a nuclear disaster before undertaking
25 these reforms. If today's nuclear power plants

1 are to receive extended operating licenses or
2 nuclear power are built, the first step must be
3 the completion of the reforms necessary at the
4 NRC.

5 That agency needs to become an effective
6 regulator and a reliable guardian of public health
7 and safety. I've mentioned that we apply a short
8 list standard. We also use a short list ourselves
9 for the steps that we need to take in order to get
10 reasonably safe and secure nuclear power.

11 Our list has one item. Simply reform
12 the NRC. It's such a short list that we don't
13 need to write it down. We can remember even one
14 step. But we do believe we could use some help in
15 accomplishing this one step.

16 We recognize that the California Energy
17 Commission is not responsible for the NRC and
18 cannot compel the agency to undertake any needed
19 reforms. But we both have access to the United
20 States Congress which does have oversight
21 responsibility for the NRC and can compel the NRC
22 to reform.

23 We hope the Commission will join UCS in
24 sending clear and repeated messages to the United
25 States Congress that the status quo at the NRC is

1 simply unacceptable if we are to have reasonably
2 safe and secure nuclear power in our futures.

3 I personally believe the NRC can become
4 a consistently, effective, reliable regulator.
5 Mr. Jones of the NRC outlined the steps the agency
6 is taking to, escalating steps, the agency is
7 taking to improve conditions at Palo Verde.

8 We've monitored that plant very closely
9 over the last three years and have concluded that
10 NRC Region IV has been doing an excellent job of
11 addressing the declining problem at that site and
12 trying to compel the changes that are needed at
13 that site.

14 Our goal is to make that kind of
15 performance the rule at the NRC instead of the
16 exception. I appreciate this opportunity to share
17 our perspectives during your process. Thank you.

18 PRESIDING MEMBER PFANNENSTIEL: Thank
19 you Mr. Lochbaum and we appreciate your coming
20 here and providing that perspective. Are there
21 questions? Thank you.

22 MR. McCLARY: Next and the final
23 panelist for this morning is Rochelle Becker.
24 Ms. Becker is the Executive Director at the
25 Alliance for Nuclear Responsibility. She's been

1 active on nuclear power safety issues in
2 California for 30 years either in the past with
3 Mothers for Peace or currently with the Alliance
4 and I believe we have another presentation as
5 well. I will turn the podium over to Ms. Becker.

6 MS. BECKER: First, I've never done
7 PowerPoint before so I hope you all bear with me.
8 I would first very much like to thank the
9 Commission for inviting us to attend today and to
10 talk about our concerns about the costs, benefits
11 and risks of continuing to rely on aging nuclear
12 power plants on a seismically active coast in our
13 state.

14 I'm also looking forward to the analysis
15 that will be done by the California Energy
16 Commission as mandated by 1632 whose author is my
17 Assemblyman, Mr. Blakeslee, Assemblyman Sam
18 Blakeslee.

19 I'm really going to try to do this right
20 without doing too much damage to all this
21 equipment. The Alliance for Nuclear
22 Responsibility's purpose here today is to
23 highlight the public's concern regarding the
24 continued operation at aging nuclear reactors.

25 We are delighted to be included with

1 renowned experts and stakeholders. The resolution
2 of these concerns impacts 38 million Californians
3 who may also be wondering who will be in charge
4 and who will be charged for the economic impacts
5 should our state allow highly-radioactive wastes
6 to be produced on our seismically-active coast for
7 an additional 20 years.

8 To date the Nuclear Regulatory
9 Commission has blessed the license renewal for 27
10 nuclear sites with one or more reactor at each
11 site and has eight more applications on file
12 awaiting approval and 24 more nuclear utilities in
13 queue.

14 Will the NRC have the human resources or
15 the political will to safely monitor these old
16 reactors while cheerleading for the so-called
17 renaissance of the nuclear industry.

18 Will the Department of Energy find a
19 solution for the storage of highly-radioactive
20 wastes and if so what will it cost?

21 Our state has been waiting over 30 years
22 for a solution to the storage of radioactive
23 wastes. We are still waiting. And assuming Yucca
24 ever opens will it be able to handle a high-level
25 radioactive waste that will be produced during the

1 additional 20 years of operation if license
2 renewal applications are filed.

3 As there is virtually no doubt that the
4 Nuclear Regulatory Commission would approve the
5 applications.

6 And if those two agencies fail and leave
7 our state faced with a catastrophic radioactive
8 release will FEMA be able to ensure successful
9 emergency actions?

10 A transparent process with state and
11 public input is absolutely mandatory to resolve
12 these questions.

13 Since the last Energy Commission
14 workshop in 2005 the Public Utilities Commission
15 or the public has seen a plethora of headlines
16 relating to California's nuclear energy suppliers
17 and their problems. These problems occur even
18 when even though California has some of the most
19 active watchdog organizations in the country.

20 These are some of the problems at San
21 Onofre, Palo Verde and Diablo Canyon. But I have
22 to admit that we do have the pretties nuclear
23 power plant in the nation (laughter).

24 The media appears to be most comfortable
25 quoting the assertions of the nuclear industry

1 that new nuclear plants are quote, unquote needed
2 to solve our energy needs and to quote, unquote
3 address climate change.

4 To say nuclear power is the answer to
5 global warming rings of a secretive, Cheney energy
6 policy versus a responsible, forward-looking
7 energy plan.

8 The familiar refrain of no new nuclear
9 power plants until the issues of permanent and
10 safe waste storage are in place, economics are
11 market driven and proliferation is addressed has
12 morphed into we should consider nuclear power but
13 remain concerned about waste, economics and
14 proliferation. And that is a very big but.

15 Media coverage rarely considers the
16 downside, the financial burden continuing to
17 operate reactors designed over 50 years ago.

18 Yes, Professor Peterson told you I'd be
19 talking about him just a bit and this is his
20 quote. However what he stated was that these old
21 nukes do have seatbelts and shoulder harnesses and
22 safer than motorcycles. Yet if we are to look
23 forward shouldn't we be striving for clean,
24 efficient and cost-effective mass transit versus
25 continuing to drive our seat-belted and

1 radioactive waste-producing Edsels?

2 Since the beginning of this century the
3 California Public Utilities Commission has
4 approved billions of ratepayer dollars to bail out
5 nuclear utilities and to operate and maintain,
6 replace aging components, increase security and
7 construct on-site storage for high-level
8 radioactive waste.

9 We don't use the word ISFSI. It is
10 high-level radioactive waste storage and that is
11 what we should call it.

12 A few years ago the Public Utilities
13 Commission approved the replacement of steam
14 generators at a cost of \$700-plus million per
15 nuclear facility. The steam generators like other
16 large and costly components including turbine
17 rotors and reactor vessel heads were designed to
18 last the full 40 year life of the reactors yet
19 failed within 20 years.

20 Replacements today are no assurance that
21 the new components will last if California's
22 nuclear power plants are allowed to operate beyond
23 current license terms. These replacements and the
24 Nuclear Regulatory Commission's statement that it
25 intends to grant license renewals to all nuclear

1 power plants were the spark that created the
2 Alliance for Nuclear Responsibility.

3 The Alliance believes our state has a
4 responsibility to ensure future generations as
5 economic, safe and reliable.

6 We wanted to play PG&E's ad but I don't
7 know if we can do that. Just giving PG&E a little
8 plug here, maybe. It's not going to work, never
9 mind.

10 Our goal is to encourage 4,000 megawatts
11 of electricity that will not produce high-level
12 radioactive wastes for future generations thereby
13 supporting PG&E's message of wind, sun, water and
14 renewable energy as the wave of the future.

15 I watched this commercial over and over
16 and over again with this little guy in his red
17 jacket running around in circles. And never once
18 does he say to his classroom, and we need nuclear
19 power too.

20 Our state cannot afford to get it wrong
21 again. With the advent of SB 1 and AB 32 our
22 state's commitment to clean power supplies is a
23 beacon of light to the world. Yet California is
24 in a three-way tie for first in energy efficiency.

25 A 2006 study funded by a grant from the

1 US EPA stated, quote, more and more states are
2 turning to energy efficiency outpacing the federal
3 government by a widening margin and leading the
4 way on appliance standards, building codes, energy
5 efficiency, resource standards and other key
6 policies that drive energy efficiency investment.

7 The connections that can be gleaned from
8 this data are relevant to the matters before the
9 Energy Commission and the issue of continued
10 reliance on nuclear power.

11 The top ten states in efficiency
12 represent a wide diversity of demographic data.
13 They are not clustered in one region but represent
14 diversity in climate, size, population and
15 regional distribution.

16 The top ten leading states have had very
17 active interventions including oversight and/or
18 legal actions by community groups, attorneys
19 general, local and state agencies and state
20 legislators to invoke and enforce state's rights
21 in issues not preempted by the Nuclear Regulatory
22 Commission or in direct challenge to such
23 preemption.

24 These states have experience both
25 economic and both the economic and reliability

1 vagaries of nuclear power and have compensated for
2 the loss of that power which may be a direct link
3 to their strong showing in implementing energy
4 efficiency. Only four of California's aging
5 reactors remain in operation today.

6 By comparison the trailing states of
7 Georgia, Virginia and particularly Alabama and
8 Mississippi are states in which the energy
9 utilities have expressed the most interest in
10 building the first nuclear utilities.

11 Perhaps the states that have sought to
12 un-encumber themselves from the shackles of the
13 older technology will be poised to move ahead with
14 the next generation of truly renewable and green
15 energy. And those that remain mired and dependent
16 on the past will lose that opportunity.

17 California's willingness to legislate
18 energy policies that balance generation with
19 conservation, reliability, economics and the
20 environment should make all proud.

21 However nuclear cannot be defined as the
22 green energy. And we need not make a selfish
23 choice for generation. California should not ask
24 state residents to make that choice unless
25 absolutely no other option exists.

1 In that context the Alliance for Nuclear
2 Responsibility and Sierra Club fail to understand
3 why the California Energy Commission's sister
4 agency the California Public Utilities Commission
5 refused to withhold ratepayer funding until the
6 completion of the Energy Commission's analysis as
7 mandated by 1632.

8 We were joined by the PUC's Division of
9 Ratepayers Advocates and TURN as well as
10 legislative leaders in requesting that ratepayer
11 funds be delayed until the fruition of the CEC's
12 analysis. However rather than listen to consumer,
13 environmental and elected representatives the PUC
14 added a few qualifiers to the timing of ratepayer
15 compensation and gave PG&E what it requested.
16 This is an historical pattern that has not served
17 California ratepayers well.

18 Costs are difficult to gauge 15 to 18
19 years in advance of current license expirations.
20 And the history of cost overruns in the nuclear
21 industry is infamous. Fifteen years ago no one
22 knew that components designed to last the life of
23 the reactors would fail and need expensive
24 replacements. Now ratepayers are being held
25 responsible for \$16.8 million for PG&E's third

1 feasibility study of license renewal.

2 It is important to note that the Nuclear
3 Regulatory Commission does not require the scope
4 of a license, renewal application to include the
5 costs of increasing stockpiles of high-level
6 radioactive wastes, increasing security
7 requirements nor enhanced emergency planning.

8 The Alliance is grateful to live in a
9 state willing to analyze these important economic
10 impacts.

11 The resolution of controversial issues
12 of once-through cooling and seismic impacts is
13 very important to this analysis. This information
14 will be extremely valuable in making the analysis
15 meaningful.

16 A seismically-active coast is not a safe
17 place to store wastes. And even the NRC says west
18 of the Rocky Mountain sites that lie within a
19 range of strong near-field, ground motion from
20 historical earthquakes on large capable faults
21 should be avoided. Yet they are not being
22 avoided, they are being halted temporary.

23 California seismic history, of the 39
24 worldwide earthquakes listed on the USGS survey
25 site, 21 of them occurred in California. Since

1 1900 almost 90 damaging earthquakes with a
2 magnitude of over 6.0 have occurred within the
3 state resulting in billions of dollars of property
4 damage and thousands of deaths and injuries.

5 Where is radioactive waste stored today?
6 Here's a slide. Here's a seismic map. Where will
7 it be stored tomorrow?

8 The cost of license renewals to
9 California ratepayers could be considerable yet
10 virtually all these costs remain unknown. For
11 example, the final cost of a permanent storage
12 site for high-level radioactive wastes now being
13 stored under a temporary license on our
14 seismically-active coast without a definition for
15 temporary has been granted.

16 A permanent solution promised for
17 several decades remains mired in controversy and
18 perhaps the Department of Energy's solution is to
19 change its PR campaign at taxpayers' cost. The,
20 quote, division in charge of disposal and storage
21 of spent nuclear fuel, still radioactive, and
22 radioactive wastes, notably the controversial
23 Yucca Mountain Project is on the hunt for a PR
24 firm to develop its communications and public
25 outreach.

1 According to Mr. Loux and Ms. Macfarlane
2 the DOE might better use our taxpayer dollars for
3 a deep, geologic site that will protect the
4 public.

5 Over 2,100 spent-fuel assemblies are now
6 packed tightly together in pools at Diablo Canyon
7 designed for 540 assemblies. Yet PG&E plans to
8 move only enough old radioactive fuel assemblies
9 to replace them with new hotter assemblies. This
10 is their statement before the California Public
11 Utilities Commission, not this, but that was their
12 statement before the California Public Utilities
13 Commission. I don't know where I am on the
14 slides.

15 Further cost information is needed to
16 determine full economic impacts of aging nuclear
17 reactors, for example, the lack of homeowner or
18 business owner ability to attain private insurance
19 no matter what they are willing to pay could be an
20 incredible economic disaster that's magnitude is
21 greater than either Chernobyl or Katrina.

22 While the loss of housing and the
23 ability to export all agriculture and dairy from
24 Ukraine was in the billions it pales in comparison
25 to California's agriculture industry which exports

1 over \$9 billion annually, a tourism industry which
2 creates \$88 billion per year and 900,000 jobs.

3 A radioactive release, no matter how
4 small, could severely damage these industries and
5 the federal insurance program set up to address
6 these losses is woefully inadequate.

7 Federally funded nuclear and other
8 energy research from the mid 1950s until 1996 at
9 the site of at least nine nuclear accidents in
10 California including a partial meltdown in 1959 is
11 telling. This meltdown and these accidents have
12 depressed property values and remain the likely
13 cause of significant cancers in the area.

14 The long-awaited clean up costs for this
15 site was the subject of a bill sponsored by
16 Senator Kuehl which successfully passed out of
17 Assembly Toxics Committee this week.

18 An example of how this affects a
19 California homeowner whose home represents his
20 largest investment was a subject of a recent LA
21 news article, quote, Scott Ewing was set to open
22 escrow on his \$1.7 million home when buyers
23 learned that research had detected higher cancer
24 rates among people living near within two miles of
25 the Santa Susanna Field Lab. Quote, we're bummed,

1 said Ewing who recently bought a home in Simi
2 Valley. Now we have to prove or disprove what's
3 in that study. And the pool of people willing to
4 buy in this area has diminished. And we have to
5 disclose the study to the buyers.

6 In the last few years strontium and
7 tritium leaks have been discovered off-site at at
8 least seven of our nation's nuclear plants,
9 including San Onofre.

10 Any incident or even innuendo created by
11 tritium leaks or the stigma of a radioactive
12 release threatens to destabilize home and real
13 estate values, particularly in California's
14 coastal zone which are some of the most highly
15 appraised parcels in the entire nation.

16 The cost of providing security,
17 infrastructure improvements along our state's
18 rails and roads over which radioactive wastes may
19 some day be shipped to somewhere else must be
20 included in this analysis. Training and providing
21 equipment for the state's first responders will be
22 a continual and costly challenge that will be
23 required as long as waste is produced and
24 temporarily stored on-site.

25 This is a truck hauling 6,000 pounds of

1 uranium overturns on I-5 was one of the headlines,
2 Plutonium transit uproar, crash of truck with
3 radioactive wastes released the desert stirs
4 concerns. I know they keep talking about all
5 these shipments that are happening without
6 incidents but somehow the press picks up something
7 that's happened somewhere.

8 This is a derailment of a train. If a
9 permanent waste site opens how will the waste get
10 there? There's 77,000 tons that need to be
11 transported on our roads and our rails.

12 The cost of providing security
13 infrastructure improvements along our state's
14 rails and roads I already read that.

15 The skyrocketing costs of uranium
16 appears to have investors drooling yet this
17 astronomical cost will again impact ratepayers
18 funding for old and obviously deteriorating
19 technology.

20 Finally on a not all-inclusive list is
21 the economic impacts of California's vital marine
22 works and resources from the use of billions of
23 gallons of once-through cooling and the effects of
24 thermal discharge on its fishing, recreation and
25 coastal communities.

1 California's reactor communities have
2 additional costs, benefits and risks. Cost,
3 emergency planning. Recently this County of San
4 Luis Obispo's grand jury stated that citing a lack
5 of money and personnel San Luis Obispo County will
6 not carry out the majority of recommendations
7 recently made by the Civil Grand Jury to improve
8 public safety in the event of a radiation release
9 at the Diablo Canyon Nuclear Power Plant.

10 Also another cost is bringing San Onofre
11 and Diablo Canyon into compliance with recent
12 federal court decisions on water and security.

13 I had a list of benefits but Mr. Keenan
14 gave them to you and I don't think he needs two
15 bites of the apple. The economic benefits are
16 likely similar in the area surrounding San Onofre,
17 San Clemente and Oceanside.

18 But San Onofre and Oceanside are not
19 company towns and therefore they're not as
20 dependant as San Luis Obispo on Diablo Canyon's
21 generosity and taxes.

22 Risks, a radioactive release from Diablo
23 Canyon would place the \$1 billion tourist industry
24 in San Luis Obispo at risk. The cost would likely
25 be much higher if there was a radioactive release

1 at San Onofre as Disneyland, Legoland, Sea World,
2 the San Diego Zoo, the Wild Animal Park and the LA
3 Dodgers Stadium or Orange County or whatever they
4 name it now are all within 50 miles of the San
5 Onofre Nuclear Plant.

6 A radioactive release from Diablo Canyon
7 would place San Luis Obispo's \$59 million
8 agricultural industry at risk, likely a bit less
9 for San Onofre.

10 As more visionary communities step away
11 from PG&E and SCE generation and move towards
12 community choice, munis and off-grid clean and
13 efficient technologies fewer and fewer ratepayers
14 will be left to pay the increasing costs of
15 California's aging nuclear plants.

16 The California Energy Commission's
17 analysis of costly externalities that are part of
18 a nuclear power plant generation won't finally
19 give our state a true bottom line of what nuclear
20 power costs.

21 The Nuclear Regulatory Commission
22 considers none of this in their license renewal
23 process but they are costs every California
24 ratepayer deserves to know and which our state
25 government has a right to ascertain and act upon.

1 To say as certain pundits do that
2 nuclear power is still economical is like saying
3 that driving a Rolls Royce is economical if you
4 only count the cost of the gas. If you exclude
5 the price of tune ups, the hard-to-obtain parts,
6 the non-existent insurance and the specialized
7 service.

8 The cost of nuclear power once touted as
9 too cheap to meter has been historically
10 underestimated by as much as 500 percent. In the
11 case of Diablo Canyon and San Onofre this has been
12 to the detriment of California ratepayers
13 including the misdirection of ratepayer dollars
14 that could have been better invested in exciting
15 and truly renewable, truly sustainable forms of
16 energy generation.

17 PG&E's own words our at least the words
18 presented in their well-publicized and executed
19 television campaign which I can't show you, tell
20 us the future is wind, sun, water and other
21 renewable energy. Why not rise to that challenge
22 and create a future with 4,000 megawatts of golden
23 opportunity? Again, thank you very much for
24 inviting someone who represents the public and
25 ratepayers to attend this meeting and speak today.

1 PRESIDING MEMBER PFANNENSTIEL: Thank
2 you Ms. Becker. Are there questions? We have
3 none, thank you very much for participating.

4 MR. McCLARY: And that is all of our
5 speakers for this morning. It's past noon.

6 PRESIDING MEMBER PFANNENSTIEL: It is.
7 I want to thank the morning panel. I'm sorry we
8 ran so late but it was, it was worth it in my
9 opinion. I think we built an incredibly strong
10 record on these subjects. And we appreciate you
11 who travelled a great distance to come and
12 participate with us, very valuable information.

13 We're going to take a lunch break. And
14 we are running late so let's come back in a little
15 over an hour. It's twenty of one now. Let's come
16 back at a quarter to two. So an hour and five
17 minutes from now.

18 (Whereupon, the lunch recess
19 was taken.)

20 --oOo--

21
22
23
24
25

1 AFTERNOON SESSION

2 PRESIDING MEMBER PFANNENSTIEL: Good
3 afternoon. I think we're ready to start up in the
4 afternoon session. We have a number of impressive
5 invited speakers so why don't I turn it over to
6 Dr. Weisenmiller to get us going.

7 DR. WEISENMILLER: Good afternoon.
8 Starting out on the last panel of our two day
9 session. And as we have done in most of these
10 we're starting out with a public official and our
11 first speaker will be Richard Cheston from the US
12 Government Accountability Office. He is the
13 Assistant Director in GAO's Natural Resources and
14 Environment team. His public service has been
15 with GAO and as part of that he's worked on
16 primarily energy and scientific issues. And he is
17 currently responsible for engagements evaluating
18 Yucca Mountain and the NRC's readiness to review
19 license applications. And he is also responsible
20 for their recent report on Key Challenges Remain
21 for Developing and Deploying Advanced Energy
22 Technologies. I think we have provided these
23 three GAO reports to the Committee, the
24 Commissioners.

25 MR. CHESTON: Good afternoon, Madame

1 Chairman and Commissioners. I am pleased to be
2 here today to discuss the US Government
3 Accountability Office's assessment of the key
4 challenges to the development and deployment of
5 nuclear power in the United States.

6 My remarks will summarize recent GAO
7 assessments of the Department of Energy's efforts
8 to, one, design and build a repository for the
9 permanent storage of spent nuclear fuel and other
10 radioactive waste at Yucca Mountain in Nevada,
11 two, stimulate the deployment of Generation III
12 nuclear power technologies, and three, conduct R&D
13 designed to develop Generation IV technologies. I
14 will also discuss the NRC's efforts to regulate
15 104 operating nuclear power reactors and prepare
16 for license applications to build and operate as
17 many as 29 new nuclear power reactors.

18 Turning first to DOE's efforts to build
19 a nuclear waste repository at the Yucca Mountain
20 site. Nuclear power reactors generate 20 percent
21 of the nation's electricity but also create waste
22 that can remain highly radioactive for hundreds of
23 thousands of years and require proper disposal to
24 protect public health and the environment. More
25 than 50,000 metric tons of this radioactive waste,

1 enough to fill the area of a football field about
2 ten feet deep, currently is being stored
3 temporarily at 72 sites around the country,
4 principally at commercial nuclear power plants.

5 The Nuclear Waste Policy Act of 1982
6 directed DOE to construct an underground geologic
7 repository to permanently store spent nuclear fuel
8 and other radioactive waste. The act required
9 nuclear power plants to contribute to the Nuclear
10 Waste Fund to pay for the construction and
11 operation of the nuclear waste repository and set
12 1998 as the target date for DOE to start accepting
13 this waste.

14 Before construction of the repository
15 can begin DOE's Office of Civilian Radioactive
16 Waste must apply for and obtain a license from
17 NRC. In June 2006 OCRWM's director announced an
18 aggressive schedule to submit DOE's license
19 application for a repository to NRC by June 30,
20 2008. OCRWM's director currently estimates that
21 2017 is the earliest date that the repository
22 could open.

23 As apt of NRC's licensing process DOE
24 must demonstrate its repository will meet NRC
25 standards for protecting public health and the

1 environment from hazardous exposure to radioactive
2 waste. In preparation for submitting a license
3 application OCRWM has conducted numerous
4 scientific and technical studies at the Yucca
5 Mountain site that will serve as supporting
6 documentation to demonstrate that it can meet
7 these standards.

8 OCRWM has also developed mathematical
9 models to measure the probability that various
10 combinations of natural and engineered features of
11 the repository will safely contain the waste for
12 the long term, taking into account water
13 infiltration, earthquakes, volcanic action and
14 other scenarios.

15 To ensure the reliability of the license
16 applicants' technical analyses NRC requires them
17 to implement a quality assurance program so that
18 scientific analyses, design, engineering,
19 procurement, record keeping and other work at the
20 project are performed under controlled conditions
21 that ensure quality and enable the work to be
22 verified by others. Project teams are then
23 responsible for carrying out aspects of the work
24 and creating their own policies and procedures to
25 implement the quality assurance requirements.

1 In March 2006 we reported that OCRWM had
2 experienced persistent problems with its quality
3 assurance program for the Yucca Mountain project.
4 We concluded that the project's management tools
5 were ineffective for monitoring performance and
6 detecting a new quality assurance problems. We
7 recommended that DOE take actions to strengthen
8 the project's management tools to better identify
9 problems and track progress in addressing them.
10 The report also identified three substantial
11 management challenges facing the project.

12 First, DOE faced challenges related to
13 its 2005 discovery of email messages implying that
14 some US Geological Survey employees who provided
15 technical analysis for the Yucca Mountain project
16 had falsified records for scientific work and had
17 shown disdain for a quality assurance program
18 requirements. Our subsequent report in January
19 2007 found that DOE had spent about \$20.5 million
20 on rework and training associated with the USGS
21 work.

22 Second, DOE faced challenges in ensuring
23 that specific engineering designs reflected high
24 level plans and regulatory requirements. For
25 example, a building for handling radioactive waste

1 was required not to have any water, which could
2 facilitate a nuclear reaction. However, the
3 building was inadvertently designed with a fire
4 suppression sprinkler system.

5 Third, DOE faces challenges with
6 management continuity. For example, between 2001
7 and 2006 nine of seventeen key management
8 positions experienced turnover. NRC has expressed
9 concern about the need for continuity of qualified
10 managers rather than a series of acting managers.

11 Quality assurance challenges are not new
12 at the project and over time have contributed to
13 delays in submitting a license application. In
14 2001 DOE determined that it would not be able to
15 submit a license application to NRC by December
16 2002, in part because of ongoing efforts to
17 resolve quality assurance problems. DOE was also
18 unable to meet a December 2004 goal for submitting
19 a license application.

20 In October 2005 DOE implemented its New
21 Part Forward, which made major changes to the
22 design, organization and management of the project
23 by, for example, reorganizing project staff to
24 create a single manager in charge of the project's
25 main tasks in science, engineering and licensing.

