

BEFORE THE
CALIFORNIA ENERGY COMMISSION

DOCKET

11-IEP-1G

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In the Matter of,)
)Docket 11-IEP-1G
IEPR Committee Workshop on)
Distributed Generation)

IEPR Committee Workshop

Distributed Generation - Getting to 12,000 MW by 2020

CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

MONDAY, MAY 9, 2011

9:35 A.M.

Reported by:
Kent Odell

Commissioners Present

Robert Weisenmiller PhD, Chair and Presiding Member,
IEPR Committee
Karen Douglas, Associate Member, IEPR Committee
Carla J. Peterman, Presiding Member of Renewables
Committee

Staff Present:

Paul Feist, Advisor to Karen Douglas
Jim Bartridge, Advisor to Carla Peterman
Kevin Barker, Advisor to Robert Weisenmiller
Suzanne Korosec, IEPR Lead
Heather Raitt, California Energy Commission
Linda Spiegel, California Energy Commission

Also Present (*on phone)

Panelists

Panel 1:

Heather Raitt, California Energy Commission
Michael Picker, Office of the Governor
Aaron Johnson, Pacific Gas and Electric Company
Gary Schoonyan, Southern California Energy
Jim Avery, San Diego Gas and Electric Company
Jim Shetler, Sacramento Municipality Utility District
Jeanne Clinton, California Public Utilities Commission
Noah Long, Natural Resources Defense Council
Nicole Capretz, Environmental Health
Bill Gallegos, Communities for a Better Environment
Heather Sanders, California Independent System Operator
Mary Leslie, Los Angeles Business Council
Bill Powers, Powers Engineering

Discussion 1:

Christian Hewicker, KEMA

Panel 2:

Heather Raitt, California Energy Commission
Jon Carruthers, Pacific Gas and Electric Company
Robert Woods, Southern California Edison
Bill Torre, San Diego Gas and Electric Company
Dave Brown, Sacramento Municipal Utility District
Carl Lenox, SunPower
David Korinek, KEMA

Discussion 2:

Heather Raitt, California Energy Commission
Karin Corfee, KEMA
Julia Donoho, Sonoma County

Panel 3:

Linda Spiegel, California Energy Commission
Jan Kleissl, University of California San Diego
Roland Winston, University of California Merced
James I. Zoellick