1 Int also designated Sandia National Laboratories
2 as the project's lead laboratory to integrate the
3 scientific work previously being overseen by the
4 project's lead contractor, Bechtel/SAIC Company.

5 More recently the director fundamentally
6 changed DOE's management of the Yucca Mountain
7 project. DOE now directly manages the project
8 rather than its prior role that was limited to
9 overseeing Bechtel/SAIC's implementation of its
10 management and operating contract. The OCRWM
11 director and deputy director now hold monthly
12 program review meetings with DOE and contractor
13 project managers and routinely participate in
14 quality assurance management meetings with a focus
15 on identifying and correcting problems.

16 Many states have expressed alarm at the
17 delays in opening Yucca Mountain, fearing that the
18 repository will suffer continual delays or might
19 never open, forcing the nuclear power plants to
20 store the spent fuel indefinitely. According to
21 the National Council of State Legislatures, seven
22 states have prohibited the construction of new
23 nuclear power plants, citing the need to resolve
24 the spent fuel issue.

25 While the states are concerned about

1 public health and environmental risks, especially
2 with about 2,000 tons of spent nuclear fuel being
3 added to the national inventory annual, DOE and
4 NRC cite a long list of studies that indicate that
5 the risk of radiation release from spent fuel in
6 interim storage in pools or in dry storage casks
7 is low.

8 Turning next to the additional
9 challenges that electric power companies face in
10 deciding whether to deploy Generation III
11 reactors. In December 2006 we reported that the
12 nuclear energy industry, DOE and NRC face
13 important challenges in reinvigorating the nuclear
14 power industry by building new, Generation III
15 reactors. These challenges include the high
16 capital costs of the nuclear power reactor
17 construction projects, regulatory uncertainty that
18 could delay construction that could substantially
19 add to project costs, public resistance and the
20 previously mentioned discussion on the uncertainty
21 about the long-term storage of nuclear waste.

22 During the 1960s and '70s the costs and
23 time frames of constructing many nuclear power
24 plants vastly exceeded anticipated budgets and
25 schedules. And in the late 1970s public concern

1 grew about the safe operation of existing
2 reactors.

3 NRC issued its last permit to construct
4 a nuclear reactor in 1978, the year before the
5 Three Mile Island nuclear reactor accident, which
6 heightened public opposition to nuclear power and
7 tightened NRC's oversight of nuclear power plant
8 operations. Since then no electric power company
9 has applied to NRC for a new, nuclear reactor
10 construction permit. However, as of December
11 2006, of the 103 operating nuclear reactors in the
12 United States, 43 have been approved for a 20 year
13 license extension and another ten had submitted
14 applications to NRC to extend their licenses.

15 Nuclear energy representatives expect that a
16 new nuclear power plant could cost between \$1.5
17 billion and \$4 billion. More than double the cost
18 of comparably sized, conventional coal-fired
19 plants. These costs may increase if, one,
20 transmission lines need to be installed or
21 upgraded, two, significant delays occur during
22 construction or start-up activities, or three,
23 lawsuits are filed resulting in higher legal costs
24 and delay.

25 Although nuclear power plants have

1 relatively low operating costs and can operate at
2 90 percent capacity, the overall cost of
3 construction makes nuclear energy a high-cost
4 option.

5 In recent years MIT and the University
6 of Chicago issued studies comparing nuclear
7 power's cost with other forms of generating
8 electricity. Both studies concluded that assuming
9 no unexpected costs or delays in licensing and
10 construction, nuclear power is only marginally
11 competitive with conventional coal and natural
12 gas, and even then only if the nuclear power
13 industry significantly reduces anticipated
14 construction costs.

15 However, the MIT study found that if a
16 tax on carbon emissions were introduced, nuclear
17 energy could become much more competitive because
18 conventional coal and natural gas power plants
19 would be subject to the tax while nuclear reactors
20 would not because they do not emit carbon dioxide
21 during the generation of the electricity. Coal-
22 based IGCC plants could perform much better than
23 conventional coal-fired plants in capturing and
24 sequestering carbon dioxide emissions. but these
25 plants are considerably more expensive to build

1 and operate than conventional coal-fired plants.

2 Because NRC has not issued a
3 construction permit in almost 30 years investors
4 worry that the problems that contributed to the
5 schedule delays, cost overruns and abandonment of
6 many plant reactors may not be resolved. For
7 example, the Nuclear Energy Institute noted that
8 some nuclear power plants that should have cost
9 about \$500 million at the time actually cost \$1
10 billion and took several years longer than
11 anticipated to build.

12 Among the reasons for these problems
13 were that electric power utilities had custom-
14 built many of the nuclear power plants rather than
15 using a standard design, and sometimes began
16 construction with preliminary design information,
17 only to resort to mid-construction retrofits as
18 final design plants changed.

19 In 1989 NRC streamlined its licensing
20 process by contributing its -- by combining its
21 construction and operating licenses into a single
22 license that requires applicants to submit final
23 design information, safety analyses and
24 environmental data in advance of or with license
25 application.

1 While industry representatives generally
2 agree that the revised licensing process reduces
3 risk of retrofits, they are concerned that the new
4 process has not been tested and could lead to
5 costly delays. For example, some representatives
6 noted that NRC had already fallen behind schedule
7 in reviewing early site permits for three electric
8 power companies submitted, that three companies had
9 submitted as part of a DOE demonstration program
10 to stimulate power companies to apply to NRC for a
11 combined construction/operating license.

12 Electric power companies have notified
13 NRC that they plan to submit license applications
14 to build and operate 29 new reactors. To prepare
15 NRC is implementing a design-centered approach
16 requiring that applicants use standardized design
17 for each reactor manufacturer with variations only
18 to address the site's local characteristics such
19 as environmental conditions.

20 NRC also has created a separate Office
21 of New Reactors to oversee the licensing process,
22 is hiring additional staff, and is developing a
23 more robust system to handle electronic comments.

24 NRC initially announced its intent to
25 issue a decision on each license application with

1 42 months after it was docketed. However, NRC
2 announced on Monday that the Commission has
3 approved a series of recommendations to reduce the
4 length of the review process. While NRC has
5 issued draft regulatory guidance for submitting
6 and reviewing the combined license applications it
7 has yet to finalize the guidance.

8 According to the nuclear energy
9 industry, public support for nuclear power has
10 increased in recent years, primarily as a result
11 of the industry's improved safety record and a
12 growing awareness that nuclear power production
13 releases few greenhouse gases.

14 Many electric power companies plan to
15 build new nuclear reactors at existing power
16 plants, expecting to encounter less community
17 resistance and to take advantage of existing power
18 transmission lines and historic, environmental
19 data for the required environmental assessment.
20 However, industry officials acknowledge that the
21 support is fragile and noted that a nuclear
22 accident anywhere in the world could undermine
23 this support.

24 Turning to DOE's nuclear energy R&D
25 program. Historically, DOE's nuclear energy R&D

1 program peaked at \$2.4 billion in real terms in
2 fiscal year 1998 (sic) and then fell through
3 fiscal year 1998 when the nuclear R&D program
4 received no budget authority. Since 999, budget
5 authority for nuclear energy R&D has gradually
6 increased as DOE implemented a long-term agenda to
7 develop more efficient and proliferation-resistant
8 fuel cycles. devise technologies for managing
9 nuclear waste and design a fourth generation of
10 nuclear reactors that would not use conventional
11 light water reactor technology. In fiscal year
12 2001 DOE prioritized its R&D program to focus on,
13 one, the Nuclear Power 2010 program, two, the
14 Advanced Fuel Cycle Initiative, and three, the so-
15 called Generation IV Nuclear Energy Systems
16 Initiative.

17 Finally, turning to NRC's reactor
18 oversight process. NRC ensures the safety of the
19 nation's 104 operating commercial nuclear power
20 plants by issuing regulations, licensing and
21 overseeing plants, and requiring necessary action
22 to protect public health and safety, up to and
23 including shutting down a plant if it is not
24 meeting the licensing conditions and poses an
25 undue risk to public health and safety.

1 Plant operators are responsible for
2 safely operating their plants in accordance with
3 their licenses.

4 NRC's new ROP process is similar to its
5 prior process in that the oversight activities
6 largely consist of fiscal plant inspections.
7 However, the inspections now focus on more
8 important safety issues. The unexpected discovery
9 in March 2002 of the extensive corrosion and a
10 pineapple-sized cavity in the reactor vessel head,
11 one of the vital barriers preventing radioactive
12 release at the Davis-Besse nuclear power plant in
13 Ohio, led NRC to reexamine its safety oversight
14 and other regulatory processes to determine how
15 such corrosion could have been missed. NRC made
16 several changes to the ROP based on the lessons
17 learned from that event.

18 NRC uses various tools and takes a risk-
19 informed and graded approach to ensuring the
20 safety of nuclear power plants. The tools include
21 physical inspections of plants' equipment and
22 records, and quantitative measures or indicators
23 of plant performance such as the number of
24 unplanned reactor shutdowns. NRC uses a risk-
25 informed approach. That is, is one that considers

1 safety significance in selecting the equipment or
2 operating procedures to be inspected to apply
3 these tools.

4 NRC inspectors conduct baseline
5 inspections of plant operations almost
6 continuously at each nuclear power site. When NRC
7 becomes aware of a performance problem at a plant
8 it assigns the inspection finding one of four
9 colors that reflect the finding's risk
10 significance, which is set based on measures that
11 reflect the potential health effects that could
12 occur from radiological exposure.

13 For most serious inspection findings NRC
14 conducts supplemental inspections to review the
15 extent of the problem, the sufficiency of the
16 licensee's evaluation of the root cause of the
17 problem and the licensee's proposed corrective
18 actions in response to the identified performance
19 problem.

20 NRC conducts specific inspections to
21 investigate specific safety incidents such as
22 reactor shutdowns due to equipment failures
23 because of their potential significance to safety.
24 Based on the number and risk significance of
25 inspection findings and performance indicators NRC

1 places each plant into one of five oversight
2 categories on its action matrix, which corresponds
3 to graded or increasing levels of oversight.

4 From 2001 through September 2006 the ROP
5 resulted in more than 4,000 inspection findings
6 concerning nuclear power plant licensees' failure
7 to fully comply with safe operating procedures.
8 NRC subjected 79 of the 103 operating plants to
9 increased oversight for varying amounts of time.
10 Most of these plants received the lowest level of
11 increased oversight, consisting of a supplemental
12 inspection to follow-up on corrective actions
13 taken for performance problems.

14 About 97 percent of the inspection
15 findings were green, meaning that they were
16 actions or failures NRC considered important to
17 correct but of very low significance to overall
18 safe plant operations. Of the other 98 inspection
19 findings, 86 were white, meaning they were
20 considered to be of low to moderate risk
21 significance, while 12 were of the highest levels
22 of significance to safety, either yellow or red.
23 For example, a steam generator tube failed at one
24 plant causing an increased risk of the release of
25 radioactive material.

1 Over the past five years five plants
2 have been subjected to the highest level of NRC
3 oversight that still allows continued operations.
4 Plants in this category were subjected to this
5 higher oversight for long periods of time due to
6 the more intensive supplemental inspections
7 conducted by NRC and the more systemic nature of
8 the plants' performance problems and subsequent
9 corrective actions NRC expected the licensees to
10 take.

11 NRC inspectors told us that when plant
12 performance declines it is often the result of
13 ineffective, corrective action program, problems
14 related to human performance or complacent
15 management. In assessing ROP results we found an
16 association between poorer performing plants and
17 deficiencies in the plants' human performance and
18 problem identification and resolution programs.

19 One important shortcoming in the ROP
20 that we and others have found is that it is not as
21 effective as it could be in identifying and
22 addressing early indications of deteriorating
23 safety at nuclear power plants before problems
24 develop. In response, NRC recently undertook a
25 major initiative to improve its ability to address

1 plants' safety culture. That is, the
2 organizational characteristics that ensure that
3 issues affecting nuclear plant safety receive the
4 attention their significance warrants. NRC
5 recently modified its oversight process by
6 redefining and increasing its focus on cross-
7 cutting safety issues and developing new
8 requirements under the ROP to more directly assess
9 safety culture at poorer performing plants.

10 We concluded that NRC's efforts to
11 incorporate safety culture into the ROP may be its
12 most critical future change. More than four years
13 have passed since the Davis-Besse plant
14 highlighted that a significant weakness in NRC's
15 oversight was its inability to identify
16 deteriorating safety conditions at plants before
17 they resulted in a performance problem. NRC is
18 taking concrete actions to begin incorporating
19 safety culture into the ROP. It will be important
20 to closely monitor this effort to ensure that it
21 is achieving the result of objectively assessing
22 safety culture while providing an early indication
23 of declining safety performance.

24 We recommended that NRC aggressively
25 monitor, evaluate, and if needed, implement

1 additional measures to increase the effectiveness
2 of its safety culture changes. We also
3 recommended that NRC make available additional
4 information on plants' safety culture to the
5 public and its other stakeholders to provide a
6 more comprehensive picture of plant performance.

7 Madame Chairman, this concludes my
8 prepared statement. I would be happy to answer
9 any questions that you or the Commissioners may
10 have.

11 PRESIDING MEMBER PFANNENSTIEL: Thank
12 you, Mr. Cheston. Are there questions?
13 Commissioner Boyd.

14 COMMISSIONER BOYD: Thank you,
15 Mr. Cheston. And I was just wondering, in your
16 office's oversight of the NRC, and in the vein of
17 these questions about culture and safety culture
18 and trying to spur the injection of more concern
19 about safety in the procedures and the activities
20 of the office. I was just wondering if your
21 office has had any observations on the culture
22 within the NRC.

23 Before lunch we heard a presentation
24 that was pretty strong with regard to the lack of
25 adequate, let's say, culture within the NRC, and

1 another speaker questioning whether we, we as an
2 agency, we as a state, should rely as heavily as
3 perhaps we have in the past on the NRC. I just
4 wonder, do you have any thoughts or comments?

5 MR. CHESTON: We have not looked at that
6 issue direction in our work. We have recently
7 issued a report looking at human capital issues at
8 NRC. NRC is experiencing a huge turnover of staff
9 where a number of people have retired. In
10 addition NRC is adding about another 1,000 people
11 to their staff in preparation for the new reactor
12 licensing.

13 I guess my basic reaction is with that
14 much turnover it's a very important question to
15 ensure, number one, that these folks receive the
16 training that they need to. A lot of people are
17 taking over new jobs within the office and have
18 new responsibilities. In addition it's always
19 good to have an outside review and a careful
20 review to ensure that safety is occurring in the
21 nuclear power field.

22 COMMISSIONER BOYD: Thank you.

23 PRESIDING MEMBER PFANNENSTIEL: Any more
24 questions? Commissioner Geesman.

25 ASSOCIATE MEMBER GEESMAN: Has your

1 office looked at the question of financial
2 guarantees and the adequacy of those contained in
3 the 2005 Energy Policy Act? Either to get an
4 initial round of plants off the ground or perhaps
5 even further out into the future to sustain an
6 industry.

7 MR. CHESTON: We issued -- At the back
8 of my statement I included a list of recent GAO
9 reports and testimonies and two of them took a
10 look broadly at the loan guarantee issue. There
11 are separate concerns for the nuclear power area
12 because my understanding was the Department was
13 not going to guarantee the full cost, they were
14 only going to guarantee, I can't remember if it
15 was 90 percent of the cost. And the various
16 nuclear industry folks said that would not be
17 sufficient for them, that was too great a risk.

18 A second one is that the House
19 Appropriations Committee has issued their report
20 for the energy and water development
21 appropriation. And in that my understanding is
22 that nuclear would not be eligible for the
23 guarantees this coming year.

24 ASSOCIATE MEMBER GEESMAN: Thank you.

25 PRESIDING MEMBER PFANNENSTIEL: Other

1 questions? Thank you, Mr. Cheston. Very
2 important information for us, thanks.

3 DR. WEISENMILLER: Next we're going to
4 make an adjustment to the schedule and go with Jim
5 Harding next. Jim has a flight he needs to catch
6 so we need to get him out of here in about an
7 hour. I'm sure his talk will be less than an hour
8 but I think going through a couple of more between
9 now and then is not going to work.

10 MR. HARDING: I might actually jump up
11 and do it from here.

12 DR. WEISENMILLER: Okay. Just to do the
13 introduction for Jim. One of the things to
14 highlight is that Jim was a member of the recent
15 Keystone Center's nuclear report and can talk
16 particularly, I guess, on the economic issue.
17 Obviously later we have Tom Cochran and Tom was
18 actually on the steering committee of that report
19 so between the two of them I think we can cover,
20 they can cover just about any questions you might
21 have on that.

22 In terms of Jim's background, again,
23 trying to keep it simple. He was the director of
24 external affairs and director of power planning
25 and forecasting for Seattle City Light, which he

1 assured me is even greener than PG&E in terms of
2 kilowatt hours and associated greenhouse gas
3 emissions.

4 He also had a number of opportunities in
5 state service. At least some of us remember Jim
6 when he was at the Energy Commission as advisor to
7 two commissioners and ultimately in the Washington
8 State Energy Office and with the Northwest Power
9 Planning Council. Another period of time he was
10 with MHB so he also has a consulting hat. And
11 then as a public interest background he was with
12 Friends of the Earth decades ago.

13 MR. HARDING: Yes.

14 DR. WEISENMILLER: So with that.

15 MR. HARDING: Thank you Bob.

16 DR. WEISENMILLER: Sure.

17 MR. HARDING: Back in those days Bob and
18 I worked for the same commissioner as it turned
19 out. It's a pleasure to be back here and see so
20 many old friends and faces and also to talk a
21 little bit about what has become a much more
22 popular topic these days than it was a few years
23 ago when you last held a hearing on nuclear power.

24 I am indeed going to talk about much of
25 the work that went into the economics part of the

1 Keystone Center report. And for those of you who
2 don't know, the Keystone Center has a history that
3 goes back to the mid-70s, that some of their first
4 work was on the nuclear fuel cycle. And the way
5 they approach issues is to bring people of
6 strongly held but varying opinions together in a
7 room to see whether they can write anything
8 together.

9 And initially we did a series of reports
10 on the back end of the nuclear fuel cycle in the
11 '70s that were weekend activities and we'd get a
12 letter out to Frank Press, the president's science
13 advisor, by Monday. I found it a very useful
14 approach at that time. It beats the alternative
15 of people sparring with each other using words
16 they look up in the thesaurus the day before.

17 It is helpful to have NRDC, Southern
18 Company, GE, Friends of the Earth if necessary, on
19 the same document, even if the document is
20 nuanced. And the Keystone Report is at various
21 points nuanced. But we did try to take a pretty
22 close look at this question as well as --

23 We started with the basic reason why we
24 were here. It was driven a little bit by, driven
25 for the most part by persistently higher fossil

1 fuel prices, growth in demand for electricity and
2 carbon.

3 And many of you are familiar with the
4 recent paper by Rob Socolow and his colleague.
5 They were proposing that the world over the course
6 of the next 50 years needs to find a way to avoid
7 seven gigatons of carbon emissions annually. They
8 looked at 15 different ways that one might get to
9 a gigaton, seven of which are needed to stabilize
10 atmospheric concentrations of CO2 at about twice
11 pre-industrial levels. One of those was nuclear.

12 A nuclear wedge was about 700 power
13 plants, we have 370 worldwide. So we need to
14 build 1,070 reactors over the next 50 years or
15 about 21 a year. Along with lots of new uranium
16 enrichment plants, repositories, maybe
17 reprocessing plants. Can that happen at all and
18 can it happen without weapons proliferation was
19 one of our questions.

20 This is the picture worldwide on
21 retirements. Some of this is without life
22 extension and some of it is driven by statutory
23 requirements in Western Europe. But as you can
24 see the pace, we don't see it right now but the
25 pace picks up pretty quickly by the mid-2020s. It

1 can be pushed out a bit but I think you'd still
2 see that most of the 370, all the 370 retired over
3 the next 50 years.

4 There are some forecasts, nobody
5 forecasts electricity demand or nuclear power out
6 to 2050, it's way too far. But some people tried
7 to do it for 2030. As you can see the two main
8 forecasts that I've looked at are the Energy
9 Information Administration and the International
10 Energy Agency. Both have -- they both to some
11 extent rely on each other. But as you can see,
12 net additions between now and 2030 are well short
13 of that ace of 21 gigawatts per year. And indeed
14 in terms of fraction of the world's electricity
15 it's not a great deal. It doesn't change much
16 between now and 2030.

17 The last column is a fairly interesting
18 one, which is the fraction of the net additions,
19 additions above existing capacity, that occur
20 outside of the OECD, including OECD Japan and
21 Korea and Russia. So you could alternatively
22 label that China, India, et cetera. If you're
23 going to see expansion that is where it is going
24 to happen.

25 So I think two to six is a credible

1 number. I think it's within the capacity of the
2 existing industry but well below what is necessary
3 to get toward a wedge. And as I said before, even
4 with roughly 75 to 100 percent of the net capacity
5 additions occurring outside of the essentially
6 developed world, nuclear power still is just
7 keeping pace with electricity growth in India and
8 China where it is growing the fastest.

9 The other countries you could think
10 about, some of them raise concerns as to the
11 associated fuel cycle facilities that would
12 support their needs.

13 So now I am going to jump from
14 proliferation which isn't really, which might be
15 an issue for you but not within the Warren-Alquist
16 Act, to reactor economics and how we start to
17 think about what a new reactor might cost in the
18 United States.

19 The past is of no assistance. We built
20 some reactors in the early '70s relatively
21 cheaply, we built quite a few in the late '80s
22 that were extraordinarily expensive and the spread
23 was a factor of three. So there are many reasons
24 for this story and each dot has its own story to
25 tell.

1 You've heard before, we mis-estimated
2 badly, regardless of what year you did the
3 estimate.

4 And I think today we're mis-estimating
5 badly. You can look at 13 studies, as we did in
6 the first phase of the Keystone Report, knock out
7 the outliers, average the rest and come up with a
8 lousy number. We started in a different -- We
9 approached this problem differently and I think
10 our report is consistent, has a much higher
11 number. A factor of two to three higher than the
12 studies. But it is also consistent with recent
13 conclusions, very recent conclusions of both
14 Standard and Poor's and Florida Power & Light.

15 And the main -- We started with the only
16 place you can go to look for recent experience is
17 Asia. We haven't built anything. There's no
18 database outside of Asia. So if you looked at the
19 recently completed standardized reactors in Japan
20 and South Korea you get a number that starts --
21 This is in the range of \$3,000 per kilowatt.
22 Overnight costs. That's as if you could start
23 today, finish tomorrow.

24 This is actually the basis. The first
25 column in 2002 dollars is exactly where the MIT

1 study started. So they essentially did this same
2 exercise and published their report in 2003. But
3 we've had some changes since 2003. After many
4 years of fairly flat or basically zero escalation
5 in materials and equipment that curve is about
6 five percent real per year since 2002.

7 It is not specific to the nuclear
8 industry and it affects all generation
9 technologies, but capital intensive ones the most.
10 Spread over a longer period of time you can see
11 that that curve is steeper than we had in the mid-
12 70s and the mid-70s when escalation in nuclear
13 construction costs was most acute. I think that's
14 at 7.4 nominal, which would be what, 4.7 real.

15 In addition to that general problem,
16 which some people call the China Effect, higher
17 steel, concrete, zinc, copper prices, we have some
18 specific issues with the nuclear industry that I
19 think are going to be difficult to get around.

20 The industry has been moribund in the
21 US, Western Europe and Russia since TMI and
22 Chernobyl, at least with respect to new
23 construction. So crews, contractors, sub
24 suppliers, forging capacity. Making the large
25 equipment isn't going to happen in the US, we have

1 to go abroad for that. Quality control,
2 inspections by the NRC. It's going to be harder
3 to do.

4 And this last one surprised me quite a
5 bit. Uranium production is currently about 60
6 percent of western uranium demand. And I'll go
7 into that. I'll try to keep it short and sweet
8 but it's complicated. Most products you produce
9 about as much as you consume.

10 So what we did in Keystone to get to our
11 numbers was to take the Asian numbers, assume four
12 percent real from 2002 to bring us to 2007.

13 Standard rate-based treatment but our
14 best advice was that Wall Street would exact some
15 risk premium on equity.

16 Reasonably high capacity factor.

17 Higher fuel costs, three to four times
18 current levels.

19 And you get a number that looks like
20 \$4,000 a kilowatt in 2007 dollars, which is
21 entirely consistent with the S&P findings but a
22 factor of three higher than the studies.

23 Capital isn't the only factor. These
24 are not Keystone numbers, these are my numbers.
25 The Keystone numbers are 8 and 11 but they are in

1 most respects pretty close. Eight to 11, 9 to 12.
2 This is not an inexpensive proposition to build
3 and operate a new reactor over its lifetime.

4 Okay, the strange market. This market
5 actually reminds me a great deal of the California
6 electricity market a couple of years ago. The
7 primary supply of uranium is that first red bar,
8 which means how much actually we dig up out of the
9 group. And then the first, what should I call
10 that, turquoise bar is how much enrichment
11 capacity we have worldwide.

12 This thing called secondary supply. I
13 probably shouldn't use that, it won't speed me up.
14 The secondary supply is associated with first of
15 all utilities that bought uranium well in advance
16 but cancelled their plant after TMI. The same
17 thing happened in Europe after Chernobyl, both in
18 Russia and Western Europe.

19 Finally we privatized enrichment
20 capacity and associated inventories in the US and
21 currently about 50 percent of our electricity in
22 the United States is produced by blended down
23 surplus weapons uranium.

24 So all of those things go away and they
25 go away in a hurry. Roughly by 2013. And to meet

1 the demand of the current worldwide industry you
2 need to find some combination of uranium supply
3 and enrichment that gets you to the green lines.
4 So we're looking at needing to double both of
5 these actually quite soon.

6 That's just a graph of -- We used to
7 produce a lot of uranium, partly for weapons and
8 requirements are now well above worldwide
9 production.

10 It's been a volatile market. This chart
11 was done in October of last year. Prices in early
12 June, that last little red number, are at 135,
13 which is getting close to off the chart.

14 I don't know if I want to even want to
15 talk about this. But the problem gets worse if
16 you try to build lots more reactors. No surprise.

17 Currently we're not seeing the effect of
18 higher uranium prices in PG&E's rates or in EIA
19 figures, for this reason. Uranium that is burned
20 in 2007 was actually bought in 2002. It takes
21 four years to get from either in physical turns or
22 in lead time, physical lead time for mining,
23 convert milling, conversion US-6, enriching,
24 reconversion, fuel fabrication, ship it to the
25 reactor.

1 In that time -- So people burning at
2 SONGS probably spent \$15 on their uranium. When
3 it gets to the reactor the only thing that's
4 happened to that \$15 is it's increased because of
5 inventory charges. Essentially interest. It's
6 capitalized. But utilities in mass are going to
7 have to enter this market in the next couple of
8 years in order to meet their requirements four
9 years from today.

10 I just came back. I was in Singapore
11 giving a very similar presentation to Rio Tinto,
12 which is the second-largest uranium mining
13 company. And they found this interesting but you
14 won't. (Laughter).

15 When uranium prices skyrocket and
16 supplies get tight it is very common for people to
17 start talking again about reprocessing of nuclear
18 fuel. MIT looked at this question with very
19 inexpensive uranium prices and inexpensive
20 enrichment prices. I looked at this question both
21 in the context of the Keystone report and using
22 more recent numbers.

23 Yeah, nuclear fuel cycle costs are three
24 to four times higher than you will see reflected
25 in almost any study, assuming those costs stick

1 around for awhile and I think they will. But they
2 are still a factor of two to three lower than you
3 would if you closed the cycle with reprocessing.
4 I think that reprocessing number, by the way, is
5 pretty low. So it is an uneconomic choice with
6 many other liabilities in terms of waste
7 management and non-proliferation resistance.

8 This is another bad one. You should
9 actually close your eyes to the last line. This
10 is what the recent Standard & Poor's report said
11 about the cost of new generation. And the coal
12 numbers reflect recent escalation, they're a lot
13 higher than I would have used a few years ago in
14 the utility business.

15 What they also tell you is that nuclear
16 power doesn't look particularly attractive just
17 based on internal costs compared to those
18 resources. If you force new generation to
19 actually capture and sequester carbon that makes
20 life impossible for pulverized coal. Although I
21 am going to tell you, I think their carbon capture
22 number is about two times to high, at least for
23 pulverized coal. That number should ultimately be
24 in the two to three cents a kilowatt hour, maybe
25 even less. What it also tells you is that --

1 That line is if you have to sequester.
2 And I'm certainly going to pick wind if I have it.
3 And maybe nuclear but it's not compelling. It
4 might also be true that your choice on either of
5 these rows may be driven by transmission more than
6 the difference between the cost of generation.

7 Finally, if you tax carbon rather than
8 require sequestration, or can buy credits, you
9 will build these fossil resources before you build
10 reactors. The reason for that is just that the
11 sequestration cost is not only cost per kilowatt
12 but it is serious parasitic use of electricity.
13 It is higher than \$30 a ton. That's just a
14 shortcut.

15 MR. WILLIAMS (FROM THE AUDIENCE): What
16 was your natural gas cost?

17 MR. HARDING: \$7 a million. I don't
18 know if that's high or not. If you build lots of
19 combined cycles it's probably low.

20 I think S&P's estimates for carbon
21 capture are on the high side, as I say here.
22 International Energy Agency estimates are two to
23 three rather than three to six. And with about 15
24 technologies available they see that dropping
25 somewhat.

1 And as I say here, pulverized coal is
2 cheap, although the transmission, I can assure you
3 the transmission is not.

4 Wind, as I think everybody on the west
5 coast knows, is the cheapest marginal resource,
6 even though wind prices have escalated
7 dramatically.

8 Gas is not out of the picture, even at
9 seven.

10 And if carbon is taxed rather than
11 sequestration, if capture and sequestration is
12 required you'd probably end up at least in the
13 near-term buying the credits or paying the tax
14 rather than doing sequestration.

15 And with that I'm done and happy to
16 answer questions.

17 PRESIDING MEMBER PFANNENSTIEL:

18 Questions? Commissioner Geesman.

19 ASSOCIATE MEMBER GEESMAN: Jim, it's
20 good to see you again. We should have more of
21 these hearings. I note that each time you show up
22 you look younger but Weisenmiller and I seem to
23 have put on more gray hair.

24 MR. HARDING: And as I recall you
25 replaced me in my position.

1 ASSOCIATE MEMBER GEESMAN: Yes, we all
2 worked for that same commissioner.

3 We had a hearing earlier this week, Alan
4 Hanson was here from AREVA. I asked him about the
5 Keystone group. He said that you guys generally
6 tended to embrace watered-down conclusions as a
7 result of the consensus process and that you had
8 ignored all of his advice. I am not going to ask
9 you whether that's right or not.

10 MR. HARDING: We listened very closely.

11 ASSOCIATE MEMBER GEESMAN: I note though
12 -- The executive summary of the report was made
13 available to us in our background materials. I
14 note that one of the things that was said was that
15 the joint fact finding group concludes that while
16 some companies have announced their intentions to
17 build merchant nuclear power plants it will likely
18 be easier to finance nuclear power in states where
19 the costs are included in the rate base with a
20 regulated return on equity. I wonder, as an
21 individual participant in the process, do you
22 agree with that?

23 MR. HARDING: Yes, very much so. And
24 actually your consultant report hits this point
25 quite well. In fact, much better than we did in

1 the body of the report. I would also say that
2 when you look at the executive summary you really
3 do get the watered down version because findings
4 are what people really struggled with. As one of
5 my friends often says, and we relied upon, every
6 public policy problem in the world can be solved
7 with increased ambiguity. So that's where we
8 went. I think the body of the report is a much
9 more interesting read.

10 ASSOCIATE MEMBER GEESMAN: Your capital
11 cost assumptions I presume are financed capital
12 costs instead of the so-called overnight capital
13 costs?

14 MR. HARDING: The \$4,000 per kilowatt,
15 the difference between the \$3,000 overnight and
16 the \$4,000 is real interest and escalation during
17 construction. So it is completed in the year 2012
18 and then all of those costs are brought back to
19 2007 dollars. So yes.

20 ASSOCIATE MEMBER GEESMAN: So that
21 assumes no or negligible construction schedule
22 overrun.

23 MR. HARDING: Correct. I think we're
24 being pretty generous. We assumed a five to six
25 year construction period. In our low case we

1 assumed, -- My dear friend Paul Genoa from the
2 Nuclear Energy Institute asked me to run four but
3 the low case had no real escalation in it so it
4 doesn't matter whether you do it four or five,
5 it's the same number.

6 ASSOCIATE MEMBER GEESMAN: What was your
7 real interest rate assumption?

8 MR. HARDING: It was 15 percent return
9 on equity, 50/50 debt equity, eight percent debt.
10 My guess is that's probably close to eight percent
11 real. It's probably less than that weighted after
12 tax cost to capital. I can't do the number in my
13 head but I'd be happy to provide the Commission
14 the number.

15 ASSOCIATE MEMBER GEESMAN: If you would
16 send that to us for our record. I also note from
17 the executive summary, We agree that the most
18 recent construction experience is the best
19 indicator of future costs. Then you did comment
20 about the vintage of a lot of our construction
21 assumptions. I didn't hear any reference to the
22 AREVA project in Finland. I wonder if you've got
23 a view on that?

24 MR. HARDING: Yes. We would have liked
25 to use data from the Olkiluoto 3 project that's

1 underway. The project is not done. AREVA has
2 encountered significant delays and they blame
3 several factors. Most recently they said they
4 underestimated the supply chain challenges,
5 skilled contractors and crews. They've got,
6 evidently, 27 languages to deal with on the site.

7 ASSOCIATE MEMBER GEESMAN: It sounds
8 like the Los Angeles Unified School District.
9 (Laughter).

10 MR. HARDING: They have had a rocky
11 relationship with the Finnish regulator and they,
12 themselves have said they were less-advanced on
13 design before they started building. And I found
14 interesting that a lot of people will say, we're
15 not going to do that again. But when it gets down
16 to the real world, both the Finnish regulator and
17 AREVA said, it's not realistic to expect a vendor
18 to develop a full set of construction plans before
19 you start the project. It's not going to happen.
20 It takes too much money and time. Even for a
21 standardized plant.

22 So they're about a year and a half
23 behind schedule and they have told the French
24 equivalent of Wall Street that they will not make
25 money on this, and estimate their loss at between

1 \$700 million and a billion. Which is a tough for
2 a vendor to deal with. A utility, PG&E could
3 handle that, but a vendor doesn't have the pockets
4 to do that. So we don't know what the final cost
5 is going to be, that's only AREVA's fraction.
6 There are other parties such as the utility itself
7 that could also be seeing overruns.

8 ASSOCIATE MEMBER GEESMAN: Thank you
9 very much.

10 PRESIDING MEMBER PFANNENSTIEL: Jim, I
11 have a couple of kind of small points just in your
12 analysis. You talked about just using the
13 Japanese experience and not as you were just
14 discussing, others. Any French plants come on
15 during that time?

16 MR. HARDING: No. There is one -- After
17 AREVA gets done on Olkiluoto they will start on
18 Flamanville 3, which will be another data point.
19 But alas there just isn't very much out there.

20 PRESIDING MEMBER PFANNENSTIEL: And then
21 you talked about the construction costs spiking in
22 recent years since 2002 and you talked about how
23 much greater those were than say the mid-80s when
24 we had such a big run-up in nuclear costs. But as
25 I remember, and I do remember, in the mid-80s

1 interest rates were real high then and those big
2 capital intensive projects like nuclear power were
3 hammered by high interest rates and we don't have
4 that. That must be somewhat offsetting in terms
5 of the comparison of the costs then and the costs
6 now.

7 MR. HARDING: Correct.

8 PRESIDING MEMBER PFANNENSTIEL: But not
9 very much is what you're --

10 MR. HARDING: Well, we don't really know
11 what the curve looks like for the components of
12 the nuclear reactor. This is sort of chemical
13 plant stuff, refineries. So we don't have an
14 index from 2002 to 2007 that would really
15 represent the basket of things that a reactor
16 builder might want to buy. It's the best that
17 EPRI could give us and it isn't very good.

18 It's a challenge to try to come up with
19 the right approach going forward. In our low case
20 we assumed zero real escalation going forward. In
21 our high case we assumed about four. But I would
22 be real uncomfortable saying that either of those
23 numbers is even -- I'm not that comfortable with
24 any of the numbers that we started with, let alone
25 the ones that we escalate to. It's challenging

1 without having much recent, real stuff to go on.

2 But I am pleased to see that we didn't
3 get, we had lots of utilities on this panel. None
4 of them disagreed with the numbers we produced.
5 Florida Power & Light, operating completely
6 independently produced similar numbers and I never
7 talked to the guy at S&P until I saw his report
8 last month. So I think we're in the ballpark.

9 PRESIDING MEMBER PFANNENSTIEL: Yes, it
10 seems to me that it really does seem to be
11 ballpark. Thank you.

12 MR. HARDING: But ballpark is the right
13 word.

14 PRESIDING MEMBER PFANNENSTIEL: Yes.
15 I'm not sure which ballpark. Any other questions?

16 COMMISSIONER BOYD: I just want to make
17 a comment. I just want to thank Mr. Harding for
18 -- and actually Mr. Cheston actually broached
19 costs. We hadn't had much cost discussion today.
20 But I wanted to particularly thank Mr. Harding,
21 who I don't know from the past, not being a long-
22 time alumni of this organization, for this dose of
23 cold reality in terms of cost.

24 Because I do remember when we did the
25 2005 IEPR and some of the questions we left on the

1 table that besides the heavy concentration of, we
2 don't have fuel storage solved, the cost. The
3 absolute uncertainty and inaccuracy of cost was an
4 issue then and it obviously remains an issue today
5 in terms of trying to determine the life cycle
6 benefits of multiple energy strategies. The cost
7 in this arena has always been a puzzlement, so
8 thank you very much.

9 DR. WEISENMILLER: We'll now go back to
10 the order that we had the agenda on. Our next
11 speaker will be Professor Fthenakis, who is a
12 senior chemical engineer with Brookhaven National
13 Laboratory and a professor of earth and
14 environmental engineering at Columbia University

15 At Brookhaven he leads the national
16 photovoltaic environmental health and safety
17 research center operating under the auspices of
18 DOE since 1982. And at Columbia he founded and
19 directs the Center for Life Cycle Analysis.

20 DR. FTHENAKIS: Thank you, Bob, for the
21 introduction. Good afternoon, Madame Chair
22 Commissioner, Commissioners, distinguished
23 panelists, fellow citizens. I am honored to be
24 here. And I am also very pleased to have escaped
25 the storm, we had a storm in New York City

1 yesterday, and arrive in the beautiful and sunny
2 city of Sacramento early this morning instead of
3 11 o'clock last night as was scheduled.

4 (Laughter). I am very, very pleased to be here.

5 As Bob mentioned I direct at Brookhaven
6 National Lab the Center for Photovoltaic
7 Environmental Health and Safety Research under the
8 auspices of the Department of Energy and at
9 Columbia I teach air pollution prevention control.
10 Most of my work has been on air pollution
11 prevention controls and solar systems.

12 Environmental-related work. So not nuclear. My
13 knowledge of the nuclear fuel cycle, it springs
14 from my comparisons of nuclear with solar. So
15 admittedly it is not very extensive.

16 But nevertheless I think that I can
17 really give some feedback to this audience related
18 to at least three questions. I will answer at the
19 minimum three questions. One is, what are the
20 real greenhouse gas emissions from the nuclear
21 fuel cycle? The numbers are all over the place.
22 So I think I can give an authoritative answer,
23 especially for the US nuclear fuel cycle. What
24 are the real greenhouse gas emissions.

25 Two, what are the accidental risks

1 related, the quantifiable, accidental risks.
2 Because they are risks that we cannot really
3 quantify. We don't know how to quantify in the
4 nuclear fuel cycle.

5 And three, in view of the increased
6 support of nuclear power as a carbon-free or low-
7 carbon technology I will try to answer the
8 question, is it really, as some other panelists
9 will argue, the only technology, low-carbon
10 technology that has the potential to satisfy all
11 our energy needs.

12 Now with this in mind let's start with
13 the nuclear fuel cycle. You are all familiar with
14 it. The cycle starts by mining/milling the ores
15 from the ground. Then we have the conversion,
16 enrichment. The conversion into fuel, into
17 uranium oxide in the fuel fabrication. And along
18 with the construction and the operation of the
19 nuclear power plant the reprocessing in some
20 countries. We produce electricity, eventually
21 waste disposal.

22 Now we don't have direct emissions or
23 greenhouse gases during operation unless we use
24 diesel generators for start-up. So most of the
25 emissions are indirect. Emissions in each of

1 those stages from the production of the materials.
2 Fuel goes into the production of the materials.
3 And also from the kind of dirty, quote/unquote,
4 electricity above-ground that is used in all of
5 these stages.

6 So we will be looking into those stages
7 one by one and we will be quantifying the inputs
8 and outputs in terms of materials and energy and
9 the outputs in terms of emissions, and we link
10 those to greenhouse gas emissions. So we have
11 indirect emissions from carbon dioxide and some
12 other greenhouse gases in each of these stages
13 because primarily of fossil fuels used in the
14 production of the materials and the above-ground
15 electricity.

16 Now the numbers, as I mentioned, are all
17 over the chart. You can see here before we
18 embarked on our own analysis we looked at numbers
19 in the literature. And you can see here a range
20 from a low in Sweden, as wonderful as the Swedish
21 utility of 3.5 grams of carbon dioxide equivalent,
22 all the way to 100. So a factor of 30 here
23 between the low estimate and the high estimate.
24 The only estimate that corresponds to the United
25 States is the old Argonne study by DeLucchi, now

1 at University of California at Davis, which is a
2 relatively high number of 70.

3 I am going to point you to actually
4 three or four issues here. The big range here in
5 the estimates is caused by either different
6 assumptions in the enrichment stage, different
7 technologies, diffusion versus centrifuge, and
8 different methodologies and different background,
9 electricity mixtures in different countries. So
10 it is a country-specific exercise.

11 Now the big difference is here.
12 Actually the big estimates in the high number by
13 World, actually Storm and Smith, they are
14 resulting from a different methodology that I will
15 highlight later.

16 Let's look at in more detail the
17 breakdown actually of the greenhouse gas emissions
18 and the differences resulting from different
19 enrichment scenarios. As you know, gaseous
20 diffusion, actually it takes a lot of energy,
21 about 2,400 to 3,000 SW used. And the centrifuge,
22 about 40 times less energy. And this corresponds
23 to almost proportionately high or low greenhouse
24 gas emissions. So the fraction of the diffusion
25 to centrifuge makes a big difference.

1 In the best case here, in Vattenfall, it
2 actually combines a big fraction of centrifuge, 80
3 percent, and also diffusion from France that is
4 powered 100 percent by nuclear. So it is kind of
5 a carbon-free diffusion and mostly centrifuge.

6 Now the big number here actually
7 includes an enrichment, a big fraction of some
8 kind of dirty centrifuge. The United States, as I
9 will highlight later, it changes, it changes per
10 year. But in old years we used actually to power
11 our Paducah, Kentucky plant with coal. In 2005 it
12 was about 20 percent coal and about 80 percent
13 from Tennessee Valley Authority. That is also a
14 more coal-intensive mixture than the other US.

15 Again, so this is actually one reason
16 for the big differences. The diffusion versus
17 centrifuge mixture. Also background electricity,
18 as I mentioned before. In Sweden and Switzerland
19 we have rather carbon-free background mixtures,
20 it's mostly hydro and nuclear. In Sweden it's
21 about 95 percent, in Switzerland it's 97 percent.
22 So that reflects in greenhouse gas emissions and
23 that's why we have the very low numbers here in
24 Sweden and the low numbers in Switzerland.

25 Now our analysis. As I mentioned, the

1 only analysis of the US nuclear fuel cycle was
2 DeLucchi's in 1999. Comprehensive at its time but
3 outdated now. So we started, we embarked on a new
4 analysis and those are our assumptions. You can
5 see here reactor lifetime we assumed 40. Burn-up.
6 This enrichment mixture is a five-year average,
7 1998 to 2002.

8 We produced our study in 2005 and we
9 didn't have the latest 2006 and 2007 numbers. But
10 we did an update of these numbers and we'll
11 present it later. So those are our assumptions
12 related to other parameters and they are all
13 influential.

14 This is our reference case. We thought
15 an adverse case and this is our best case because
16 there is some uncertainty in the input data. I am
17 going to highlight the differences in our
18 assumptions related to the ore concentration,
19 They are all real cases here. We are assuming a
20 reference point of two percent uranium, and in our
21 best that we get ore from Canada, very high
22 concentration of uranium, and in our worst that we
23 get it from our other friend, Australian, .005
24 percent.

25 And there will be a difference that I

1 will highlight later on the estimate that is
2 produced by the different methodology . The basic
3 methodology that we use is process based but we
4 also use economic input output. That is the
5 methodology, that I will point out later, is
6 expected to over-estimate emissions. And that is
7 the methodology that was used by Storm and Smith
8 in their high number global case.

9 So those are the emissions that we
10 obtained according to the assumptions that I
11 listed earlier that correspond to real conditions
12 in the US cycle. And you can see in our reference
13 case we determined that the greenhouse gas
14 emissions, as given by carbon dioxide equivalent
15 in units per kilowatt hour it's about 24 and we
16 have a range from about 17 to about 55 so a ratio
17 of three. A good improvement from the previous
18 uncertainty. Obviously this relates to the US
19 cycle and the previous numbers that had a
20 divergence of a factor of 30, they were taking
21 into account different conditions in different
22 countries. So for the US we believe that this is
23 a good reference.

24 Let's see, what else this graph shows.
25 You can see the difference in the mining, in the

1 emissions related to the mining. From our
2 reference case to our maximum impacts case here we
3 have .2 percent uranium, here we have .005 percent
4 uranium. So the more we dig into dilute ores the
5 more greenhouse gas emissions we expect to
6 generate. Obviously because it is a more energy-
7 intensive process.

8 And there is at the maximum, there is
9 the limit at which we cannot really extract
10 uranium energy cost-effectively. And there is a
11 debate of what is that limit so I am not going to
12 enter into this discussion. But it is good to
13 know that the more we use uranium the more energy
14 intensive really the process becomes and the more
15 greenhouse gas emissions we may generate.

16 Here we have in the blue the enrichment
17 base, the greenhouse gas emissions, that they are
18 constant in this exercise because we assume the
19 constant 1998 to '02 EIEA mixture. You can see
20 the differences here in the operation stage
21 between our reference and our maximum case because
22 we assumed -- actually we use different
23 methodology in the operations and construction.
24 So you can see the big differences here in the
25 construction. This is process-based, this is

1 input/output economic analysis based.

2 This is an update of our data. Actually
3 of our analysis. It is not published yet. What
4 we published was the 2005 result that corresponds
5 to the new enrichment reality in the United
6 States. It changes over the years. But now in
7 the last five years actually we have 12 percent
8 local enrichment versus 34 percent in previous
9 years. So we have kind of a cleaner enrichment
10 than before and or reference case becomes actually
11 17 from 24 with the newer data. So you can see
12 the impact of the enrichment as it changes from a
13 period to another period.

14 Now going back into our estimates and
15 the estimates of others. You can see a
16 compilation of all the estimates here. Our
17 estimates for the US cycle, they are given with
18 this bright green. In enrichment we are actually
19 in agreement more or less with most other people.
20 This big difference here in Australia is based on
21 100 percent enrichment in the United States so
22 very dirty enrichment. In our case we have the
23 actual enrichment mixture that is only in this
24 case 34 percent US based on the Paducah, Kentucky.

25 The Australian case here, the Australian

1 study, it was published after we published our
2 study and actually cites our study. Their
3 numbers, their numbers correspond to ours in terms
4 of enrichment. They have much bigger numbers
5 though in construction and operation because they
6 use a different method. This is the IECA Sydney
7 Study, a very comprehensive study, and transparent
8 study, but they use economic input/output instead
9 of process-based analysis.

10 Now what is the difference? I think
11 this example will highlight the impact of
12 different methodologies. Process based. In the
13 process-based we are just looking into detailed
14 material and energy inventories in each stage. So
15 we know we get from the industry, from the
16 manufacturers what exactly are the materials used
17 in each stage. What are the fuel used, what are
18 the outputs in terms of waste, in terms of
19 emissions and what are the energy emissions. And
20 then we relate those to greenhouse gas emissions.

21 in the economic input/output analysis
22 we'd be using emission factors related to
23 different economic inputs and there will be
24 different categories that relate dollars spent
25 with emissions.

1 Now to the degree that one or the other
2 they are very detailed you would expect
3 correspondingly high or low accuracy. But in the
4 economic input/output analysis we don't really
5 have many details many times. In our case we use
6 the Carnegie/Mellons EI/O database and they didn't
7 have any categories specific for nuclear power
8 plants. We used the general building and
9 manufacturing category. Storm used a different
10 database and the folks in Sydney used a different
11 database. They are all actually pretty much based
12 on similar emission factors.

13 Then you can see that the department
14 point is the construction costs. So this
15 construction cost is the overnight cost. As Jim
16 looked at earlier, there is a big divergence in
17 terms of construction overnight costs. Our case
18 here, 4.5, is based on the Oakridge number 3.3 in
19 1989. And with inflation we actually determined
20 that this is a good number.

21 The Sydney group's number is very, very
22 low. By the way, this corresponds to \$4,500 per
23 kilowatt hour. This corresponds to \$1,300 per
24 kilowatt. And you can see the big differences. In
25 our study when we used process-based we get one

1 gram of carbon dioxide a kilowatt hour. In our
2 worst study when we used economic input/output we
3 got an 11 times bigger number.

4 Now we know from this exercise and from
5 many other exercises we did on the solar electric
6 cycle that the economic input/output would likely
7 overestimate. Now the process-based LCA may
8 slightly underestimate also. It all depends on
9 the degree of the aggregation of the data. I am
10 not going, really, to spend more time on this
11 debate, what is actually the degree of over-
12 estimation or under-estimation.

13 But I think that everybody will agree
14 that if we use a life-cycle analysis method to
15 compare different technologies we should use the
16 same one in order to have well balanced, well-
17 balanced comparisons. In view of the differences
18 that the different methodologies may give us we
19 should use the same methodology.

20 So we limit our comparison to process-
21 based and this is the picture that we believe is
22 actually the most comprehensive, the most accurate
23 picture. These estimates here on greenhouse gas
24 emissions from coal, natural gas and petroleum,
25 they are all based on process-based data, they are

1 not based on economic input/output.

2 So you expect that you will see that
3 most of the emissions happen during operations.
4 When we burn the fossil fuel the carbon content of
5 the fuel gets into -- converts into carbon dioxide
6 and goes into the atmosphere. So we believe that
7 in this context the high numbers by Storm and
8 Smith, for example, they are irrelevant because
9 they are based on economic input/output and they
10 do not really correlate with estimates on other
11 technologies.

12 Now these are our estimates based on a
13 very comprehensive detailed analysis of
14 photovoltaics so you can see that nuclear and the
15 photovoltaics, they emit minor greenhouse gas
16 emissions in relation to the ones by each of the
17 major fossil fuel cycles.

18 Now these numbers, obviously they
19 change. They change depending on the change of
20 the input data. For example, I showed that by
21 using the newest enrichment mixture in the United
22 States 24 has become 17 already. Now this number,
23 it was much higher, much higher up to three or
24 four years ago. You will see values for
25 photovoltaics as high as 50 and they were based on

1 all the dated prototypes, they don't really
2 reflect the current reality. And this number, the
3 206 number has changed already.

4 Now when we're talking about solar
5 electric we have always to give the background in
6 terms of what is the sort of input. This
7 corresponds to US average. That's 1800 kilowatt
8 hours per square meter per year. For the
9 southwest the number is already, is 17. The
10 southwest average is 2150 kilowatt hours square
11 meters per year, this is 17. This is for a
12 ground-mounted utility application. For a rooftop
13 where you get the synergy between the building
14 material and the PV material the number is 20.

15 This corresponds to nine percent
16 modiums. The same company that was manufacturing
17 nine percent modiums in 2006 now increased their
18 efficiency to ten percent. For cost, that by 2010
19 the efficiency will be 12 percent. So it's a
20 dynamic process. And especially, especially as it
21 relates to solar electric. The numbers are
22 expected to become much lower if in the US cycle,
23 if in the nuclear US cycle we use 100 percent
24 centrifuge this number is going to become 12.

25 So that gives you an understanding of

1 what are the dynamics and a perspective of what
2 would be the greenhouse gas emissions in the
3 future. We don't expect reductions here. Not
4 from what we know. But we do expect reductions in
5 the nuclear and the solar electric fuel cycles.

6 Now let me change gears and try very
7 briefly to give some highlights on our work on
8 quantifying accidental risks. Together with
9 colleagues at the European Commission's Joint
10 Research Center in the Netherlands we have defined
11 this framework where we're looking into risks
12 according to three different categories.

13 Normal operation. This many times
14 overlaps with sustainability criteria so we're
15 looking actually at emissions of greenhouse gases
16 as described earlier and the emissions of toxic
17 gases and the emissions of heavy gases and
18 materials input/outputs and occupational
19 statistics, occupational safety statistics in
20 terms of how many people get injured during a work
21 week.

22 According to this actually metric -- In
23 this category we don't expect very big differences
24 in different fuel cycles with the exception of
25 risks related to air pollution from coal,

1 obviously.

2 Now we spent some time on quantifying
3 accidental risks and we try also, are still trying
4 to quantify this category that relates to perhaps
5 increased likelihood of nuclear proliferation,
6 military conflicts. Perhaps, perhaps releases
7 from a permanent nuclear waste repository 2,000
8 years in the future. We haven't really progressed
9 very much in this category so I am not going to
10 present anything on this.

11 But with this balance I wanted really to
12 project the underlying, here, rationale. That we
13 have always to balance risks and benefits. A
14 modern society needs electricity. Now, of course,
15 with the production of electricity there are some
16 risks and we need to see how to quantify those
17 risks and what will be the associated risks and
18 benefits.

19 So one metric, there are accidental
20 risks per event. And you can here the numbers
21 that are produced by the Paul Scherrer Institute
22 people in Switzerland. This is a logarithmic
23 scale. Events per gigawatt/year. So it
24 normalizes events. Events are classified as
25 either fatalities or injuries per energy output.

1 And you can see here, this is nuclear
2 without Chernobyl, no fatalities for this period,
3 '69 to 2000, 30 years. And this is with
4 Chernobyl. And you can see here that according to
5 this metric nuclear is safer than all the coal
6 cycles, even with Chernobyl. Now they have a
7 number here for photovoltaics that is not
8 recommended by any data. They admit that is based
9 on some expert opinion.

10 This is our number for photovoltaics
11 based on EPA R&P data. We used nine-year data on
12 real statistics, submissions of risk management
13 programs. We have 14,000 companies in the United
14 States that submit to the EPA anything that
15 relates to accidents and those are the numbers we
16 get for photovoltaics. They do not relate to
17 actual incidents for photovoltaics but they relate
18 to incidents in the production of materials that
19 are used in photovoltaics. Anyway, this is only
20 highlight. I don't have time to go very much in
21 detail into this.

22 Another metric related to maximum
23 consequences per single accident. And those are
24 the Paul Scherrer Institute numbers again. Some
25 may argue that their numbers with Chernobyl are

1 high. Actually the UN numbers I think are lower.
2 Nevertheless, here you can see, for example, in
3 Africa, in Zimbabwe in mining, here you can see --
4 this goes further back than 1969, it goes to
5 perhaps 1950. This is the explosion in a refinery
6 in the Philippines and here you have an explosion
7 and subsequent consequences in Russia. This is
8 Chernobyl. This is another accident in 1957 in
9 the ex-USSR.

10 This is the number they have for
11 photovoltaics based on expert analysis, expert
12 opinion, it is not quantifiable. They are going
13 to change it now. In the next report they are
14 going to use our number, they agreed, because our
15 number is based on actual data. And there hasn't
16 been any fatalities in the PV manufacturing side
17 but this correlates to the production of hydrogen
18 and the silicone trichloride that are used as feed
19 stocks in the production of metallurgical grade
20 silicone.

21 Now what is the underlying question
22 here? Every technology has some risks. Of course
23 as a society we have to question ourselves, what
24 are the risks that we should accept and how to go
25 forward. Some will argue that the nuclear energy

1 is the way to both satisfy our energy needs in
2 view of the fossil fuels being depleted and of the
3 greenhouse gas emissions, that they perhaps have
4 reached a dangerous level. Others will argue that
5 coal with carbon dioxide capture and carbon
6 sequestration is the solution. Others will argue
7 that renewables is the solution.

8 Now each of these scenarios will have
9 their cons. So for example, in talking about
10 spent fuel management. We don't know how to go
11 about proliferation risks.

12 Coal with carbon sequestration. I will
13 put a big question mark in the technical
14 feasibility. We don't know if it is feasible yet.
15 Even if we have one percent leaks per year with
16 100 times -- actually residence time of carbon
17 dioxide in the atmosphere. We don't do very much.

18 Then we have the residual pollution,
19 even when we have specifiers and baghouse
20 equipment working at the 99.8 percent efficiencies
21 still we have problem. I mean, coal is never
22 completely clean. Things escape through the
23 pollution control equipment.

24 Wind, as Tim mentioned before, it's
25 already cost, actually collective. But we have

1 resource limits. We don't have more than a few
2 terrawatt of wind all over the world. And we have
3 the problem with intermittency.

4 Solar, we think that it is high cost and
5 obviously we have the initial intermittency.

6 Now our view of each of these options
7 will determine what really we think about the
8 prospect of each of those. And I'm very briefly
9 going to allude on the President's Advanced Energy
10 Initiative where all three pathways are being
11 pursued with new investments, clean coal, nuclear
12 power, renewable solar and wind energy.

13 And the secretary of the department
14 believes in diversification. Obviously
15 diversification, it also makes us think of how,
16 what will be the degree of the diversification.
17 Let's say from 20 percent nuclear it's easy to
18 think about getting to the 40 percent or 60
19 percent. From .3 percent solar is perhaps more
20 difficult to envision that we can get to 30 and 60
21 percent, 100 percent solar.

22 But I will put my money on, as Thomas Edison
23 said, on solar. And I am going just to give you a
24 highlight of work in progress that our group, my
25 group at Brookhaven is conducting related to the

1 prospect of solar.

2 Before I do that. These are the
3 projections of the Department of Energy, the Solar
4 America Initiative, which is a part of the
5 President's Advanced Energy Initiative. Those are
6 the prices now. For the southwest, where we have
7 most of -- we have the highest sort of potential
8 with the price about 18 cents per kilowatt hour.
9 For the northern state about 35. The department
10 believes that with incentives that have been
11 already in place the price can be competitive with
12 the utility rates by 2015.

13 We believe, my group, and these are my
14 personal views, we believe that it will take a
15 little longer. That it will take to 2020. But we
16 do believe that the implementation can be much
17 higher than what the department thinks. The
18 implementation according to SAI will be only about
19 five, ten new gigawatt throughout the United
20 States.

21 We believe that we could have five
22 gigawatt per year, 1.5 gigawatt per year in the
23 first five years of the implementations with the
24 right incentives that will cover the difference
25 between the current 17 cents per kilowatt hour and

1 the utility rate cost of 6 cents. So in the form
2 of a subsidy or tariff that would be phased out by
3 2020 we believe that we can have much higher
4 penetration of solar.

5 And we do have the geographical
6 potential in the southwest. We have at least
7 200,000 square miles of desert land that is not
8 used in anything else and is suitable for
9 constructing photovoltaic systems and concentrated
10 solar power systems.

11 This area receives about 3,600
12 quadrillion BTU and as a nation we spend about 100
13 quadrillion BTU for all our end-use actually,
14 including transportation, electricity and
15 transportation. So if we capture just three
16 percent of this then we can satisfy the total US
17 annual energy consumption.

18 So work in progress that is going to be
19 published in a high-impact journal so I don't have
20 the liberty to disclose the details at this point.
21 We show that based on just the southwest we can
22 satisfy the needs of the whole country by mid-
23 century.

24 And obviously we can add to this the one
25 million roofs, the Governor of California's

1 initiative. But that will be a much slower
2 process.

3 So we do believe actually that the price
4 getting down to the level that we can also, that
5 it can also support storage. Storage technologies
6 are evolving and 20 years from now we may have
7 something a lot more effective. But even now we
8 have a technology that has been proven for about
9 20 years. It's called compressed air energy
10 storage and we have facilities in Iowa, we have
11 facilities in Germany.

12 And we do believe that with the right
13 scale the cost, the additional cost to electricity
14 generation from photovoltaics from compressed air
15 energy storage 24 hours is another two cents. So
16 we do believe that we could by 2020 have a
17 technology there that can give 24 hour electricity
18 generation at about eight cents per kilowatt hour.

19 And also solar power with heat storage.
20 We do have systems already operating with six hour
21 storage. The Spaniards just integrated a system
22 with 24 hour storage, thermal storage, so that we
23 could use it to go over the diurnal cycles.

24 I guess you have to wait to the
25 publication to see the details. But we do

1 believe, and that's the bottom line, that solar
2 can be an equal player, an equal player to nuclear
3 and to clean coal in terms of potential. Not only
4 a minority player but can be an equal player.

5 Now in conclusion. The life cycle
6 framework is necessary to have a complete
7 description in terms of sustainability, in terms
8 of potentials of energy technologies.

9 By looking in all the cycles, in all the
10 stages of the cycle of energy production
11 technology we can describe items like resource
12 availability and cost, potential risks and
13 benefits. And I think that the time frame has to
14 be not only this generation but also future
15 generations. So depletion of fuel and so on.

16 With this I will be actually ready for
17 questions from the Commissioners and the rest.

18 PRESIDING MEMBER PFANNENSTIEL: Thank
19 you very much.

20 DR. FTHENAKIS: Thank you.

21 PRESIDING MEMBER PFANNENSTIEL: Very
22 interesting. Questions? Who wants to start?

23 ASSOCIATE MEMBER GEESMAN: In projecting
24 costs out across generation, or benefit for that
25 matter, what type of discount rate do you use and

1 what's your rationale for the one that you select?

2 DR. FTHENAKIS: For the nuclear fuel
3 cycle?

4 ASSOCIATE MEMBER GEESMAN: For any of
5 the multi-generational, economic calculations you
6 make.

7 DR. FTHENAKIS: We haven't done any
8 economic calculations related to the nuclear fuel
9 cycle other than the ones that were depicted in
10 the economic input/output analysis based strictly
11 on overnight costs. Nothing else than that.

12 The economic analysis in the solar cycle
13 is not part of any, any comparative type of
14 analysis. We assume there -- Actually James
15 Mason, that I list here as my contributor, is the
16 economics guy. I am a chemical engineer, that is
17 his domain. But he assumes what we believe are
18 kind of standard assumptions. A 15 percent, I
19 think, credit, 30 year depreciation.

20 But I will have to -- If you need
21 details in terms of our solar electric costs over
22 the next several years I think we can disclose
23 those only after the publication. We have agreed
24 with the editor that we are not going to give any
25 details out before the paper is published.

1 ASSOCIATE MEMBER GEESMAN: I'm not so
2 much asking for that. I'm aware of the difficulty
3 and the dispute among various economists in these
4 long range projections as to the appropriate way
5 to discount the future.

6 The Stern Commission had one particular
7 perspective. In this country William Nordhaus
8 attempted to rebut the Stern Report. The
9 differences there, because both were using social
10 discount rates, a substantial difference over a
11 period of time. But based on a comparison with
12 the cost of capital discount rates would both seem
13 to be pretty low.

14 And I'm wondering if you have a
15 particular perspective as to the appropriate way
16 to look at costs and benefits out on a distant
17 time horizon.

18 DR. FTHENAKIS: Mr. Geesman, we haven't
19 actually used any cost analysis related to perhaps
20 external costs and to what would be the carbon
21 displacement cost.

22 This is not part of our analysis related
23 to the prospects of solar. We just have the
24 scenario of needed incentives for the price to
25 become competitive, competitive with the utility

1 generation, electricity. So we don't assign any
2 carbon dioxide displacement credits at all.

3 ASSOCIATE MEMBER GEESMAN: Okay. Thank
4 you.

5 DR. FTHENAKIS: Sure.

6 PRESIDING MEMBER PFANNENSTIEL: Yes,
7 Commissioner Byron.

8 COMMISSIONER BYRON: Dr. Fthenakis,
9 thank you for being here today. It sounds like
10 you didn't get very much sleep last night.

11 I am very intrigued by some of the data
12 that I have not seen before with regard to
13 accidental risks, the fatalities in electricity
14 production and also the maximum consequences for
15 accidents. I was wondering, and maybe you covered
16 this to some extent, but can you describe a little
17 bit of the basis for how you come up with these
18 projected fatalities for the various generating
19 sources on your maximum consequences per accident
20 figure.

21 DR. FTHENAKIS: Yes. the numbers that I
22 showed related to the conventional energy
23 technologies, they are not ours. They are the
24 ones by the Paul Scherrer Institute, Roberto Dones
25 and Stefan Hirschberg and their team. But I know

1 how they actually, how they obtained those
2 numbers. They are based on actual statistics.
3 Those numbers are, according to their report that
4 is available in the public domain, is based on
5 actual statistics. With the exception of that
6 number on PV. And they have a number on wind also
7 that I don't, I don't show here, an equal number,
8 100, that is based on expert opinion.

9 Now our number, our number here is based
10 on actual, statistical data from risk management
11 program submissions to the US EPA related to the
12 materials used in photovoltaics. So for example
13 in different technologies we use different
14 hazardous materials. In the photovoltaic cycle
15 crystalline silicone, we'll be using hydrochloric
16 acid. Hydrochloric acid in the manufacturing of
17 the modules. Upstream in the manufacturing of the
18 metallurgical silicone will be silicone
19 trichloride. In the silicone we use xylene, we're
20 using hydrogen.

21 So as part of the life cycle analysis we
22 will be looking into consequence, accidental data.
23 In this cases are consequences, fatalities,
24 related to the production of hydrogen and related
25 to the production of silicon trichloride, to the

1 production of xylene, production of hydrochloric
2 acid. If we normalize these, the usage of these
3 gases in the photovoltaic industry and electricity
4 output. We normalize those.

5 So that's how we derive this number here
6 for the United States, for the United States. If
7 we're looking to Asia we have different numbers.
8 For example, we had an accident that caused one
9 fatality in Taiwan in November of '05 in an actual
10 production facility. We had another one three
11 months ago in India. But this is all United
12 States and this is OECD. So it's not exactly
13 apples with apples. This is OECD, this is United
14 States. I'm wondering if this answered your
15 question.

16 COMMISSIONER BYRON: Well I am most
17 interested in the nuclear one.

18 DR. FTHENAKIS: Oh, in the nuclear.

19 COMMISSIONER BYRON: Yes.

20 DR. FTHENAKIS: In the nuclear, these
21 are numbers from the Paul Scherrer Institute.
22 They corresponded to their assessment of what was
23 the actual, the actual number of fatalities,
24 including obviously latent fatalities from
25 Chernobyl. It is not my number, it is not my

1 number.

2 COMMISSIONER BYRON: What about the
3 nuclear except Chernobyl?

4 DR. FTHENAKIS: The low one?

5 COMMISSIONER BYRON: Yes.

6 DR. FTHENAKIS: This corresponds to a
7 1957 accident in the ex-Soviet Union. I think
8 Chelyabinsk is the location. So it corresponds to
9 an actual, an actual accident.

10 DR. COCHRAN: It must be the key steam
11 accident.

12 DR. FTHENAKIS: I'm sorry?

13 MR. WILLIAMS (FROM THE AUDIENCE): That
14 was the nitrate that blew up in the reprocessing
15 plant.

16 DR. COCHRAN: A waste tank explosion.

17 PRESIDING MEMBER PFANNENSTIEL: Excuse
18 me, if people aren't speaking into the microphone
19 it is not getting picked up by the record at all.

20 COMMISSIONER BYRON: Okay. Well I think
21 I'm getting a better sense of the basis for the
22 numbers as they are. It is not some credible
23 accident that is being projected, this is based
24 upon actual data going back to some events.

25 DR. FTHENAKIS: Exactly.

1 COMMISSIONER BYRON: Okay.

2 DR. FTHENAKIS: With the exception, with
3 the exception of their numbers on renewables.
4 Photovoltaics and wind. I'm talking about Paul
5 Scherrer Institute's numbers. They are based on
6 expert opinion. Because the industry is so small
7 that they thought there were not enough really
8 data in databases to quantify the potential, the
9 potential for an accident in those technologies.
10 But those are numbers, actually exact numbers as
11 they were presented from actual incidents.

12 COMMISSIONER BYRON: Thank you.

13 DR. FTHENAKIS: My pleasure.

14 PRESIDING MEMBER PFANNENSTIEL: Anything
15 else? Thank you sir, very much for adding to our
16 record.

17 DR. FTHENAKIS: My pleasure.

18 DR. WEISENMILLER: Our next speaker is
19 Mary Quillian, who is the Director of Business and
20 Environmental Policy at the Nuclear Energy
21 Institute, which is the strategic policy group for
22 the nuclear energy industry. She is primarily
23 focusing on establishing policies that encourage
24 construction of new nuclear power plants and
25 highlights the value of nuclear energy as a source

1 of clean, affordable energy.

2 So was at Cinergy before and she has a
3 bachelor's of science in mechanical engineering
4 from Cornell and an MBA from the Sloan School of
5 Management at MIT.

6 MS. QUILLIAN: Thank you, all of you,
7 distinguished Commissioners, for inviting me to
8 speak here today. I am Mary Quillian, I work at
9 the Nuclear Energy Institute, which is the policy
10 organization for the commercial nuclear industry.
11 We are based in Washington. Our members include
12 all utilities that have operating licenses and
13 operate nuclear power plants in the United States,
14 including many of the companies that support those
15 operators, nuclear vendors, reactor designers,
16 engineering firms, fuel fabrication industries, et
17 cetera, et cetera. Next slide, please.

18 Today I am going to talk briefly about
19 several topics. The economics, safety and
20 environmental benefits of nuclear energy. I would
21 like to go over new plants.

22 You are going to hear some specific
23 details from the point of view of a company that
24 is actually pursuing a new nuclear power plant
25 from Joe Turnage later but I am going to talk more

1 generally about the industry looking at these
2 things.

3 And I will try to hit upon
4 standardization, which I know is something you all
5 are interested in, used fuel and how that plays
6 into new plants, and financing issues.

7 I will briefly review the stimulus in
8 the Energy Policy Act of 2005 for new nuclear
9 power plant construction. And we'll talk about
10 what individual states are doing these days to
11 support new nuclear construction.

12 And lastly I'll just sort of think about
13 electricity demand growth in California and how
14 we're going to tackle that. Or how you guys are
15 going to tackle that. Next slide, please.

16 Capacity factors. As you can see the
17 nuclear industry over the last 20 years has done a
18 phenomenal job of increasing our efficiency and in
19 the last five or six years have turned in a pretty
20 steady performance of capacity factors at about 90
21 percent. That's far above the capacity factors of
22 other industries.

23 And I might add that we keep capacity
24 factor numbers that include outages so the
25 refueling outages are a part of those numbers.

1 That means that, you know, in some years there are
2 lots of plants that have capacity factors well
3 above 90 percent because there are other plants
4 that are refueling. Next slide.

5 Increased capacity factors have also led
6 us to be able to increase generation and we have
7 had record or near-record generation numbers for
8 the last several years from the US nuclear fleet.
9 Next slide.

10 That has also led to very steady or
11 slightly declining production costs among the
12 fleet of nuclear power plants in the United
13 States. Next slide.

14 Part of the reason nuclear power
15 production costs are stable and low is because of
16 the parts of the production costs. If we look at
17 this slide we notice that for fossil-fired
18 generation like coal and gas an overwhelming large
19 percentage of production costs is the cost of the
20 fuel that goes into producing electricity from
21 those different technologies. So as those fuel
22 prices go up and down that affects the price of
23 the electricity generated at those plants.

24 Whereas with nuclear fuel only comprises
25 about a quarter of the production costs and the

1 rest, the O&M, is very predictable. It's people
2 and obviously other parts of operation and
3 maintenance. And of that fuel cost only about
4 half of that is the uranium. We saw earlier a
5 mention that uranium's spot market prices are at a
6 record high now.

7 And whereas I do think at some point
8 that will show up in our production costs because
9 there is a delay, I'd also like to note that most
10 of our utilities do not purchase their uranium
11 from the spot market. A very small percentage of
12 the uranium they purchase is actually from the
13 spot market and most of it is done through
14 negotiated contracts. And if the spot market is
15 going up today you might wait for a week and it
16 will go down \$10 and that kind of a thing. And
17 then again you're also not buying from that market
18 but you negotiate directly with uranium suppliers
19 for that.

20 I'll also point out one other thing here
21 and that is that our production costs include,
22 includes the fees that go to the Nuclear Waste
23 Fund. It's about ten percent of the fuel cost.
24 Next slide please.

25 Let me turn to safety. We just heard a

1 lot of information about safety. I just am going
2 to give the update to a slide that was shown
3 earlier. These are 2006 statistics, which do
4 indeed show that the nuclear power plant ISAR
5 number has gone down since 2004. We are well
6 below the ISAR number for the electric utility
7 industry as a whole and below manufacturing. So
8 fundamentally nuclear power plants are pretty safe
9 places to work. Next slide please.

10 All right, environmental benefits.
11 Nuclear power provides about 20 percent of
12 electricity in the United States. It is non-
13 greenhouse gas emitting in the generation aspect
14 of nuclear power.

15 The operation of the nuclear power
16 plants in 2006 prevented 681 million metric tons
17 of greenhouse gas emissions into the atmosphere.
18 That number is calculated by a regional average of
19 fossil mix that would have been employed to
20 produce power regionally if nuclear power plants
21 did not run. That number is more than two times
22 the amount of greenhouse gases prevented by all
23 the other non-emitting sources in the United
24 States combined.

25 I would also just like to point out that

1 in terms of capacity in the United States there is
2 about 100 megawatts -- I'm sorry, 100,000
3 megawatts of nuclear capacity in the United
4 States. There is roughly about the same amount of
5 hydro capacity in the United States. Next slide
6 please.

7 We also just heard a report on life
8 cycle emissions. And it is interesting that all
9 the various studies that Professor Fthenakis cited
10 are none of the ones I cited in my comments that
11 we turned in to the Commission, I actually have
12 five different studies, so now you have a plethora
13 of information on life cycle emission data.

14 And all of them come to the same
15 conclusion. And that is, the life cycle emissions
16 from nuclear power are comparable to the life
17 cycle emissions of renewable energy. So this
18 notion that the fuel fabrication and externalities
19 associate with producing nuclear energy contribute
20 tremendously to greenhouse gas emissions is just
21 fundamentally wrong. Because per kilowatt hour
22 it's comparable with other renewable sources.

23 Next slide.

24 Okay, let's turn now to new plants. I'm
25 going to here talk a little bit about

1 standardization. I know that's something you're
2 interested in. I'll tell you that's definitely
3 something the industry is interested in. I think
4 as an industry since we do have what we sometimes
5 like to call 104 unique nuclear power plants
6 operating today, standardization is something that
7 industry has been focused on and definitely
8 supports.

9 How does standardization reduce the
10 costs of nuclear energy? Well, it is very costly
11 to design a nuclear reactor, as you might imagine.
12 So if you can design it once and build that same
13 reactor several times you will spread those design
14 costs over several plants. That will reduce the
15 cost.

16 Construction practices. The more often
17 you build the same plant the better you are going
18 to get at it. And those efficiencies that you
19 gain, frankly just from experience, will reduce
20 both time and resources that will have to be
21 employed to construct that plant. There are some
22 real examples of this in Japan. I know of one
23 where after building a couple of the same plant,
24 the last one they built they were able to build in
25 just 42 months.

1 Parts and components. If you have got
2 several plants that are using the same parts it
3 makes your procurement and your sort of spare
4 parts inventory operations more efficient.

5 Overall there is a tremendous efficiency
6 gain from the regulatory interface aspect of this.
7 The NRC has to review in detail that design once.
8 And then in the future when companies come with an
9 application for that design it allows the NRC to
10 focus on site-specific issues because they have
11 already approved that design.

12 The regulatory interface efficiencies
13 continue when it comes to inspection. You will
14 have plant inspectors that become very familiar
15 with a particular design that can go from plant to
16 plant that are all of that same design.

17 Then you have the ability to incorporate
18 design improvements across the board. A design
19 improvement might be an upgrade or an improvement
20 to an operations or maintenance procedure, which
21 has to be reviewed by the NRC. So if they review
22 that once then that improvement can be applied to
23 all the different plants of the same design
24 family.

25 Finally there are clearly going to be

1 operation and maintenance gains. The industry
2 expects the operating costs of the new plants once
3 they get going to actually be less than the
4 operating costs of the plants today. And seeing
5 as how we have one of the lowest operating costs
6 today that's pretty remarkable. That will be --

7 Those gains will come from procedures.
8 Every plant has to develop its own operating and
9 maintenance procedures today because they are so
10 unique. If you have same design plants out there
11 you design those procedures once and you can apply
12 them to the suite of the same plant.

13 Good practices and training become
14 easier. Easier to share skilled workers.

15 You have more efficient outages for the
16 same reason you have more efficient construction.
17 The more you do it the more you learn, the more
18 you can apply to the next outage.

19 And then finally all of those things
20 should lead, frankly, to improved equipment
21 reliability. And that will also bring costs down.
22 Next slide please.

23 Fuel. And where does this fit in to the
24 picture of new, nuclear power plants? Up until
25 recently the United States was focused on a once-

1 through fuel cycle, which would put the used fuel
2 that contained 90 percent of the energy it had
3 when it started, in a long-term repository. Next
4 slide.

5 I think that everyone is now looking for
6 a new strategy and we know that the Department of
7 Energy, for example, is working on a new strategy
8 to close the fuel cycle. Closing the fuel cycle
9 fundamentally will be a good idea. In the long
10 run it should make good business sense.
11 Furthermore, it's the right thing to do from an
12 environmental stewardship point of view. So in
13 the long run industry is very supportive of this.
14 However, this is going to take a lot of new
15 technology.

16 We are going to have to develop new
17 advanced technologies to separate out the
18 components of the used fuel in a more
19 proliferation-resistant manner. We are going to
20 have to develop facilities that will take some of
21 those components and process them back into fuel
22 that can be used in current light water reactors.
23 We have to develop fast reactors that can the use
24 some of those other constituents from the used
25 fuel. And finally, there will continue to be

1 byproducts. Even a closed fuel cycle produces
2 byproducts that will require long-term disposal in
3 a repository. So pursuing Yucca Mountain
4 continues to make sense, even in this fuel cycle
5 regime. Next slide.

6 Industry is interested in the potential
7 for closing the fuel cycle for a number of
8 reasons. One of them is, as we start to look at
9 potential facilities for some of these
10 reprocessing technologies they become very good
11 candidates for interim storage of used fuel
12 because the used fuel would have to go there
13 eventually. We think that that makes sense and we
14 encourage the Department of Energy and we did
15 encourage Congress to continue to look at that
16 option.

17 One of the things we're recommending is
18 that this pursuit of a closed fuel cycle be done
19 in a phased approach. And what I mean by that is
20 since there continues to be research that needs to
21 be done to deploy demonstration models of these
22 technologies and eventually get to
23 commercialization.

24 We think it makes sense to have a phased
25 approach so that you can remain flexible as you're

1 doing those research and deployments of various
2 technologies so you can really -- you can get the
3 right answer. You can give the scientists and
4 engineers really the time to flesh out those
5 different technologies and make sure we're doing
6 it right. Because in the end that's where we need
7 to get to. Next slide.

8 Clearly the used fuel management issue
9 is not a, is not a show stopper for the nuclear
10 industry. There are 17 companies or consortia
11 that have announced they are pursuing the
12 submittal of a license application to the Nuclear
13 Regulatory Commission over the next several years.
14 That could be more than 30 units. Next slide.

15 Let me talk a little bit about the
16 licensing process and the timeline for that
17 licensing process and construction. As mentioned
18 earlier, there is a new licensing process that was
19 put in place in 1992. This new licensing process
20 has three parts. The actual design. Hopefully
21 that standardized design is certified.

22 You have an option for an early site
23 permit where a company or a utility that would
24 very much like to have a site reviewed for all the
25 site-specific issues like seismic and

1 environmental impact and things like that, they
2 can go to through an early site permit. They
3 don't need to have chosen a design for the reactor
4 at that point.

5 And then finally you have the combined
6 construction and operating license, or COL as we
7 call it in the industry. And that is where you
8 pair a site with a design. Clearly you have to
9 have the design certification well underway when
10 you put a COL in, but you can do the design
11 certification and the early site permitting
12 concurrently with the COL.

13 So companies today, the 17 companies,
14 have been preparing applications. To put together
15 an application takes about 18 to 24 months. After
16 you get your application done you submit it to the
17 NRC and the NRC is going to take about three years
18 to review those applications, particularly the
19 applications of the first in a design. So in
20 other words, later applications using the same
21 design should see reduced review times at the NRC
22 because the NRC has already approved a COL with
23 that design.

24 And frankly, these applications are
25 about 70 percent design-specific, 30 percent site-

1 specific. So you can see where there is
2 regulatory efficiency if they have already
3 reviewed that design and given a license and they
4 have okayed that design once. Then clearly they
5 focus on the other 30 percent of future
6 applications which are site-specific.

7 When a company puts an application into
8 the NRC they can, they won't necessarily always do
9 this but they can begin some very limited site
10 preparation. And that would include site clearing
11 and grading work and things like building roads
12 and parking lots. So nothing plant specific but
13 site prep that would get you ready for
14 construction.

15 Construction of the plant itself cannot
16 begin until after receiving a COL from the Nuclear
17 Regulatory Commission. And once that happens we
18 estimate that the first plants will take somewhere
19 between four to six years to be constructed.
20 Again, because of standardization we anticipate
21 that construction time for future plants of the
22 same design to be reduced significantly.

23 I might add that another thing that is
24 happening during the review of the COL is the
25 procurement of long-lead items and putting down

1 deposits for places in the queue for things like
2 large forgings. And there are companies out there
3 that have, that have plopped down some money for
4 places in the queue and for long lead time items.

5 The preparation of the -- The
6 preparation of the license application itself, the
7 fees for filing an application, as well as the
8 cost of seeing that application through the review
9 process, because it's a very interactive back and
10 forth process during the NRC review, probably
11 costs somewhere between 45 and 90 million dollars.
12 And so 17 companies are willing to put that kind
13 of money down to reserve the option to build a
14 nuclear plant in the future.

15 Once a plant gets their COL they begin
16 construction. And during the construction process
17 the NRC will be reviewing something called ITAACs.
18 And ITAACs are basically construction acceptance
19 criteria or standards which are specifically
20 written in the license. And the NRC will be
21 checking those things off making sure that those
22 standards were met during construction and in the
23 sort of testing phase of start-up.

24 And once all of those ITAAC are signed
25 off by the NRC, which says, which basically means

1 that the plant was built to the standards and
2 qualifications in the design, then the plant can
3 immediately proceed to operation and there is no
4 additional step of going back for an additional
5 license as there used to be. Next slide please.

6 Financing. Here is the big one. All
7 right, let's first talk about the Energy Policy
8 Act. And the three main incentives in the Energy
9 Policy Act for new nuclear power plant
10 construction boiled down to the production tax
11 credit, the standby support and the loan guarantee
12 program.

13 The production tax credit is an 18
14 megawatt -- \$18 per megawatt hour tax credit for
15 the first 6,000 megawatts of electricity or the
16 first 6,000 megawatts of capacity of new nuclear
17 capacity.

18 Guidance issued by the Department of the
19 Treasury indicates that those 6,000 megawatts will
20 be distributed over all plants that meet three
21 time criteria. They have submitted their COL
22 application by the end of 2008, they begin
23 construction by the beginning of 2014, and they
24 start commercial operations by the beginning of
25 2021.

1 We estimate that the production tax
2 credit is probably worth somewhere between \$5 and
3 \$7 a megawatt hour.

4 The production tax credit is a
5 tremendous incentive to get to operating the new
6 nuclear power plants. To get to the operation
7 stage. However, the PTC does very little in
8 helping companies finance the construction, and
9 frankly that is where the heavy lift is in getting
10 these plants built. Next slide.

11 Then there is standby support, which was
12 intended to be an insurance. A federal insurance
13 to cover specifically delays resulting from
14 litigation and licensing.

15 That coverage for the first two plants
16 is \$500 million and the coverage for the next four
17 plants is \$250 million. It would only go towards
18 50 percent of the costs and it would only kick in
19 six months after a delay began.

20 I should say this has limited value,
21 frankly, from the point of view of executives in
22 the industry for a couple of reasons. First of
23 all, it only covers debt coverage. So basically
24 the interest is all that this insurance would
25 cover and there are significant other costs that

1 you would be incurring during any sort of delay
2 such as paying your workers.

3 And the other reason why this is limited
4 is that those next four plants, since the coverage
5 doesn't kick in until six months after a delay
6 begins, a company basically has to eat six months
7 of delay costs. That's a lot of delay and frankly
8 we're really hoping not to have to wait that long.

9 So what we found is that this particular
10 stimulus, whereas it was well-intentioned and the
11 idea was good, the actual value that the
12 executives making decisions on whether to build
13 nuclear power plants, this doesn't play much into
14 their decisions. But the next one is very
15 important and that's the loan guarantee program.

16 The loan guarantee program, it comes out
17 of Title 17 of the Energy Policy Act of 2005. And
18 let me stress that it is not nuclear-specific.
19 Title 17 in my opinion was very visionary. The
20 idea was to encourage the commercialization of new
21 technologies not yet deployed in the United States
22 that specifically reduce, avoid or sequester
23 greenhouse gas emissions or other emissions. That
24 means renewables, clean coal, clean transmission,
25 cleaner refineries, nuclear power plants and a

1 bunch of other stuff. So there are a lot of
2 different technologies that would benefit from
3 this federal loan guarantee program.

4 The federal loan guarantee program
5 authorizes the Department of Energy to provide a
6 guarantee for up to 80 percent of the cost of the
7 plant or the project. Earlier the loan guarantee
8 program was mentioned.

9 Right now the Department of Energy is in
10 the middle of a comment period on proposed rules
11 for this program. Their proposed rules -- In
12 their proposed rules they suggested that they
13 would only cover 90 percent of the debt. Eighty
14 percent of the project cost and 90 percent of the
15 debt are two very different things. So that's a
16 little bit where this confusion comes in. So the
17 comment period, we're in the middle of the comment
18 period. The comment period ends July 2 and we
19 expect that the Department of Energy will finalize
20 rules for the loan guarantee program this fall.

21 Congress when they appropriated some
22 money to get that program up and running,
23 administrative costs if you will, this last
24 winter, prohibited them from issuing any loan
25 guarantees until they finalize the regulations.

1 So we won't, we won't see any loan guarantees
2 coming out until they finalize the regulations,
3 hopefully towards the end of this year.

4 Part of the --

5 ASSOCIATE MEMBER GEESMAN: Can I
6 interrupt? Can I interrupt?

7 MS. QUILLIAN: Of course.

8 ASSOCIATE MEMBER GEESMAN: Can there be
9 loan guarantees before there is a subsequent
10 Congressional appropriation?

11 MS. QUILLIAN: It depends on which
12 lawyer you ask. There are -- That is still,
13 frankly, being worked out. There are loan
14 guarantee programs that exist. For example, OPEC
15 and the Ex-Im Bank program. The Ex-Im Bank
16 program has the authority to make loan guarantees
17 up to, what is it, \$100 billion I think.

18 DR. TURNAGE: It's capped at Ex-Im at
19 \$100 billion in any one year.

20 MS. QUILLIAN: Yes. So they have the
21 authority to issue loan guarantees up to \$100
22 billion for the deployment of US technologies in
23 foreign countries. And as some people point out,
24 you could build a nuclear power plant in Mexico
25 easier than you can build a nuclear power plant in

1 New Mexico given US loan guarantee programs that
2 already are established.

3 DR. TURNAGE: Mary, if I could amplify
4 that just a little bit. It's required that there
5 be a subsidy cost, a cost to the loan guarantee
6 program, by statute. It could have been by
7 Congressional appropriation or by the applicant
8 paying a fee or a combination of those. I think
9 the reality is that the applicants are going to
10 pay the fee. So there's no hit to the federal
11 budget.

12 But there right now is a requirement
13 under the Federal Credit Reform Act that there be
14 an annual authorization, as is done with Ex-Im
15 Bank. So it's an issue about the size of that
16 cap. And the real issue is an annual
17 authorization for that cap as opposed to an
18 explicit appropriation.

19 MS. QUILLIAN: Thanks Joe. He's
20 absolutely right. The cost of the program we
21 expect will be borne by the projects that are
22 paying the fee for the loan guarantee.

23 ASSOCIATE MEMBER GEESMAN: Yes. My
24 question is a lot more practical than that. If
25 I'm Citibank or some other lender and I am about

1 to loan one of your projects 90 percent -- rather
2 I am about to loan your project money and I am
3 expecting that 90 percent of my debt will be
4 guaranteed. Will my counsel give me a legal
5 opinion that I have a federal loan guarantee
6 without a separate appropriation?

7 DR. TURNAGE: Two things would have to
8 happen. I think that an annual authorization of
9 the magnitude of the total cap. So I would have
10 to have a line of sight that I would qualify for
11 that. And we would intend to get a conditional,
12 terms and conditions on a federal loan guarantee
13 in hand before I talked to the banks.

14 ASSOCIATE MEMBER GEESMAN: Okay, thank
15 you.

16 MS. QUILLIAN: Thanks, Joe. Since he's
17 doing it he's got a better answer for you on that
18 one.

19 Generally loan guarantees will reduce
20 costs, and specifically it will reduce the cost of
21 electricity from these projects. Not just nuclear
22 but wind, clean coal, all the other ones too, for
23 several reasons. It allows project developers to
24 increase their leverage, which means more debt
25 versus equity. And debt is cheaper than equity.

1 And it would reduce the financing costs because a
2 guaranteed loan is going to have lower interest
3 than a non-guaranteed loan.

4 And finally it allows -- Basically what
5 it does is it makes that debt non-recourse to the
6 project sponsor. And what that does is very
7 important because it reduces the impact on a
8 credit rating of the parent that may be
9 undertaking that project. And that is very
10 important. Next slide.

11 To get a new nuclear power plant built,
12 it's a big undertaking. We don't cite specific
13 costs right now because we don't know exactly what
14 it's going to cost. Frankly the detailed
15 engineering work is ongoing as these various
16 companies, various 17 companies, prepare their
17 applications. And given that detailed work we'd
18 like to wait until those costs are done.

19 We also are keenly aware of the fact
20 that prices for steel and concrete are going up
21 these days. But we do think that a nuclear power
22 plant is probably going to come in somewhere
23 between five and six billion dollars. That's a
24 big, big price.

25 In order to get a nuclear power plant

1 built, frankly, companies, regulators, the federal
2 government, are going to have to figure out a way
3 for some equitable risk-sharing in this. And
4 because -- And I think that there are several
5 states that are starting to recognize that and
6 several states have begun putting in policies that
7 allow some risk to be borne by the consumers and
8 some risk to be borne by the shareholders. And
9 the federal loan guarantee would say, some risk
10 borne by the federal government in getting new
11 nuclear power plants built.

12 Part of the reason why these states are
13 in fact looking at policies for new nuclear are
14 because they see the value in a diversified
15 portfolio. And right now the only thing an
16 electric utility executive feels remotely safe
17 about building is renewable and gas. And we can't
18 get enough of that built in the near-term to meet
19 some of the needs that are projected in 2010 and
20 2012. So the diversification of fuel sources and
21 the volatile price of natural gas, frankly, is
22 another reason why they're seeking that.

23 So what are they doing? Next slide.
24 there are several states that have put in place
25 policies either through legislation and/regulation

1 that allow a couple of things. QUIP. And what is
2 QUIP? Well really what they're allowing is they
3 are allowing the carrying cost of the construction
4 project to be passed on through rates during the
5 construction. Capital costs will not go into
6 rates until the end of the project when the
7 nuclear power plant comes on-line and becomes
8 useful. But that, allowing the carrying costs to
9 get passed through, reduces the revenue hit to the
10 utility during construction and that is very
11 important.

12 The other thing about those particular
13 policies, which are, I believe, equally as
14 important, is an ongoing periodic prudency review.
15 And I don't think there is any company out there
16 in a regulated area that would build a nuclear
17 power plant given a five or six year construction
18 period and just hope that the regulators would
19 approve it at the end of the five or six years and
20 put it into rate base.

21 So they need some sort of assurance up
22 front that the regulators think it's a good idea
23 to pursue the nuclear plant and then on a regular
24 basis during construction or reviewing those costs
25 and finding them prudent along as you go. I just

1 think that makes so much sense because it's a
2 shared decision process.

3 ASSOCIATE MEMBER GEESMAN: Can I
4 interrupt again?

5 MS. QUILLIAN: Of course.

6 ASSOCIATE MEMBER GEESMAN: What if they
7 decide in year two or year three that those costs
8 weren't prudently incurred. What happens then?

9 MS. QUILLIAN: Well, at that point I
10 would say that the utility would think twice about
11 continuing. There is in most of those policies,
12 any costs that have been found prudent or have
13 been pre-approved, even if the plant is not
14 finished are put in rates and recovered. So I --
15 Well there would be a new discussion at that
16 point. I can't tell you exactly what the utility
17 would do, it would depend on the time. But that's
18 information, that's good information for them in
19 the middle of construction rather than at the end
20 of construction.

21 ASSOCIATE MEMBER GEESMAN: It's dreadful
22 information at the time that you're trying to get
23 financing.

24 MS. QUILLIAN: Oh no, you've got
25 financing at that point. I mean --

1 ASSOCIATE MEMBER GEESMAN: But ongoing
2 prudency reviews are one thing. As long as you
3 assume the answer will be yes each time you come
4 up for review. If you can actually contemplate
5 that the answer may be no, isn't that an awful lot
6 of risk for a utility to take?

7 MS. QUILLIAN: Well if the answer is no
8 that gives the utility the opportunity to stop
9 right there. The costs that they have incurred
10 are going to be recovered and therefore they
11 shouldn't be racking up any more debt.

12 ASSOCIATE MEMBER GEESMAN: So if I'm the
13 CEO does my bonus get approved that year or not?
14 (Laughter).

15 PRESIDING MEMBER PFANNENSTIEL:
16 Probably.

17 MS. QUILLIAN: It depends on what the,
18 it depends on what the reward system is for that
19 particular CEO and that particular company.

20 ASSOCIATE MEMBER GEESMAN: The only
21 former utility executive on the Commission says
22 probably, so --

23 PRESIDING MEMBER PFANNENSTIEL: Whoops.

24 MS. QUILLIAN: So there you go.

25 But one of the other things I'll point

1 out here with states moving forward on policies to
2 support new nuclear is that just because it's been
3 a central theme discussions over the last few days
4 is the waste issue. These states clearly are
5 comfortable with having near-term waste management
6 in place and movement towards final disposal or a
7 final reprocessing option.

8 And they are willing to deal with the
9 near-term waste management issues, which frankly
10 we've proved we can do, either through short-term
11 on-site storage and then interim storage. They're
12 willing to accept that in order to get new nuclear
13 power plants built for various reasons that mostly
14 include fuel diversification and electricity rates
15 in the future. So next slide. We're almost done.

16 Let's talk a little bit about
17 electricity growth and greenhouse gas emissions
18 and all that kind of good stuff. Forgive me, I'm
19 using EIA numbers here. Frankly, because I
20 couldn't find 2030 predictions from the CEC and
21 California energy demand. I'm sure you have them,
22 I'm just not adept at your website so please
23 forgive me.

24 So the Department of Energy's Energy
25 Information Administration in their Annual Energy

1 Outlook in 2007 showed that California's
2 electricity growth is actually predicted to
3 outpace slightly the national electricity growth
4 overall. And we do know that in recent years your
5 electricity demand growth has been what, between
6 four and six percent a year. And that's pretty
7 high, you know. It's what, about two percent a
8 year nationally.

9 And we know there are certain parts of
10 the country, and California is one of them, the
11 Southeast is another, Florida particularly, where
12 you've got population growth and you've got demand
13 growth that's ranging around five or six percent.
14 And you have to deal with that. How is California
15 going to deal with that, especially in light of
16 the greenhouse gas emission limitations that
17 frankly California has been a leader in putting in
18 place. Their prediction --

19 And they take into consideration, as far
20 as I -- Well actually no, I take that back. In
21 their introduction they talked about California's
22 greenhouse gas emission reduction mandate. But
23 because there isn't any clear line of sight in how
24 that is going to yet be put in place they were
25 unable to factor that in their calculations. So

1 the 27 gigawatts of capacity additions they are
2 predicting for California obviously does not
3 consider greenhouse gas emission reduction
4 mandates here.

5 They are predicting 292 gigawatts of
6 electricity capacity has to be added to the United
7 States. That's a lot. And let me tell you, they
8 are not predicting very much of that is going to
9 be nuclear.

10 If what happens is what they predict,
11 nuclear energy will go from about 20 percent of
12 the fuel mix to about 16. That's a US number.
13 What if we wanted to keep nuclear at 20 percent?
14 What would we need to do between now and 2030?
15 Well we need to build about 50 gigawatts. We
16 think that's doable. We did it in the 1970s where
17 we built 51 gigawatts. We did it in the 1980s
18 where we built almost 55 gigawatts. So it's
19 clearly doable. But it is going to mean a lot of
20 other things like policies have to fall into place
21 to support that.

22 So I just kind of throw that up there
23 because there are some interesting conundrums to
24 think about. And I think one of the basic ones is
25 marrying environmental goals to electricity demand

1 and figuring out how that is going to be.

2 The one thing I will say, and this will
3 probably surprise you coming from somebody at NEI.
4 But we're going to end up building a lot of stuff.
5 Nuclear is not the answer, and we have never
6 claimed it to be. But we do think that nuclear
7 energy is an important part and an important tool
8 in building a generation system in the future that
9 will meet greenhouse gas emission reduction
10 criteria.

11 Okay, lastly I'd just like to leave you
12 with two little quotes here. The California
13 politicians that represent you all in Washington
14 are starting to change their tune on nuclear.
15 Senator Boxer, who as you well know is Chair of
16 the Environment and Public Works Committee, has
17 recently said that she thinks that we're going to
18 be seeing new nuclear power plants in the United
19 States.

20 And then, next slide, Nancy Pelosi, our
21 House Speaker, has admitted that we have to keep
22 an open mind because nuclear has to be on the
23 table, it has to be considered. And so I think
24 that's a significant shift.

25 And I will say I appreciate the

1 opportunity to come speak to you today and answer
2 your questions and I would be happy to answer
3 questions in the future if they should arise. Or
4 questions right now.

5 PRESIDING MEMBER PFANNENSTIEL: Thank
6 you very much for being here. I know you dealt
7 with some of the tough questions as we went. Are
8 there further questions?

9 ASSOCIATE MEMBER GEESMAN: I have a
10 question.

11 MS. QUILLIAN: Another one?

12 ASSOCIATE MEMBER GEESMAN: This doesn't
13 relate to financing. On the question of trying to
14 boost credibility among the public and with
15 regulators in particular. Have you any thoughts
16 as to how better use can be made of the INPO
17 process and the INPO organization? And
18 specifically, what information needs to be kept
19 private versus what can be publicly disseminated.

20 MS. QUILLIAN: I personally don't. But
21 I'll tell you, given your questions this morning,
22 Commissioner Geesman, I was talking to a colleague
23 over lunch about this particular issue. And I
24 personally think that we need to go back and we
25 need to look at that. Because inside the industry

1 INPO is considered a program that really holds
2 each company and each operator's feet to the fire.

3 We all know that we are as strong as the
4 weakest link. So any major problem at any plant,
5 frankly globally, but let's say nationally because
6 we have a much better handle on that, affects all
7 of us. So the self-policing mechanisms and real
8 focus on instilling best practices and safety
9 culture and those types of things, INPO does a
10 real good job at that.

11 And obviously things slip through the
12 cracks. Obviously problems happen. I will tell
13 you, there are always lessons learned from those
14 problems. Every single nuclear power plant, every
15 single day, spends a few minutes at their morning
16 meeting talking about some operational issue that
17 either they've had or somebody else has recently
18 experienced and thinking about how that could
19 affect that plant and what they need to do to
20 prevent that from happening at that plant. And
21 that's pretty significant that they think about it
22 every day.

23 So I don't have a good answer for you.
24 But I will tell you that I am going to take this
25 issue back and hopefully get some discussion among

1 industry and INPO because it's a good question and
2 we should be mulling that over.

3 ASSOCIATE MEMBER GEESMAN: I think that
4 in other industries you will see that self-
5 regulatory organizations serve a real valuable
6 role. And in the particular paradigm that your
7 industry has been in for several decades now I do
8 think you're judged by your weakest link.

9 And I understand herd logic at times
10 allows the weakest of the wildebeests to dictate
11 policy for everyone. I think your industry would
12 be better served if you had more of an only the
13 strong will survive approach. Thanks.

14 COMMISSIONER BYRON: What has become
15 clear to me as well is that it's organizations
16 like INPO and the kind of inspections that the
17 nuclear industry sustains all the time, don't just
18 address safety. Clearly there's been tremendous
19 success in recent years, as you indicated in your
20 data, with performance and also O&M. I have seen
21 figures over the last 20 years that have shown
22 tremendous gains in reducing O&M costs.

23 So I would attribute those inspections
24 and that self-policing has had a lot to do with
25 that as well. I should probably ask that in the

1 form of a question. Would you agree with that?

2 (Laughter).

3 MS. QUILLIAN: Yes.

4 COMMISSIONER BYRON: Thank you.

5 PRESIDING MEMBER PFANNENSTIEL: Other
6 questions? I want to say that I really appreciate
7 your being here. I think you provided both
8 valuable information and a very useful perspective
9 for us, thank you.

10 MS. QUILLIAN: Thank you.

11 DR. WEISENMILLER: Commissioners, our
12 next speaker will be Joe Turnage Joe is a Senior
13 Vice President of Constellation Generation Group
14 and he is currently focused on successfully
15 deploying a fleet of at least four US advanced
16 nuclear power plants in North America.

17 Prior to Constellation he was Senior
18 Vice President and Chief Technology Officer for
19 Pacific Gas and Electric Company's unregulated
20 subsidiary, PG&E National Energy Group. And prior
21 to that he was President of Tenera Energy, a
22 consulting firm for the power industry.

23 And Dr. Turnage holds a PhD in nuclear
24 engineering from MIT.

25 DR. TURNAGE: Okay, now if I can figure

1 out how to scroll this. Thanks a lot, it is a
2 privilege to be here. I really appreciate the
3 opportunity. I appreciate the opportunity to come
4 back to California any time. I moved from
5 Huntington Beach to the East Coast in 1997 and my
6 wife has never forgiven me for that.

7 This is great. Jim Harding teed me up
8 beautifully earlier today so I'm going to be
9 appreciative of him for that because I am going to
10 talk to you today from a point of view of, in
11 fact, a merchant generating company that is
12 looking to deploy a fleet of advanced nuclear
13 reactors.

14 When we will make a decision to build a
15 plant the economic risk of that will be borne by
16 our stockholders. It will not be borne by any
17 rate payer. So what my presentation is kind of
18 about is how does a conservative company, risk-
19 averse, do such a thing.

20 Constellation by the way, you probably
21 know, is the nation's largest wholesale seller of
22 electricity. And it's the largest retail seller
23 of electricity. Larger maybe than the next three
24 competitors combined. We sell electricity in
25 every place where the regulations allow retail and

1 wholesale sales. We sell to over 70 of the
2 Fortune 100 companies, for example. So our models
3 and our fundamental business orientation is that
4 of a competitive, merchant energy supplier.

5 You folks have seen an awful lot of this
6 stuff and I'm going to page through it quickly.
7 What you have got for the record is a bit of a
8 drink from a fire hose so I won't go through all
9 that again. But a couple of comments about the
10 forces that we saw beginning to drive and shape
11 what is now called the renaissance of nuclear.

12 And it really begins with the
13 fundamentals of supply and demand. We haven't
14 built adequate baseload generation in this country
15 and it is getting acute in many of the regions of
16 the country.

17 There is a study that EIA tosses around
18 that says that just to maintain nuclear's share of
19 20 percent of the nation's electric supply by 2035
20 -- that's an interesting date because many of the
21 current fleet retire between 2030 and 2035. But
22 to maintain that 20 percent requires about 81,000
23 megawatts of new nuclear power plants. That's a
24 heavy lift.

25 But in many areas that we are examining

1 deploying plants the fundamentals of supply and
2 demand are calling for the need for new baseload
3 generation. You've heard Mary talk about the one-
4 step licensing process, a new regulatory process.

5 I need not go into that other than we
6 are engaged right now with the Nuclear Regulatory
7 Commission for our reference combined operating
8 license. We've submitted our Q8 program, it's
9 been accepted and approved. We are working within
10 the next several weeks to submit our environmental
11 report, which is a very significant part of the
12 combined operating license.

13 At the same time AREVA, our nuclear
14 system supplier, is proceeding with the NRC to
15 secure design certification for what we're calling
16 the US EPR.

17 Public acceptance has improved. You've
18 seen the NEI numbers that they're enthusiastic
19 about nuclear. MIT in 2002 did an analysis of
20 public acceptance of nuclear and did another one,
21 updated it five years later this year, and it's
22 closer to 50/50. So when I tell people that there
23 is more enthusiasm for nuclear these days I get a
24 response from -- I remember John Sununu about a
25 year ago and he said, yeah, but it's only one

1 micron deep. I think that continues to be an
2 issue for us. But much less so in the local
3 communities typically around operating nuclear
4 plants.

5 In exploring the site for our reference
6 plant, which is in Calvert County, Maryland, we
7 went and talked to the folks there. And this is
8 kind of typical. A guy stands up in the room and
9 he says, when I moved to Calvert County this was
10 the poorest county in Maryland. Now property
11 values were low. Calvert Cliffs was built. And
12 when my daughter needed an elementary school to go
13 to this plant's property taxes helped build it.
14 And when she needed a high school it helped there
15 too. Now property values are very high and we're
16 a relatively affluent county in the state. Please
17 come build Calvert Cliffs Unit 3.

18 So where we are interested in deploying
19 plants are areas where the fundamentals of supply
20 and demand work, where the fundamentals of land
21 and water and transmission and access to load
22 work, and where there is strong public support.

23 Greenhouse gases. You have heard an
24 awful lot about that and I've got slides in here
25 totally redundant to the slides you saw from

1 Brookhaven National Laboratory and others.

2 Interesting to me was the driver of greenhouse
3 gases I believe is why the Energy Policy Act of
4 '05 passed with such widespread bipartisan
5 support.

6 I was in OECD in Paris last summer and
7 it was just interesting. There is a nuclear
8 renaissance in the European Union as well as here.
9 There it is driven by the economic implications of
10 the carbon cap and trade program. Here I believe
11 the nuclear renaissance is driven by the Nuclear
12 Policy Act. But that in turn was driven by
13 concerns about greenhouse gas to secure the boats
14 for the EAct of '05. So behind the renaissance
15 of new nuclear is true concerns about global
16 warming and the fact that this fundamentally a
17 non-CO2 emitter.

18 Technology's advanced with all the
19 nuclear designs. They're all about a factor of
20 ten safer if you look at safety as core melt
21 frequency. I will say a little bit but not very
22 much about the particular reactor choice and
23 technology we've chosen and why. And overall it's
24 all packaged in with the Energy Policy Act.

25 I can't avoid just mentioning this one

1 issue on the CO2. Nuclear, a clean, green,
2 generating machine. I just love that. That's not
3 my quote, it's from the Governor of Mississippi,
4 Haley Barbour. And I have to admit I enjoyed
5 that.

6 This is Socolow's wedge. You've seen
7 that I know. Take away from this, truly dealing
8 with CO2 globally is a very heavy lift. And these
9 are some equivalences that Socolow pointed. That
10 adding twice today's nuclear output to displace
11 coal is like driving two billion cars on ethanol,
12 using one-sixth of the world's crop land.

13 And his point is, these are seven wedges
14 here. And we need them all just to maintain
15 current carbon emissions over the next 50 years.
16 And I guess the thing I would suggest to you is
17 that I know that for some the role of nuclear in a
18 low-carbon energy future is, if you'll pardon
19 this, an inconvenient truth, but it is the truth.

20 On the Energy Policy Act. You've heard
21 about standby supports and production tax credits.
22 I'll amplify a little bit about the loan
23 guarantees and the status and what our heartburn
24 is with the status. And you'll see some analysis
25 later that I'm going to present of the economic

1 implications of all of those incentives,
2 production tax credits and the loan guarantees
3 from a merchant perspective.

4 Right now the rules suggest, as Mary has
5 told you, that there is going to be a requirement
6 for about ten percent of the debt to be not backed
7 by a federal loan guarantee. So 90 percent
8 guaranteed, 10 percent not guaranteed. Candidly,
9 we could live with that.

10 But the problem is the package. Because
11 the same proposed rules contain the elimination of
12 pari passu treatment of the second-tier debt
13 falling with default. I've got lenders that would
14 be absolutely prepared to loan me 100 percent of
15 the debt but when they see that they say, I don't
16 think so. Even worse, most lenders would like to
17 strip away the federal insured portion of the
18 debt, take that to secondary markets and manage
19 their risk. That's not allowed.

20 So the combination of a requirement for
21 a second tranche debt and the lack of pari passu
22 treatment and the lack of the ability to strip
23 create a kind of unworkable package for us. There
24 is no natural market for that. We've got markets
25 for secured debt, we've got markets for risky

1 debt. But this weird hybrid contains no natural
2 market and I think that's going to be a real
3 problem for us.

4 We're certainly making comments to that
5 effect in terms of our responses to the draft
6 rulemaking. We're working hard to influence, not
7 the Department of Energy. I could not say this
8 six months ago. But today they get it. OMB and
9 Treasury does not. And our struggle to get the
10 rules right is about the interagencies and getting
11 them to the place that DOE now is at.

12 Alternatively we are also proposing to
13 the Congress, legislative fixes. I know that DOE
14 is hard over on no pari passu because of their
15 interpretation of the statute in the Energy Policy
16 Act. We have a different interpretation. We'll
17 explain legally our logic behind that. But quite
18 frankly, it might be easier to legislatively fix
19 that than to persuade DOE to change its mind.

20 And I know that OMB and Treasury are
21 interested in this unguaranteed tranche of debt,
22 mostly because they don't trust DOE to be
23 competent to do a robust credit analysis of the
24 default probability of these projects.

25 Now when we push back and say, these are

1 very large companies for nuclear projects with \$1
2 billion or so of equity at risk. You're not going
3 to get some shabby, failure-prone proposal from
4 these guys. And the response back is, we're not
5 so much worried about you guys. I'm worried about
6 the ma and pa shop ethanol producers that would
7 qualify as well.

8 I think there are answers to this but I
9 think that those are the driving forces. And
10 right now we're early on. Comments will be
11 received on Monday. But you're going to hear more
12 and more from our company, the issue of federal
13 loan guarantees is critical. We're a green light
14 right now, full speed ahead. But should we not
15 get those rules right it'll turn to yellow to red.

16 ASSOCIATE MEMBER GEESMAN: Is there also
17 a limit on the number of guarantees that a single
18 company can --

19 DR. TURNAGE: Not by statute. And
20 there's no overall cap by statute.

21 ASSOCIATE MEMBER GEESMAN: What about in
22 terms of DOE?

23 DR. TURNAGE: Politically I think there
24 will be a requirement for a cap and it will be
25 capped as part of an annual authorization process

1 that we discussed earlier. I think it needs to be
2 a fairly large cap. These are \$5-ish billion
3 projects. And we need a lot of them to have a
4 significant impact on the driving forces of energy
5 security or greenhouse gases. We will be happy
6 with what Ex-Im Bank has an annual cap of \$100
7 billion. We may not get that much.

8 Because of those forces driving us we
9 formed with AREVA, and that's a French company but
10 we're dealing with their US subsidiary, UniStar
11 Nuclear. And from day one we said we're doing
12 this to facilitate the deployment of at least four
13 US EPRs. You'll enjoy this. In France they're
14 European Pressurized Reactors. In the US they are
15 US Evolutionary Power Reactors (laughter).

16 We're teamed with Bechtel as the
17 architect, engineer and constructor of the fleet.

18 We are hard over on standardization. My
19 boss says, down to the carpet and wallpaper. Mike
20 Wallace is the president of Constellation Energy
21 Group and he was at Commonwealth Edison as maybe
22 the last executive still engaged that built plants
23 when the last wave was built. He was responsible
24 for building four units at two stations, Byron and
25 Braidwood.

1 Interestingly, his counterpart on the
2 NSSS side was Tom Christopher, who is the
3 president of AREVA US. So those two guys did it
4 before. And they attempted to create absolutely
5 standardized plants, did not quite make it. They
6 absolutely intend to do it this time.

7 You'll see a business model. UniStar
8 Nuclear's business model is not about building a
9 few projects. It's about creating a company,
10 which I'll describe to you, to support the
11 creation of project companies which would be
12 jointly owned by Constellation and its energy
13 partners.

14 There is the ownership structure of
15 UniStar. Areva and Constellation created UniStar
16 Nuclear. That's a marketing shell designed to
17 help with the deployment of these companies.
18 Through UniStar Project Holdings we will then want
19 to take equity position in this fleet of at least
20 four US EPRs. Quite frankly there is one that now
21 is underway in licensing where we don't yet have
22 an equity position. It's 100 percent owned by a
23 company that's building it into a rate base.

24 We would love to own 25 percent of that.
25 But we will, with them, for Nuclear Operating

1 Services Company, and that will be a co-licensee
2 and an operator with the project company for that
3 plant and for all of the UniStar plants.

4 Standardization doesn't stop with design
5 or just with construction practices. It has to go
6 through operations with common operational
7 practices and procedures and procurement.

8 We formed UniStar Procurement Company
9 because we want to take advantage of the economies
10 of scale associated with procurement. And to with
11 some kind of serious, intellectual capability
12 manage the tough list for global procurement that
13 is going to be involved with this.

14 UniStar Development Company really has
15 two functions. It's a single company that will
16 secure the license for these plants, built under
17 the reference license, and then manage the EPC
18 contract with Bechtel and AREVA.

19 We're talking to a bunch of people about
20 potentially being equity partners with us.

21 Strategic partners are those that
22 operate currently nuclear power plants. They
23 understand the business of plant operation. We
24 currently operate five units and so we will bring
25 to the bar this notion of operations as a fleet

1 discipline. Some of our strategic partners are
2 folks with just one unit. And they really do want
3 to become part of the fleet because their
4 economics aren't as good as people secure from the
5 advantages of a fleet.

6 There are some passive owners of current
7 generating nuclear plants that would like to
8 broaden their footprint.

9 We're talking with municipals and co-
10 ops.

11 We're even talking to developers. The
12 folks in Fresno. We're talking to other
13 developers in West Texas out of Amarillo.
14 Developers typically bring land and water to the
15 bar.

16 They bring an intimate knowledge of
17 local support and relationships that could be
18 useful in securing a line of sight to power
19 purchase agreements. And they bring an intimate
20 knowledge in some cases of transmission access to
21 get the job done. We bring nuclear operational
22 expertise. And together we can secure both the
23 equity and the debt if we get the loan guarantees
24 right to move ahead.

25 We're focused on gas-dominated

1 marketplaces. We would build, and we would
2 partner with somebody in a rate-build situation as
3 opposed to a merchant situation.

4 A year ago you may recall Constellation
5 contemplated a merger with Florida Power & Light.
6 Florida's a hybrid since they have regulated
7 nuclear power plants and merchant nuclear power
8 plants like Seabrook.

9 When you do the pro formas the bottom
10 line is kind of interesting. The difference is in
11 a merchant situation with reasonable market prices
12 you wind up securing that asset at a return on
13 equity at risk about twice as high as you can
14 secure return in a rate-base build.

15 And it takes -- Well the rate-base build
16 takes about two and a half times the equity.
17 Because in the merchant case if they get the
18 energy policy right, the rule making right, I'll
19 be off balance sheet leveraged 80/20. On balance
20 sheet it's 50/50. And that rate of return was
21 based on a 12 percent return on prudently incurred
22 book value.

23 I've got to tell you though, a 14
24 percent rate of return in a regulated environment
25 with the rate payers taking risk is not a bad deal

1 for a company. So it's the balance of risk and
2 reward as we see it. Our business model is that
3 of a competitive merchant supplier. We would
4 prefer to take that risk and move forward.

5 ASSOCIATE MEMBER GEESMAN: But you don't
6 have as deep a pocket to absorb risk as the
7 regulated model.

8 DR. TURNAGE: And it's got to be off
9 balance sheet, prefer that. If we get the rules
10 right on federal loan guarantees it's absolutely
11 non-recourse to the parent. And quite frankly,
12 we're still small enough -- We're about a 15
13 billion market cap company. We're still small
14 enough, we're going to need equity partners to do
15 what we aspire to do.

16 ASSOCIATE MEMBER GEESMAN: And you're
17 relying on vendor guarantees to absorb most of
18 your construction risk?

19 DR. TURNAGE: The EPC contract, we will
20 rely on risk allocation, mostly among AREVA and
21 Bechtel. There's a gap that we may have to fill.
22 And we have not included risk allocation at the
23 EPC. As you know it's a huge issue.

24 Here's kind of the driver from a kind of
25 economic and public policy perspective that came

1 out of the Energy Policy Act. I'm going to go
2 through some parametrics just to give you a sense
3 of the significance of the various incentives of
4 the EPAct and how we think about this as a
5 merchant supplier.

6 Cost numbers. this is an overnight
7 cost, about \$2,000 a kW. I want to tell you two
8 things about it. One, it was developed in a
9 fairly granular fashion. This is a plant being
10 built in Finland. We understand its design. We
11 know in detail the quantities of material that go
12 into that plant. There are 19,000 line items
13 defining quantities in this estimate, okay.

14 We got labor rate, productivity and cost
15 data from Bechtel, our partner. That's based on
16 Southeastern US labor rates. A little bit cheaper
17 than in California. The second thing I want you
18 to know about this is it's wrong. I did this at
19 the end of 2005. And since then commodity costs
20 have streamed upward. We are redoing this
21 analysis. My best guess at PJM an overnight cost
22 would be for this plant is more like \$2400 a kW.

23 But for the purposes of parametrically
24 looking at the Energy Policy Act we'll stick with
25 this as a base case so you can see how the various

1 incentives affect in terms of the deltas.

2 Here is the base case. This is a big
3 plant, 1600 megawatts electric. There's an
4 implication for that by the way. We won't be
5 deploying this fleet in many places of the country
6 without transmission upgrades of some
7 significance.

8 We're assuming that this is 2009 to 2015
9 construction financing, it's leveraged. We'll
10 take it out, it'll still be leveraged.

11 I baked into this an 18 percent return
12 on equity at risk. That is not a hurdle rate,
13 don't go there. But I wanted a number that
14 produced very nice, minimum debt service coverage
15 ratios. So when I talk to lenders they're at
16 least on the same page with me for a little while.

17 I get the federal loan guarantee so I
18 get debt at Treasury plus a smidgen.

19 I'm assuming that the price of the
20 subsidy cost is one percent. That's pretty
21 aggressive. I think actually the default
22 probability of these plants, particularly if you
23 propose that there's a refi and the loan guarantee
24 not be there forever, is maybe less than that.

25 But I don't know how it's going to play

1 out at the end. I do think subsidy costs, the
2 size of the overall authorization cap and getting
3 the rules right are the three heavy lifts that
4 have to be aligned for us to be successful. I
5 assume one percent a year.

6 Half a percent loan origination fee.

7 I get all of the production tax credits.
8 Not going to happen. But in this base case I get
9 everything. I get the loan guarantees, I get all
10 the production tax credits.

11 This is a plant, by the way, that we are
12 very attracted to. Operationally it is the most
13 neutronic and thermally efficient plant of the new
14 generation. Because it has four completely
15 independent safety trains of cooling you can valve
16 one out operating at 100 percent hour and do on-
17 line maintenance. Because of that nominal outages
18 are like 11 days. So it has a very high average
19 capacity factor.

20 It also, I'll just share with you, is
21 the only one of the new technologies -- The Finns
22 did this, it's outside of our design basis. It's
23 explicitly designed for commercial as well as
24 military jet aircraft impact. And it's also
25 designed with a core catcher so that in the event

1 of any accident scenario there is no detectable
2 radiation release to the public. Now you pay for
3 that. It's probably the most expensive of the
4 reactor designs.

5 If that's the base case what do I need
6 from the bus-bar? I need \$37 a megawatt hour.
7 It's baked in at 18 percent rate of return. I get
8 everything, all the production tax credit, I get
9 federal loan guarantees. And so I'll call this
10 the most optimistic future that you could have and
11 it is a very attractive future.

12 What happens if I don't get that?
13 here's some sensitivities. Last year when I did
14 this DOE was talking about 80 percent of the 80.
15 So scenario one is I only get 64 percent of the
16 debt guaranteed. Now assume that any second
17 tranche debt would be priced like equity. Today's
18 proposal is for 90 percent of the debt so it's
19 about half this impact.

20 Under scenario one I lose \$11 a megawatt
21 hour and I had to recoup that from the market and
22 therefore I need \$51. So I lose \$14. So you need
23 \$51 a megawatt hour to get my 18 percent ROE.

24 This was not intuitive to me. I did the
25 case with no production tax credits at all. How

1 much do I lose? Eleven dollars a megawatt hour.
2 So the 80 of the 80 was worth as much as all the
3 production tax credits. If I did it again at 90
4 it would be worth half the production tax credits.
5 And since I don't think you're going to get them
6 all, you're going to get more like half since
7 they're capped at 6,000 megawatts, I view the
8 proposal of the second tranche debt to comparable
9 loss of value as if I did not secure production
10 tax credits.

11 Scenario three is I get all the
12 production tax credits but no federal guarantee.
13 Without a federal guarantee I can't do 80 percent
14 debt projects. All right. I'm on balance sheet.
15 It's going to look like 50/50 debt to equity. It
16 costs me 432 a megawatt hour. So federal loan
17 guarantees in this analysis are worth about three
18 times what production tax credits are in a
19 merchant business model.

20 If I don't get any production tax
21 credits or federal loan guarantees, if the Energy
22 Policy Act had not passed, I'm around \$80 a
23 megawatt hour. And if you recall earlier from the
24 Keystone Center, their total number -- we disagree
25 a lot on the individual pieces of this. Was if I

1 recall, between \$83 a megawatt hour and \$111 a
2 megawatt hour. If I update my capital costs I'm
3 going to be in their range. And we probably would
4 not go forward. If the Energy Policy Act had not
5 passed, if we cannot get access to loan
6 guarantees, we're going to have some difficulty
7 with this business model.

8 Dennis Spurgeon of DOE took these
9 numbers and he flipped them. I thought
10 interestingly. And he said, you know, the
11 difference between the \$80 that you'd get, you'd
12 need to get from the market, if the Energy Policy
13 Act had not passed to return to the investors as
14 18 percent, and the \$37 if it passes and you get
15 everything, is a pretty big delta representing
16 potential rate payer value. And the number is
17 \$575 million per USEPR per year.

18 But I think my point is, without the
19 Energy Policy Act we probably won't be building
20 these plants.

21 The bottom line. A snide comment by me,
22 apparently not understood by OMB and Treasury. It
23 used to say and DOE but I won't say it today.
24 It's mostly important, the second thing. Don't
25 think about the loan guarantees as an only, as a

1 subsidy for a project. We need a financing
2 platform in order to access debt at reasonable
3 rates. And even more importantly, to leverage our
4 equity.

5 That 81,000 megawatts of new nuclear
6 plants. The entire market cap of the nuclear
7 industry is about half of that of Exxon-Mobil. My
8 company, \$15 a year. How many of these can I
9 build on my balance sheet? One. So to do the
10 heavy lift if you really are serious about nuclear
11 having an impact on global warming or energy
12 security it's going to require a financing
13 platform made possible by the federal loan
14 guarantees.

15 We've got a lot of challenges. By the
16 way, I did read the executive summary. I haven't
17 read the 350 pages of the MRW report. And I think
18 we see the challenges in a very similar way. I
19 think it was a good discussion of the heavy lifts
20 that have to go.

21 I tend to see, and I think my company
22 tends to see those issues as a glass is half full
23 rather than half empty. I think it's probably
24 because we spent the last two or three years
25 seriously working and investing to figure out how

1 we can manage these challenges. And I will tell
2 you, we've got a line of sight, we believe, on
3 every significant challenge except the federal
4 loan guarantees. If that comes down correctly
5 we're going to be pretty good to go. But there
6 are a lot of challenges.

7 We just talked about rulemaking.

8 Financing, we talked about the need for
9 leverage. There will be financing available for
10 us with the federal loan guarantees. I could even
11 deal with the that secondary tranche debt if I can
12 fix the pari passu and the stricken.

13 The first wave of these plants, it
14 doesn't matter if it's Toshiba-Westinghouse,
15 Toshiba, Hitachi-GE, GE, or AREVA. The content of
16 the first wave of these plants is going to include
17 both French and Japanese content.

18 Coface, the French Ex-Im Bank
19 equivalent, and JBIC, the Japanese equivalent,
20 absolutely prepared to loan into these projects at
21 very attractive rates. They are not going to do
22 it unless we fix the pari passu problem. So it's
23 all about getting the rules right in the federal
24 loan guarantee.

25 Public perceptions. People are more

1 positively disposed to nuclear today than they
2 were five years ago. I think in general in local
3 communities they're very positive. But I think
4 it's one micro deep, as my friend John Sununu
5 said.

6 I think that an important issue will be
7 continued safe operation of these plants. If
8 there is any significant serious problem with the
9 existing 104 reactors in this country this program
10 is stopped, or certainly set back.

11 Infrastructure is a big problem. We're
12 having to source components externally. We have
13 agreed with AREVA that our target is to source 80
14 percent of our content through US sources, cannot
15 do that today. It's worse than the forging story
16 because we can't even do the ultra-heavy forgings.
17 Only one place in the world for any of these
18 advanced reactors, to get those are Japan Steel
19 Works. So the development of US infrastructure.
20 And I'd broaden that to include transmission
21 infrastructure, represents challenges.

22 And it's not just materials, it's the
23 labor pool as well. And we've got to pay
24 attention now to that.

25 We are in discussions with the president

1 and the executive committee of the National
2 Pipefitters Union. And we want to work with them
3 to build an academic and vocational training
4 institute, and we're partnering in this with our
5 partner in Amarillo, Texas. Who interestingly
6 enough is still a card-carrying fitter.

7 We've got to do these things now to
8 create the labor pool of qualified welders and
9 crafts people as well as nuclear engineers to
10 support the development of these fleets.

11 We've got issues with the back end of
12 the fuel cycle. And I think including those
13 issues is a feedback loop to public perception
14 because I think the public perception about the
15 closure of the fuel cycle is extremely important.

16 Just a comment on closure of the back
17 end of the fuel cycle. If you haven't seen the
18 recommendations of the National Commission on
19 Energy Policy, and perhaps you have, it's an
20 interesting commission. It was a bipartisan
21 commission of 21 folks. Interesting mix. John
22 Holdren, who has the highest regard. Bryson of
23 Edison. Ralph Cavanaugh of NRDC. Dick Meserve,
24 who is on our advisory board and president of the
25 Carnegie Institution and former Chairman of the US

1 NRC. These are not nuclear, wild-eyed advocates.
2 There's a mix of folks here. This was their
3 recommendation regarding spent fuel.

4 And if you look at it it's kind of my
5 company's position. Which is basically, the
6 government ought to take title to the stuff like
7 they said they would and they ought to
8 appropriately move it to some managed, retrieval
9 storage facility as we figure out whether or not
10 reprocessing is economic. Whether we can do it
11 and manage proliferation risks. No need to rush
12 to that judgement today.

13 When I go to our board for a decision to
14 build -- a notice to proceed to Bechtel, one of
15 the questions will be, what's the worst that can
16 happen to us as an investor. And quite frankly,
17 the worst we can price in. It's to build an on-
18 site, above-ground retrieval storage facility and
19 have these big concrete canisters sitting up
20 there. And I can price that out and they'll be
21 good to go for more than the life of the project.

22 So we don't view the waste disposal
23 issue, or the need for Yucca Mountain or permanent
24 disposal, any of that, as relevant to the
25 investment decision we can make to build a plant

1 that can return significant values to our
2 stockholders and to rate payers.

3 In spite of the challenges we think the
4 opportunity is real. I stole this from Jim
5 Collins in Good to Great. Our company does have a
6 passion for the work. We are a fleet operator,
7 we're proud of it. We're proud of the operating
8 experience in our existing fleet. In fact it's
9 been improved as we've grown the fleet, mostly
10 through acquisitions. We think we can be the best
11 and we think we can make a buck at this. Thank
12 you.

13 PRESIDING MEMBER PFANNENSTIEL: Thank
14 you, Dr. Turnage. Questions?

15 ASSOCIATE MEMBER GEESMAN: How do you
16 feel in terms of your construction risk exposure
17 in your pro forma in view of the experience with
18 the AREVA project in Finland?

19 DR. TURNAGE: Good question. First of
20 all, we've been, of course. Since we're a
21 customer we get to go. We've been to Olkiluoto 3.
22 We have also signed a technical assistance
23 agreement with Electricit, de France. We will
24 participate in their construction program and -- a
25 second one of these units is being built in

1 Flamanville, France. We will participate in their
2 construction program and in their
3 commercialization start-up program. That will
4 occur before our plant goes forward.

5 We understand most of the issues that
6 occurred in Flamanville. They began with the fact
7 that like we did in the past they started
8 constructing a plant that wasn't design finalized.
9 It's exacerbated by a prime contract with AREVA
10 and gazillions of small entities separately
11 contracted so the management problems in that
12 spaghetti network of relationships is very
13 difficult.

14 They did not pay attention to the
15 realities of what I'd call serious attention to
16 nuclear gray level quality assurance with Finnish
17 regulator who is extremely tough. So they poured
18 concrete out of spec and they were stopped work
19 for about six months until they figured out that
20 that really was not a problem.

21 So hopefully we will take advantage of
22 the lessons learned in Finland and in France and
23 with our constructor get real smart about that.
24 We will have design finalized before we construct.
25 We're spending about half a billion dollars to do

1 that. This is beyond the design required for
2 certification. This is getting to
3 constructability and having an absolute,
4 underlying, standardized approach.

5 I should have said, baked into that
6 overnight capital cost is another aggressive
7 assumption. It assumes we can do as well as EDF
8 did when they constructed their N-4 fleet. And
9 that represented from their first unit to the
10 fourth, not quite but almost a 20 percent
11 reduction in cost as they went through a
12 construction learning curve. The Japanese call it
13 continuous construction.

14 So the idea is it represents a risk.
15 We're trying to get real smart about it. You
16 might appreciate that our board requires the fall.
17 Give me the doomsday scenario. Costs go up by 50
18 percent. Construction lags a year. Market prices
19 go down by \$10 a megawatt hour. And roll it all
20 up and what does that look like? It looks like
21 between four and five percent ROE. You'd never do
22 that, but you don't bankrupt the company.

23 ASSOCIATE MEMBER GEESMAN: And just to
24 revisit the cap question again. Your business
25 model is premised on receiving the federal

1 guarantee for each of your four projects, is that
2 correct?

3 DR. TURNAGE: That's correct.

4 ASSOCIATE MEMBER GEESMAN: Then finally,
5 you mentioned that you really depended upon no
6 adverse safety problems with 104 existing US
7 reactors. Isn't your trip wire in fact an
8 international one?

9 DR. TURNAGE: It may be. I think if
10 there were some totally dissimilar design plant
11 having a problem like Chernobyl that's a slightly
12 different story because there's lots of problems
13 but it's probably not fatal. I think if it were
14 one of our plants it would be a disaster for us.

15 ASSOCIATE MEMBER GEESMAN: I want to
16 thank you for a very candid presentation, I
17 appreciate it a great deal.

18 DR. TURNAGE: Thank you.

19 PRESIDING MEMBER PFANNENSTIEL:
20 Dr. Turnage, just on that last question on whether
21 something happening abroad might affect your
22 ability to continue your business. You mentioned
23 the public attitudes being a micron deep. It
24 seems like something like that could really turn
25 around public attitudes.

1 DR. TURNAGE: I agree.

2 PRESIDING MEMBER PFANNENSTIEL: I want
3 to make sure I understand the business model that
4 you were describing, though. You have the
5 merchant model, so it's not dependant on rate-base
6 treatment. But it is dependant on federal loan
7 guarantees?

8 DR. TURNAGE: That's correct.

9 PRESIDING MEMBER PFANNENSTIEL: All
10 right. Now if those did go away when you were
11 into the business and defined your plant were
12 ready to go, might you then go looking for an
13 opportunity to work in a rate-based environment?

14 DR. TURNAGE: We will consider a rate-
15 base build with a partner. Again, it's financial
16 attractiveness is not as great for us. We are
17 prepared to take the merchant risks to achieve
18 those returns. But I would not exclude that and
19 we would consider having a rate-base partner.

20 PRESIDING MEMBER PFANNENSTIEL: Thank
21 you. Other questions? It's late in the day,
22 thank you very much.

23 DR. WEISENMILLER: Commissioners, I know
24 it's late in the day. Allow me to introduce our
25 last speaker. We have Tom Cochran. Tom is the

1 director of the NRDC's nuclear program and he
2 holds the Wade Greene Chair for Nuclear Policy at
3 NRDC. He has been at the NRDC since 1973. It was
4 a huge favor from Ralph to have Tom fly all the
5 way out here and give this presentation. So
6 certainly next time you see Ralph please thank him
7 for the Commission.

8 And as I indicated, Tom was on the
9 steering committee of the Keystone Center Report
10 and certainly can talk about stuff. We've given
11 everyone his bio. I could go on for a long time
12 about his background and qualifications but I
13 think given the hour it's better to let Tom speak.

14 DR. COCHRAN: Madame Chairman and
15 members of the Commission, I want to thank you for
16 this opportunity. I've given you a longer,
17 written statement which I will not go into in
18 detail. I want to highlight a few issues. Many
19 of the issues that I covered in the statement have
20 already been covered by others.

21 But the first issue is the role of
22 nuclear power in reducing greenhouse gases. I
23 just want to make a, reiterate a couple of points.
24 We have about 441 nuclear plants globally today
25 producing about 370 to 380 gigawatts of

1 electricity.

2 If you hypothetically assume those
3 operated continually for 50 years that would be
4 roughly equivalent to one of the Socolow wedges, a
5 little over a wedge. And because they are going
6 to pass through their license lifetimes in that 50
7 year period, if they are not replaced you'll lose
8 about a half a wedge. This is on a global basis.

9 Now I've given you a lot of detail on
10 our attempts to estimate just what the growth rate
11 is likely to be, both in the United States and
12 globally and you can look at the detailed
13 derivations. But our best guess is that globally
14 over the next 50 years it would be something on
15 the order of 215 to 270 gigawatts of new, nuclear
16 capacity and in the US somewhere in the roughly 25
17 to 30 range.

18 There's one huge uncertainty in all of
19 this and that is what happens to these plants,
20 particularly in the US, when they reach the end of
21 their next license extension. Most of them are
22 getting extended and I'm assuming all of them get
23 extended from 40 to 60 years. But between 2035
24 and '55 they come up again.

25 And I think there is going to be

1 enormous pressure given the fact that they produce
2 on a forward cost basis low-cost electricity.
3 There will be enormous pressure to relicense them
4 and that has obvious implications in terms of
5 safety because of the aging issue. But we've
6 assumed in these numbers I've given you that
7 that's either relicensed or replaced.

8 I won't go into the economics. Most of
9 my recent knowledge of that comes from the
10 Keystone Center report and Jim has already covered
11 those issues.

12 On the safety issue. Again that's been
13 covered, at least from my perspective, largely by
14 David Lochbaum, who spends more time on those
15 issues than I do. But my own judgment is that the
16 existing fleet of reactors in the United States is
17 clearly safer today on balance than they were 20
18 years ago or prior to Three Mile Island or
19 whatever date you want to pick.

20 The new generation of plants appear on
21 paper from PRA analysis and so forth to be safer
22 than existing plants in terms of their design.
23 The problem with PRA analysis, of course, is that
24 there is no way to really verify the calculations.
25 Numerically the absolute numbers don't mean a

1 whole lot but they give you some relative
2 perspective.

3 I believe the most important factor
4 affecting the safety of nuclear plants is the
5 safety culture at the plant. We've heard a lot of
6 discussions of that today. The point I would want
7 to make is that there is a real lack of an
8 adequate safety culture in many countries and in
9 some, very few but at some plants in the United
10 States. And we heard testimony to that effect
11 today.

12 Most of the new plants that are being
13 touted to go in over the next couple of decades
14 will not be in the US but will be in countries
15 where either our knowledge of the safety culture
16 is nonexistent or certainly questionable. And
17 many of the countries that operate these 441
18 plants have an absence of an adequate safety
19 culture. So I think if we are to see another
20 major nuclear accident, and we all hope we won't,
21 that it is more likely to occur elsewhere in other
22 countries than it will in the United States.

23 Let me turn to the issue of spent fuel.
24 Clearly some amount of spent fuel and high-level
25 nuclear waste can be safely stored at Yucca

1 Mountain. The problem is we don't know whether
2 that amount is larger or smaller than the
3 legislative limit of 70,000 tons.

4 My criticism with the whole -- Well I
5 have many criticisms about the Yucca Mountain
6 licensing process. But I am really deeply
7 troubled by the behavior of the Environmental
8 Protection Agency over the last 25 years in
9 developing the standards. Actually these
10 standards don't go out of EPA before they first go
11 through a secret, internal review process in the
12 White House that involves DOE and NRC and OMB.
13 And so what comes out is really not an independent
14 regulatory agency but it includes the applicant.
15 Bizarre if you had that in some of the other --
16 Well I guess we do have that in some of the other
17 regulatory regimes.

18 But the EPA has systematically -- Well
19 let me back up. When you think about protecting
20 future generations there are really three factors
21 you have to play with. What radiation exposure
22 dose are you going to allow an individual in the
23 future? Where are you going to make that
24 measurement or model that exposure? How far from
25 the engineered repository? And over what period

1 of time are you going to apply that criteria?

2 The Environmental Protection Agency has
3 basically corrupted each of those parameters.
4 They first cut off the time period at 10,000 years
5 because that allows you to rely heavily on the
6 engineered canister rather than the geology of the
7 site.

8 They gerrymandered the control boundary,
9 the point at which you would measure compliance.
10 So that unlike the WIPP facility where it is five
11 kilometers in every direction, in the direction
12 that it leaks out of Yucca Mountain they extended
13 the control boundary from 5 to 18 kilometers. It
14 allows the aquifer coming down from the north to
15 dilute the waste before you have to measure it to
16 see if you're meeting the exposure standard. We
17 raised that in court in a lawsuit because of the
18 deference given to the agency.

19 When the court ruled that a 10,000 year
20 cutoff was not consistent with the congressional
21 mandate that it be consistent with the National
22 Academy of Sciences' recommendations EPA's
23 response has been to propose a two-tiered dose
24 limit, retaining the 25 millirem for the first
25 10,000 years. That's a limit on the mean dose to

1 a maximally exposed individual.

2 But after 10,000 years they increased it
3 to 350 millirems but on the basis of the median
4 dose, which is one-third of the mean dose. So the
5 mean dose is actually more like a rem per year to
6 the maximally exposed individual at this
7 gerrymandered boundary.

8 And to just put the number in
9 perspective. If that were the lifetime exposure
10 to a person today, 1 in 12 people would get cancer
11 from that exposure based on the National Academy
12 of Sciences' best estimates in the BEIR VII
13 report. And half of those exposed would die of
14 cancer.

15 So in summary -- Oh, there is one other
16 point on the Yucca Mountain. The Department of
17 Energy when it makes its application to the NRC
18 and the NRC reviews its application there's going
19 to be a lot of modeling to see if these dose
20 calculations -- dose limits are met. And the DOE
21 computer code is so large that the NRC will not be
22 able to operate it. So it's a black box. But the
23 NRC will build its own code, not for the purposes
24 of licensing the plant but for the purposes of
25 knowing what questions to ask the DOE and the DOE

1 code will be the official calculations.

2 Let me turn to -- Finally on the spent
3 fuel issue. I believe aged, spent fuel can be
4 safely stored in dry casks as long as you want to
5 manage the casks. And, you know, the utilities
6 around the country are turning to dry cask storage
7 as the wet pools fill up. I think 30 out of the
8 65 sites in the US have dry cask storage. Another
9 16, I believe, have applied for the licenses and
10 there are others thinking about it. So everybody
11 is going to be moving in that direction. I don't
12 think it's necessary to have centralized dry cask
13 storage except I think it makes sense for
14 decommissioned sites that have been
15 decommissioned.

16 The troubling aspect, of course, is that
17 this may be the de facto, ultimate solution to US
18 and even global spent fuel, despite the fact that
19 the US policy has been, the government policy has
20 been not to rely on institutional controls for
21 more than 100 years.

22 On the proliferation issue, which I
23 think is the most important issue confronting the
24 civil nuclear power industry. Per Peterson I
25 thought did a very good job of identifying sort of

1 the four categories of issues that have to be
2 addressed and controlled.

3 One is, potential for diversion of
4 materials from a facility for weapons purposes.

5 The second is the potential that a non-
6 weapons state would develop clandestine facilities
7 such as similar to what Iran where it secretly
8 built an enrichment plant, I think for weapon
9 purposes beginning in 1985 and it wasn't
10 discovered until a few years ago.

11 Third is the breakout potential, such as
12 you saw in North Korea where a country signs the
13 non-proliferation treaty and safeguards agreements
14 but then reneges and uses its facilities for
15 weapon purposes.

16 And finally the non-state threat of
17 terrorists using fissile material. Here I think
18 the greatest risk is highly enriched uranium, not
19 plutonium, because it is more dispersed, less
20 well-secured, easier to work with, easier to make
21 a bomb out of. The only advantage of plutonium is
22 it has a smaller critical mass so you need less of
23 it but it is much harder to fabricate something of
24 equipment yield. So the real risks there are
25 associated with research and test reactors and not

1 with these power reactors.

2 On the proliferation front the problem
3 is that the international safeguards regime, and
4 that includes the non-proliferation treaty and
5 other treaties and the IEA safeguards. The
6 safeguards are not capable of safeguarding what I
7 would characterize as bulk handling facilities,
8 namely uranium enrichment plants, reprocessing
9 plants, mixed oxide fuel fabrication plants,
10 plutonium storage facilities and highly enriched
11 uranium storage facilities.

12 Therefore the only way this technology
13 can go forward safely from a non-proliferation
14 standpoint is if these bulk handling facilities
15 were limited to weapons states. I would add,
16 eliminate the unneeded closure of the back end of
17 the fuel cycle and that entails reprocessing and
18 MOX plants.

19 Now we've heard some testimony and you
20 had some questions related to the Department of
21 Energy's Global Nuclear Energy Partnership. In my
22 view that vision as it relates to the back end of
23 the fuel cycle is absolutely doomed to failure.
24 It cannot work. It will not work. And that's
25 because it's based on the marriage of two failed

1 technologies, reprocessing and fast reactors.

2 Reprocessing has failed in some
3 countries technically and failed in all countries
4 economically. And there is no foreseeable point
5 in time that you could say that this is going to
6 be, reprocessing will be economical. Jim Harding
7 gave you some figures earlier on the economics.

8 Technology has changed. It's also sort
9 of the dirtiest part of the nuclear business, the
10 reprocessing industry. Not necessarily in every
11 case but in most cases.

12 The real reason though that GNEP is
13 doomed to failure is because you have to have a
14 large fraction of your reactor fleet domestically
15 and globally fast reactors in order to transmute
16 the plutonium and transuranic elements to gain the
17 benefits of reduced waste management requirements.

18 The world has pursued fast reactors
19 since 1946. It's been pursued primarily to
20 develop plutonium breeder reactors. But it's been
21 pursued and failed in the United States, in
22 France, in the United Kingdom, in Germany, in
23 Italy and in Russia.

24 I add Russia, although it has two
25 operating fast reactors, one commercial sized. It

1 operates it on highly enriched uranium. And it
2 never closed the fuel cycle and stuck the United
3 States with a half a billion dollar a year fee to
4 provide the security for 34 tons of plutonium and
5 other materials that were not adequately
6 safeguarded when the Soviet Union collapsed. And
7 not so radically safeguarded today.

8 Out of about -- By the way, it also
9 failed in two nuclear navies, the United States
10 nuclear navy and the Soviet navy. When Admiral
11 Rickover tried to build one land-based prototype
12 and then put a sodium-cooled fast reactor in the
13 Seawolf before it went on sea trials he had
14 already decided to jerk the reactor out. And I
15 have in my statement a nice quote from the history
16 of the nuclear navy. And I'll just quote the very
17 end of it, the reason he pulled it:

18 "In Rickover's words they were
19 expensive to build, complex to
20 operate, susceptible to prolonged
21 shutdown as a result of even minor
22 malfunctions, and difficult and
23 time-consuming to repair."

24 And this has turned out to be the history of fast
25 reactors in the world.

1 The flagships of all of these countries
2 that I have mentioned with the exception of Russia
3 have been failures. The US and German, the Clinch
4 River and the Kalkar reactor in Germany were
5 canceled prior to doing construction.

6 A lot of people point to the French
7 program as the hallmark of excellent, nuclear
8 operations and closure of the fuel cycle in La
9 Hague, how well it works. The Superph,nix
10 operated for 11 years with a lifetime capacity
11 factor of 6.6 percent. The previous Ph,nix, which
12 is now run as an R&D facility, was running one
13 sodium leak a year for 20 years of its life.

14 The Monju reactor, the flagship of the
15 Japanese program. It's been shut down since 1995.
16 It has a lifetime capacity factor of 0.4 percent
17 and decreasing. There's probably a lot one could
18 say about problems with the Russian program if
19 they weren't secret.

20 So the one thing we did learn from fast
21 reactor development, and we primarily learned it
22 from the Superphenix, was that in France where we
23 didn't have the great cost overruns of building
24 this standardized fleet of plants, fast reactors
25 in France cost 30 percent or more than thermal

1 reactors, than the French PWR. And that was with
2 a pot-type design that the US rejected because of
3 maintenance concerns but it was a cheaper design.

4 So the Department of Energy's Global
5 Nuclear Energy Partnership is based on the theory
6 that in a market economy energy generating
7 companies are going to opt for a fast reactor that
8 has a much higher capital cost and operating cost
9 and has a potential reliability of about 50
10 percent based on the 25 or so plants that were
11 built. And that they would opt for that instead
12 of a thermal, light water reactor that they have a
13 track record of 90 percent capacity factor. I
14 don't think so.

15 So I think this program is dead, at
16 least in terms of ever showing any useful
17 benefits. Instead what is happening is the
18 Department of Energy in order to get support for
19 this has internationalized it, made it an
20 international partnership and will be promoting
21 the development of hot cells and cadres of experts
22 in plutonium metallurgy and actinide chemistry in
23 non-weapon states such as Japan now and others
24 will follow. So the program is increasing the
25 risk to US national security and will not decrease

1 it.

2 I just want to make one final summary
3 remark that is not in my written testimony. This
4 is a nuclear energy -- It's the only technology,
5 energy generating technology that requires
6 national and international treaties and
7 obligations to prevent people from making nuclear
8 weapons with the fuel.

9 It's the only technology in the US that
10 requires the federal government to subsidize the
11 risks associated with catastrophic accidents.
12 It's the only technology that requires federal
13 governments to manage the waste products because
14 they are dangerous and the materials from them can
15 be used for nuclear weapons.

16 I marvel at this industry. Every single
17 problem that it faces it has fostered off on the
18 federal government. If it's proliferation, that's
19 a State Department and a Department of Energy
20 problem. The utilities don't have to deal with
21 that.

22 If it's a waste problem, that's a
23 government problem. Give the government the
24 obligation to deal with the waste and then sue
25 them when they don't meet their obligation.

1 If it's a safety issue. Well, we'll get
2 the government to subsidize the cost of the
3 insurance because otherwise we won't build these
4 plants.

5 And then finally after this technology
6 is mature and we're extending the licenses of the
7 operating plants, they're back to the federal
8 government trying to get subsidies. Having gotten
9 subsidies and will try to get more, because they
10 are uneconomical.

11 Now we have a global warming problem.
12 That is the central, most important problem facing
13 the planet. I didn't go to the Sloan School of
14 Management. I'm a physicist, I didn't take
15 economics, but I know this: If you want to address
16 a pollution problem, an externality where people
17 are polluting the planet for free you have two
18 options that are economically efficient. One
19 option is to limit the emissions, cap carbon. The
20 second option is to tax it until the emissions are
21 reduced.

22 Instead you have this industry having
23 gone to the Hill to get \$10 billion, \$13 billion
24 worth of subsidies for their favorite technology.
25 NEI will not advocate capping carbon. NRDC will.

1 Capping carbon is the single policy that will do
2 the nuclear industry the most good in the long
3 run, capping carbon. So I like to tease my
4 friends from NEI by saying, who is more pro-
5 nuclear, NRDC or NEI? We are for capping carbon
6 and helping the nuclear industry.

7 But I do not think this industry should
8 be allowed, it's a mature industry, to go to the
9 Hill and get more subsidies that will penalize
10 technologies that can get us carbon relief faster,
11 cleaner and safer than this technology. Thank
12 you. I'd be happy to answer questions.

13 PRESIDING MEMBER PFANNENSTIEL: Thank
14 you, Mr. Cochran. Thank you so much for coming
15 here and for your excellent statement. I did have
16 a chance to read it earlier today and I thought it
17 contained a lot of incredibly useful information.

18 Are there questions from the dais?
19 Commissioner Geesman.

20 ASSOCIATE MEMBER GEESMAN: I want to
21 thank you for being here as well, Tom. Does NRDC
22 believe that it should be a matter of national
23 policy to accelerate the movement of spent fuel
24 from the pools into dry casks?

25 DR. COCHRAN: Yes.

1 ASSOCIATE MEMBER GEESMAN: Thank you.

2 DR. COCHRAN: That was easy and quick.

3 (Laughter).

4 COMMISSIONER BOYD: Perhaps another easy
5 question. I think you said it's, I don't want to
6 speak for you, safe to leave things in dry casks.
7 But here in California we have two decommissioned
8 plants, one right here in Sacramento that has a
9 dry cask storage facility but nothing else there,
10 and one that was mentioned earlier today up in
11 Humboldt where they're starting a dry cask
12 facility. And then we have two operating plants
13 that you heard about today where they either have
14 or are building dry cask facilities.

15 Then we get over to Yucca Mountain. You
16 courageously said that Yucca Mountain might be
17 good for awhile for some undefined amount. But
18 setting that aside for a moment. It was mentioned
19 here once today, and frankly it's been mentioned
20 many times, and particularly to me many times, the
21 idea of a somewhat centralized facility to move
22 materials to something that above-ground perhaps
23 can be managed for a couple of hundred years.
24 Where hopefully maybe man in his ever-accelerating
25 wisdom I hope can figure out some better solution.

1 And then we here on the west coast do
2 worry about seismicity of our state and what have
3 you and some question the wisdom of leaving dry
4 casks sitting around California. So I just wonder
5 if you have a view that there is possibly a mixed
6 approach to interim storage. That in some regions
7 it might be wiser to move to some interim storage
8 facility and other regions where the geology
9 hasn't proven to be particularly solid.

10 I don't want to pick on the east coast
11 but that was a pretty safe place until they
12 suddenly decided on Yucca Mountain. So I just
13 wonder if you have a view on that subject.

14 DR. COCHRAN: As an organization we
15 haven't developed a view but I'll give you my
16 personal view. First of all I think it's nonsense
17 to think an earthquake is going to damage a dry
18 cask storage container. I think you can shake
19 those as long as you want to and you're not going
20 to -- you may want to go back in and re-rack or
21 something in a safe facility but I cannot envision
22 it being shaken open. So I don't think that's an
23 argument, seismicity, for moving dry casks.

24 I think it makes sense to have a place
25 to move spent fuel and store it in dry casks from

1 sites you want to decommission so you can make
2 them greenfields and the company is not left
3 holding the bag at that particular site.

4 I don't think there's a strong argument
5 for centralized storage to manage the dry cask
6 storage that's currently taking place at the
7 operating reactor sites. In the first place it's
8 already there and you're building these things and
9 you're licensing them.

10 There may be an economic argument some
11 time in the future, I don't think it's there now
12 for some sort of centralization. You run the risk
13 though if you move huge amounts to a central
14 storage site that it becomes a de facto above-
15 ground repository. So I would not favor that
16 particular option. But I have no problem with
17 moving the Humboldt waste to another site.

18 COMMISSIONER BOYD: Thank you.

19 DR. COCHRAN: And I think it could be
20 transported safely.

21 COMMISSIONER BOYD: Thank you, and thank
22 you very much for being here today and being
23 willing to stay so late. I would observe sitting
24 up here that we haven't lost a soul from the
25 audience so you're a great attraction (laughter).

1 PRESIDING MEMBER PFANNENSTIEL: That's
2 because, Jim, they've all given me blue cards
3 (laughter). We have a lot of --

4 Thank you, Mr. Cochran.

5 DR. COCHRAN: Thank you.

6 PRESIDING MEMBER PFANNENSTIEL: We have
7 a lot of people who have asked to speak and we
8 have more. I would ask a couple of things. I'll
9 call the names on the blue cards in pretty much
10 the order they were given to me. The hour is
11 late. And the point of speaking is to address us
12 and to build the record, probably not to dazzle us
13 with your eloquence at this hour. I think
14 probably we're beyond that.

15 But we would appreciate people who would
16 like to get information into the record. I know
17 that there are a number of cards here from people
18 who have already addressed us this subject on
19 Monday. So obviously you're welcome to come up
20 but I would ask if you have, if there is nothing
21 additional to put in the record why don't you just
22 let us know that you're here. But we'll start
23 with Lloyd Cluff.

24 MR. CLUFF: Thank you, Madame Chairman
25 Pfannenstiel and Commissioners. My pleasure to be

1 here today. I am Lloyd Cluff with Pacific Gas and
2 Electric Company. I am director of PG&E's fuel
3 sciences department. I joined PG&E in 1985 to
4 manage the comprehensive seismic safety
5 reevaluation of the Diablo Canyon power plant.
6 And also was given the responsibility for managing
7 all earthquake risk for PG&E's corporate
8 facilities. And while Chairman Pfannenstiel was
9 there I worked with her on retrofitting one of our
10 major office buildings.

11 What I wanted to share with you, in
12 addition I have worked in the field of seismic
13 safety for more than 45 years on nuclear power
14 plants and dams and port facilities all over the
15 world and have a lot of experience and have
16 investigated a number of large, damaging
17 earthquakes worldwide.

18 And I just wanted to put on the record
19 my concern and cast some shadow on the
20 presentation made by Rochelle Becker earlier
21 today. During the long-term seismic program that
22 I managed for seven years on Diablo Canyon it was
23 a very open process. I chaired over 47 public
24 meetings. Rochelle Becker came to a lot of those
25 meetings, made comments at some of them. And her

1 style of making presentations often leads to mis-
2 representation of some of the data.

3 I just want to pick on one slide that
4 she showed that has to do with the seismic
5 history. It was slide 16, California's seismic
6 history, where she stated on the slide that there
7 have been 39 worldwide earthquakes listed in the
8 US Geological Survey site and out of those
9 worldwide records 21 occurred in California.

10 When you look at the US Geological
11 Survey website you find that there have been 500
12 worldwide earthquakes of magnitude greater than
13 six that qualify for significant earthquakes and
14 only eight percent of those occurred in
15 California. More have occurred in Alaska and
16 other places. I don't --

17 Earthquakes really are not an issue at
18 Diablo Canyon. I just wanted to use this as one
19 example of a misrepresentation of factual data
20 that is in the US Geological Survey database.
21 Thank you very much.

22 PRESIDING MEMBER PFANNENSTIEL: Thank
23 you. Doug McNea.

24 MR. McNEA: Hello, I'm Doug McNea,
25 nuclear worker. My background started in 1970

1 when I started to attend the Navy Nuclear Power
2 School at Mare Island and from there went to the
3 S5G prototype in Idaho. And from there eventually
4 to spending three and a half years working in very
5 close proximity to a nuclear reactor aboard a
6 fast-attack submarine.

7 After I fulfilled my obligation to the
8 government, to the US Navy and was discharged I
9 went to work for a small firm in San Jose that
10 does R&D testing and consulting for the nuclear
11 industry and has done a number of contract
12 projects for EPRI and directly for the utilities.

13 And as part of that over my 37 career in
14 nuclear power I have had to go to -- I have
15 probably been to close to 50 nuclear power plants
16 in the US, one in Canada and one in Sweden,
17 actually performing complex testing of turbine
18 performance using radio tracers that required
19 coordination with the plant people. And I think
20 it sort of gives me a unique perspective in terms
21 of working in the regulatory fishbowl that nuclear
22 power is.

23 I have been also in the commercial
24 nuclear industry. I have been witness to the
25 ratcheting up for the change. I mention both my

1 Navy and civilian experience because when I got
2 out of the Navy and started working in the
3 commercial field there was a giant chasm between
4 the culture of safety in the Navy and the culture
5 of safety in the commercial nuclear power
6 industry. That culture of safety in the nuclear
7 power, we have to thank Admiral Rickover for that
8 because his culture and his legacy lives on.

9 There has been a lot of mention about
10 INPO. I understand that the first head of INPO
11 also came with a Navy background. And all the
12 power plants I have been to, there's several
13 people that like myself got their start in nuclear
14 power from the Navy. The commercial nuclear
15 industry really owes a debt of gratitude to
16 Admiral Rickover on that training and that culture
17 of safety.

18 On that there's been discussions about
19 the plant design and designing safely. There is a
20 great need for that. But as in the Navy we used
21 to say, there's nothing that's sailor-proof. And
22 because of that, when it comes to safety the buck
23 stops with the nuclear worker.

24 Training has progressed immensely and
25 one of the things contrasting the Navy to the

1 commercial industry that came out in the nuclear
2 accident was prior to Three Mile Island there was
3 no real emergency -- In the Navy on a nuclear
4 submarine the captain could come back there and
5 hit the SCRAM breakers, shut the plant down. And
6 we actually had to recover from that SCRAM
7 incident or any other incident. We were actually
8 working with a real reactor, reacting to an
9 emergency situation.

10 Now in the commercial industry up until
11 Three Mile Island there was no requirement for
12 simulators. After Three Mile Island all plants
13 are required to send their operators to simulators
14 where they get some real accident scenarios where
15 they have to react. Reacting to an incident, as
16 Three Mile Island showed, you've got to see what's
17 going on and react to it.

18 And if you've been drilled, like we were
19 in the Navy. Because another thing that was
20 different between the Navy in terms of the
21 oversight is the Navy uses every ship, nuclear-
22 powered ship goes through what's called ORS,
23 Operation Rack for Safety Inspection.

24 And people that -- this is one of the
25 contrasting differences is the person that -- The

1 team that comes on board to perform this
2 inspection is people that are experienced. They
3 have gone to naval reactors, they have come from
4 the fleet. They came from the fleet, they have
5 actual experience, whether they're enlisted men or
6 officers. They have actually been out in the
7 fleet and had hands-on operating experience.

8 Unlike the NRC which has to recruit
9 because they have had a policy from the beginning
10 that they didn't want a revolving door policy
11 where people went from the industry to the
12 regulator, back to the industry. And I can
13 understand that philosophy and that's why there's
14 a real need for the INPO-type thing because of
15 that.

16 But also because of the nature of going
17 from plant, to plant, to plant. Some years I have
18 gone to three or four plants and had to be badged
19 for unescorted access. This comes in both the
20 plant safety training and the security issues.

21 First in plant training, there is the
22 safety, the culture of safety. All of the plants
23 come with this principle of STAR, stop, think,
24 act, review. If government officials used that
25 criteria we'd be a whole lot better off, mainly on

1 the review issue.

2 And the other thing is peer pressure.

3 One of the things that's talked about INPO is it's
4 only oversight, the ability to regulate is peer
5 pressure. But we are also trained in peer
6 checking. Because you need to look out not only
7 that you don't make mistakes but that the person
8 that you're working with doesn't make mistakes.
9 This is another contrast that is becoming more and
10 more prevalent in the commercial. There was a
11 gap.

12 One of the things at Navy Nuclear Power
13 School during the six months just before we left
14 we were first told this. And this goes completely
15 against military culture. We were told, and this
16 was reinforced at the prototype qualified
17 operators. That if you are ordered to do
18 something that jeopardizes the safety of the plant
19 you can be -- you can refuse to carry out that
20 order and asked to be relieved of your watch.

21 And that is the ultimate safety factor
22 is that if you are being told to do something that
23 is unsafe that you can refuse to carry out that
24 order without any disciplinary recourse.

25 And that culture has started to come

1 into the -- in going through the training at the
2 different plants that culture has started to come
3 into there too in that they're telling people, you
4 know, you have the right to go -- first you go to
5 your immediate supervisor if you have a safety
6 concern. And if that supervisor doesn't address
7 that concern then the phone numbers for the NRC
8 and where the NRC office is at the plant, you're
9 told to go there, go to the NRC with your
10 complaint. So that's the stop-gap of safety.

11 Just briefly on security. Mainly
12 because of some of the criticism of security on
13 plant access. You have to go through several
14 things to get unescorted access to nuclear power
15 plants these days, and it's ratcheted up from the
16 days when I first got out of the Navy. When you
17 went to the plant all you had to do was have your
18 good guy letter that said you were a good guy and
19 they let you in the door.

20 Well those days are long over. You have
21 to be fingerprinted. Your fingerprints have to be
22 checked out with the FBI. You have to have your
23 background checked. And then there's fitness for
24 duty where you have to have a drug screening. And
25 the restricted work hours so that you haven't

1 worked 24 hours a day so your judgment isn't
2 impaired by long work hours.

3 But the bottom thing, what was mentioned
4 this morning was about the escort, how ridiculous
5 it was that one person could escort a bunch of
6 people. Well after 9/11 you can't even get on the
7 owner-controlled area without going past a guard.
8 And if your name isn't on the list ahead of time
9 by somebody in the plant that's went all the way
10 up to the plant manager that's authorized you to
11 come on the utility's property, you don't get in.

12 And even if you're a visitor, because
13 sometimes my work has required me to be escorted,
14 you have to pass that criteria. So the idea that
15 one insider is going to escort ten Al-Qaeda
16 terrorists is ridiculous.

17 That pretty much concludes my comments.
18 I just want to reiterate what I said before. When
19 it comes to the real safety the buck does stop
20 with the nuclear worker and there has to be a
21 better appreciation. And public perception of the
22 nuclear worker needs to be improved because, quite
23 frankly, the public perception of a nuclear worker
24 is a cartoon character named Homer Simpson. Thank
25 you.

1 PRESIDING MEMBER PFANNENSTIEL: Thank
2 you, Mr. McNea. Bob Woehl.

3 MR. WOEHL: I'm from the Electric Power
4 Research Institute and I --

5 PRESIDING MEMBER PFANNENSTIEL: I'm
6 sorry, we can't, you need to go to the microphone.

7 MR. WOEHL: I'm from the Electric Power
8 Research Institute. We submitted some comments, I
9 was just going to bring those to your attention.
10 But I'll defer my time due to the late hour.

11 PRESIDING MEMBER PFANNENSTIEL: Thank
12 you, Mr. Woehl. Ken Schrader.

13 MR. SCHRADER: I'm Ken Schrader, I'm a
14 member of the North American Young Generation in
15 Nuclear and I am also a proud employee to work at
16 Diablo Canyon nuclear power plant. I'll cut down
17 my comments here to allow other people time.

18 In the last year it has been quite a
19 year for the nuclear industry. Around the world
20 we have had several new countries that are
21 starting to build new nuclear plants. In the US
22 we have around 30 new plants being considered.
23 The NRC has approved two early site permits this
24 year for plants in Clinton, Illinois and Gulf,
25 Mississippi and the Florida PUC adopted some pro-

1 nuclear incentive packages. So we have seen a lot
2 of things going on around the world and in the US.

3 In California though it has been a real
4 different story. The California legislature has
5 not been considering nuclear power as an option,
6 as far as I'm concerned. And that was kind of
7 shown recently when Chuck DeVore was presenting
8 his bill to rescind the 1976 law banning nuclear
9 plants, AB 719. He was cut off after about five
10 minutes of presenting the bill and it was quickly
11 voted down. So there is really no debate going on
12 within our Legislature.

13 Our energy options are being restricted.
14 The PUC has now removed coal as an option. So
15 we're really being left with natural gas as the
16 only source that we have for reliable power 24
17 hours a day. And gas prices, as we know, have
18 been going up. And also California, many people
19 are not supporting liquified natural gas
20 terminals, which would bring in more natural gas
21 for low supplies. So in my opinion, based on that
22 California needs to be considering returning to
23 nuclear power, as having that as an option.

24 I am very concerned with the current
25 energy strategy that we have right now for long-

1 term. I believe that if we continue down the path
2 we are right now in terms of the options we have
3 we're going to have blackouts again and another
4 energy crisis. I don't know when it will happen
5 but I believe it will happen. And I think the
6 risk of that to the Californian's is more than the
7 risk of building new nuclear plants.

8 But right now, based on the legislators'
9 feelings, they feel it's the other way around.

10 But I am optimistic that our legislature will
11 observe the changes that are going on around the
12 world and in the US, especially in other states,
13 and hopefully that they'll change their past
14 positions on new nuclear power plants. And I
15 would support any efforts that the California
16 Energy Commission could take to educate our
17 legislature on clean and safe nuclear energy.

18 I want to thank you for your time today.
19 I think this workshop is excellent. I'd like to
20 see it every two years. Thank you.

21 PRESIDING MEMBER PFANNENSTIEL: Thank
22 you very much. Susan Swift. (No response).
23 She's left I guess. David Weisman. (No
24 response). Kristin Zaitz.

25 MS. ZAITZ: Hi, I'm Kristin Zaitz. I am

1 also a member of the Young Generation in Nuclear.
2 Who would have known that two of us would go in a
3 row. But anyway I want to thank the Commission
4 for the opportunity to be a part of the process.
5 I'll keep my comments very brief.

6 I just wanted to say that I am one of
7 the many Californians that are interested in our
8 energy future. And the Young Generation in
9 Nuclear obviously supports nuclear power. We feel
10 that it is clean, safe and reliable.

11 I had the opportunity to go to our
12 national conference, it was held in Florida this
13 year, and it was really exciting to see the rest
14 of the country ramping up with new nuclear,
15 although it was a little bittersweet for us
16 California representatives. We're hopeful in the
17 future that we'll also feel that excitement here
18 in California. Thank you.

19 PRESIDING MEMBER PFANNENSTIEL: Thank
20 you. Robert Williams.

21 MR. WILLIAMS: Thank you. I spoke to
22 you Monday. I'll try to be as brief as possible
23 but I have worked in this area for 40 years on
24 everything from the IRG report. I've worked with
25 luminaries the likes of Fermi, Floyd Culler,

1 Chauncey Starr, Milt Levinson, so let me, I'll
2 mail you a bio.

3 PRESIDING MEMBER PFANNENSTIEL:

4 Mr. Williams your comments from Monday are in the
5 record.

6 MR. WILLIAMS: I understand, and I don't
7 intend to repeat them. Jack Keenan asked, what
8 could this Commission do that would assist him in
9 his search for new generation. I believe that was
10 Mr. Geesman's question. I have a more direct
11 answer than Jack Keenan gave. It's to eliminate
12 the two paragraphs in the Warren-Alquist Act that
13 require this demonstration of reprocessing and
14 require the demonstration of waste disposal.

15 As I have sat here today there have been
16 five or six different ways of explaining that
17 neither reprocessing nor waste disposal are
18 required for the safe operation of nuclear plants.
19 And we see a number of states in the United States
20 willing to proceed on that basis. I think Joe
21 Turnage's explanation of that point was very well
22 taken.

23 So from my perspective let me just
24 remind you that when the waste confidence
25 proceeding was held there were two preprocessing

1 plants in the United States that still had a
2 chance of operating, the Barnwell plant and the
3 Exxon plant. There were three plants worldwide
4 that would be damned if the United States came in
5 the waste confidence proceeding and said, you can
6 only go with spent fuel storage.

7 Now that the dust has cleared we see
8 that there is no need to proceed with reprocessing
9 until it's justified for using the fissile
10 material in breeder reactors, and there is no need
11 to proceed precipitously with spent fuel disposal.
12 So that argument by itself would be a major
13 contribution and it would stimulate a debate in
14 the legislature. I have no belief that you would
15 not get criticism and the report would not be a
16 big lightning rod. But you would do a major
17 public service if you would have the courage to do
18 that.

19 The other thing you could do is go back
20 to the 2005 report and look at each of the places
21 where it had something positive to say about
22 nuclear power, and then look at this present
23 executive summary, which has essentially nothing
24 positive to say about nuclear power. I would
25 commend you to do that. And I will write you a

1 longer letter to transmit the rest of my strongly
2 held beliefs. Thank you.

3 PRESIDING MEMBER PFANNENSTIEL: Thank
4 you. Edwin Sayre.

5 MR. SAYRE: I'm Edwin Sayre, PE. I just
6 wanted to emphasize what Mary Quillian said today
7 about standardization. I have helped design and
8 build nuclear plants around the world, to help
9 upgrade the nuclear plants and to help maintain
10 those nuclear plants. And I'll tell you this much
11 right now, if you could really push equalization
12 in the new plants that you're going to build in
13 California you can do a big job in cutting the
14 costs and improving the quality.

15 PRESIDING MEMBER PFANNENSTIEL: Thank
16 you. Tom McClean.

17 MR. McCLEAN: Good afternoon Madame
18 Chair and Commissioners. My name is Tom McClean
19 and I am a member of the Fresno Nuclear Energy
20 Group. I want to thank you for putting on this
21 two-day workshop. Had I come here with any doubts
22 that what we're doing in Fresno is the right thing
23 to do, this workshop has erased all those doubts.

24 For those of you who do not know what
25 we're about down in Fresno, we are attempting to

1 bring safe, environmentally friendly, economical
2 and sustainable power to the city of Fresno.
3 Specifically we are looking at nuclear power. And
4 to that end we have signed a letter of intent with
5 a major power company to do just that.

6 There are a few things that I heard here
7 today and on Monday and a few things that I have
8 not heard and I want to be specific about that.
9 First of all, none of the presenters here have
10 stated that they are opposed to building new,
11 nuclear facilities in the state of California.

12 Some have brought up legitimate concerns
13 regarding the transportation of the byproducts of
14 these nuclear plants and where the permanent
15 storage of these wastes should be located. All
16 presenters who spoke on the subject agree that
17 deep, geological disposal is a proven means of
18 storing these byproducts, or waste as some of you
19 call it.

20 The disagreement comes regarding the
21 geographical location of the site, rather than the
22 methodology. It was interesting to note that
23 Allison Macfarlane agreed with the technical
24 solution to the long-term storage but does not
25 agree with the DOE on the assessment of Yucca

1 Mountain. In fact, she stated that she knew of
2 several sites that would be appropriate for this
3 but did not mention them because of the political
4 sensitivities in those areas back east.

5 We have heard expert statements from
6 those who live in the industry and those who study
7 it that dry cask storage is a very safe and
8 effective means of storage for the next 60 to 100
9 years. Dry cask storage would provide the cushion
10 of time needed to satisfy not only the placement
11 of an acceptable, long-term depository but would
12 also satisfy the requirements needed to lift the
13 moratorium in California.

14 We should remember that it is the
15 methodology that needs to be proven and not the
16 site itself. Transportation and site location are
17 logistical and security issues that can be and
18 must be addressed.

19 In conclusion I would like to say that
20 the moratorium was established not as a wall to
21 block new nuclear construction but as a gate that
22 would be opened when the conditions set forth in
23 that moratorium are met. There is now conclusive
24 evidence that those conditions have been met and
25 that the moratorium should indeed be lifted.

1 What we, the Fresno Nuclear Energy Group
2 are asking for is a report from this Commission be
3 based on fact and truth rather than on political
4 expediency. I am encouraged that this will be the
5 case based on the forthright questions asked by
6 the Commissioners and the open forum that you have
7 provided us. And I would like to thank you for
8 your time and consideration.

9 PRESIDING MEMBER PFANNENSTIEL: Thank
10 you. John Hutson.

11 MR. HUTSON: I've just got about 45
12 minutes but I'm going to pass because I spoke
13 yesterday. (Laughter). You know, everybody is in
14 a big hurry. But thanks very much. Let's think
15 about energy independence. And thank you for
16 having us here.

17 PRESIDING MEMBER PFANNENSTIEL: Thank
18 you. Bruce Marlow.

19 MR. MARLOW: Bruce Marlow with the AREVA
20 Corporation, and also a Californian since 1955.
21 This is my thirty-fifth year in the nuclear power
22 industry and collectively I have been exposed to
23 more radiation than everybody in this room times
24 ten. And I'm 52 years old and I have three,
25 healthy sons so I'm a testimony that it is not as

1 bad as people make it out to be. (Laughter). And
2 obviously a little bit nervous here.

3 So a couple of things I'd like to fill
4 in the gaps with. One is that I'd like to talk
5 about Olkiluoto and all the issues. But I think
6 about ten times we talked about why costs indeed
7 will be resolved in America with standardization.

8 And importantly we talked a bit about
9 the lack of people that will help run these plants
10 and build these plants. AREVA is spending a few
11 million dollars every year to help bring on
12 educated people. We have AREVA University. We're
13 working with high schools and colleges throughout
14 Virginia where my home base is.

15 AREVA itself has 61,000 employees
16 worldwide, 41 manufacturing facilities and over
17 100 offices. And we continue to grow and we are
18 not the only player in the industry. Worldwide
19 there is going to be a lot of nuclear power plants
20 manufactured.

21 In America we're looking at
22 manufacturing some components right now in
23 Southern Indiana at the old BWXT facility and
24 we're starting to bring on manufacturing in
25 America so we'll be providing jobs. It won't all

1 be going off-campus down the road, it will
2 actually be in America as we continue to grow the
3 industry and provide more jobs.

4 And bring on a forging plant, as an
5 example. That would be a -- If you have a forging
6 plant today and you want to make it nuclear, \$200
7 million and five years and you can bring that into
8 a nuclear component facility.

9 Another thing that is interesting to
10 note. And I go to a lot of industry conferences
11 and meetings. I could tell you that there's
12 probably somewhere in the neighborhood of a dozen
13 every week, 52 weeks a year, of people getting in
14 a room like this and hammering through the
15 technical issues relative to nuclear power. I
16 mean, it goes on at every level from security to
17 engineering. It is not taken lightly, these
18 people are very professional.

19 Like earlier, it's not a Homer Simpson
20 organization and Binky the fish doesn't show up.
21 We don't have three-eyed frogs or four-armed
22 babies. It doesn't happen that way.

23 And I would encourage you to maybe meet
24 with Dr. Dale Klein, the new lead at the NRC, and
25 he has quite a program going on. I listened to

1 him yesterday down in Southern California. He
2 plans on having 1200 new people in his
3 organization by 2009. He's a pretty sharp guy and
4 quite a nice leader. He's only been in there a
5 short period of time so I think you're going to
6 see a lot of changes. And I think the concern
7 about the NRC raised earlier is going to be
8 handled quite nicely.

9 Let's see here. Relative to ordering a
10 nuclear plant. There is a large surge going on
11 worldwide. So if you were to order a plant today.
12 Let's say the State of California could get it
13 wrapped around today, we'd like a nuclear plant
14 and build it as quick as you can. If you ordered
15 it today you could bring that power on-line in
16 2018. If you wait two years you'll bring that
17 power on-line in 2028. If you wait four years it
18 will be in the 2030s. And the reason for that is
19 because you'll be waiting for components and
20 people to come and build it. So you really have
21 to think long-term.

22 Relative to that I have a couple of
23 concepts that I think are important to consider.
24 Is that we encourage people to site a nuclear
25 plant, look at doing a combined operating license

1 at the right location. So that we can in parallel
2 to discussing what to do with the California
3 moratorium, also preserve the right on that
4 privilege to actually have a nuclear plant in
5 California if it's decided by the people of
6 California to have such a thing. And to do that
7 you'd have to allow for some recovery for the
8 people making that investment. Some are in the
9 neighborhood of 80 to 100 million dollars of
10 recovery would be required if, in fact the plant
11 never got built because the State of California
12 chose not to.

13 And relative to the moratorium. We
14 don't have to eliminate it. Because as soon as
15 that debate happens, everybody that is anti-
16 nuclear is going to say we're going to build them
17 on, you know, Angel Island and Death Valley and
18 we're going to build them in Yosemite. And we'll
19 to through this huge debate about the water and
20 the ocean.

21 I suggest that there are some wonderful
22 sweet spots in the state of California that are
23 seismically acceptable that you could build a
24 nuclear power plant where the people in the town,
25 like Fresno, would like to have it there for their

1 economic benefit and also the benefit of the state
2 of California. And that you might be able to
3 modify that moratorium graphically as opposed to
4 eliminating it completely. That protects the
5 illustrious coastline and all the special places
6 in California by allowing people to maybe have the
7 economic benefits and power to California.

8 And I guess I'll say one other thing.
9 I'd like to open up an invitation. We do these
10 frequently. We take people on a tour in France.
11 You can see Olkiluoto, La Hague, the reprocessing
12 facility that for some reason everybody says does
13 not work and is a waste of time but we continue to
14 operate it in France. And the Japanese built a
15 multi-billion dollar one for themselves I guess
16 because it doesn't work but they built it anyway.

17 So fundamentally we can look at La
18 Hague, we can look at manufacturing the components
19 for nuclear plants and we can see a power plant
20 under construction. I'd open up an invitation to
21 the California Energy Commission, the California
22 Public Utilities Commission, some legislators and
23 some key stakeholders and we'd like to put that
24 together this fall for you folks. And I'll get
25 some information to you through our connections in

1 writing on what that tour might look like and I
2 think we can make that happen.

3 And then lastly I really am disturbed by
4 the concept that somehow nuclear fuel that has
5 been used is waste. If there is anything I could
6 do before I get out of the nuclear industry is to
7 have that W word eliminated. We used to call
8 aluminum cans and plastic bottles garbage. We
9 threw them in a -- everybody threw it all in one
10 container. And then somebody got smart and said
11 hey, there's some good properties in that, in that
12 product. Well fundamentally spent fuel has a lot
13 of energy in it and it's not garbage by any means.

14 And I know that myself I believe in the
15 future generations of America. And I believe that
16 the things we think that are insurmountable today
17 will be handled in the future by the educated
18 children that we're all educating that we brought
19 into life. And I think we need to put some faith
20 into them.

21 Whether it's fast reactors, I don't know
22 what that product will be. But those energy
23 canisters covered in concrete are going to be
24 valuable assets to future generations in some
25 form. And the reason I know that is because

1 today's college kids will have seven jobs in their
2 lifetime, all right. And five of those seven jobs
3 aren't even created yet today.

4 We're in a fast-paced world. Technology
5 is moving rapidly. We've done a lot just in the
6 last 100 years. Imagine what that would be times
7 two in the next 100 years. Those canisters of
8 unused fuel are going to be very valuable so we
9 need to be smart about what we do with them
10 because our future generations are going to count
11 on that for energy. And the world will run on
12 that energy. Thank you.

13 PRESIDING MEMBER PFANNENSTIEL: Thank
14 you. Bryce Johnson.

15 MR. JOHNSON: I am a retired nuclear
16 engineer and I would like to refute the most
17 refutable statement made by our last speaker from
18 NRDC. He made the statement that there has been
19 no successful fast reactor built in the world. I
20 would like to beg to differ with that. The
21 Russian Navy ran a significant portion of their
22 nuclear submarines on lead-cooled fast reactors
23 for a number of years.

24 The United States has built three very
25 successful sodium-cooled fast reactors, EBR-1,

1 EBR-2 and the FFTF, Fast Flux Test Facility. I
2 think any member of the nuclear fraternity would
3 regard EBR-2 as the most successful reactor that
4 has ever been built in the world. It operated
5 successfully for 30 years or more, it completed
6 all its missions successfully, and it even
7 demonstrated its ability to shut itself down
8 safely from a deliberately-induced power excursion
9 without any operator intervention whatsoever.
10 That's all.

11 DR. COCHRAN: May I respond to that,
12 please?

13 PRESIDING MEMBER PFANNENSTIEL:
14 Certainly.

15 DR. COCHRAN: I don't recall my precise
16 words but I said half of the fast reactors had
17 failed, not all of them. And you can do that
18 analysis by decade or by country. But by the way,
19 EBR-1 had a 40 percent core melt. Fermi-1, which
20 was a commercial size reactor, about the size of
21 EBR-2, had a partial core melt.

22 So in the US we had Clementine, the
23 first one with a liquid plutonium core, had
24 problems. EBR-1 had problems. EBR-2 was
25 successful. C-4 was successful. Clint River was

1 cancelled. And so forth.

2 The Soviet fast reactor fleet. Fast
3 reactors were put in their alpha submarines and
4 that was an unsuccessful technology. And you
5 don't see any fast reactors, any lithium-bismuth
6 cooled fast reactors in the Russian Navy or even
7 in the Soviet Navy after they pulled all their
8 alpha submarines. So it was not successful in the
9 Russian Navy.

10 But just half of them failed, not all of
11 them.

12 PRESIDING MEMBER PFANNENSTIEL: Steffen
13 Kammler.

14 MR. KAMMLER: My name is Steffen
15 Kammler, I am the CEO of City Solar. I came from
16 Germany to meet Commissioner Geesman at 4:30
17 today. (Laughter).

18 ASSOCIATE MEMBER GEESMAN: We're still
19 going to have that meeting.

20 MR. KAMMLER: And I thought before I
21 miss you I just try to mention some things out of
22 our side. Facing these wonderful I think kids'
23 pictures I want to -- yeah, tell you that the
24 fact, remind you of the fact of the biggest, ever-
25 known nuclear reactor. And guess, it's the sun.

1 The sun is rising since four billion
2 years. Every day and it is coming again the next
3 day. And scientists say the sun will rise another
4 four billion years.

5 The good thing is the sun brings the
6 energy to the earth since four billion years free,
7 without sending a bill, free without any lines and
8 pipes, to everyone, to every species which wants
9 to use it. But this is also the bad thing because
10 nobody has a chance to send a bill. Thank you.

11 PRESIDING MEMBER PFANNENSTIEL: Thank
12 you. I believe we have one person on the phone
13 who would like to make a comment, Marilyn Brown.

14 MR. GAZZOLO: She was disconnected.

15 PRESIDING MEMBER PFANNENSTIEL: No?
16 Okay. Is there anybody else who would like to
17 make a comment?

18 MS. WHITE: Commissioner, for the
19 record, I do want to bring something to the
20 Committee's attention.

21 Over the last several days I have
22 received several e-mails regarding the topic of
23 these two workshops. And in particular I am not
24 going to be able to read all of them but I did
25 want to share with you the gist of the e-mails.

1 There is great concern voiced in these e-mails,
2 particularly about the storage issues that have
3 been discussed so no need to rehash that. There
4 is also concern about costs and other things.

5 These e-mails have all been docketed.
6 They will be a part of the record. The questions
7 that are raised in them will be considered by the
8 team in revising the status report.

9 PRESIDING MEMBER PFANNENSTIEL: Thank
10 you, Lorraine.

11 Any other comments? Hearing none we'll
12 be adjourned.

13 (Whereupon, at 6:25 p.m., the Committee
14 workshop was adjourned.)

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CERTIFICATE OF REPORTER

I, JOHN COTA, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Committee Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said workshop, nor in any way interested in outcome of said workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 23rd day of July, 2007.

PETERS SHORTHAND REPORTING CORPORATION (916) 362-2345□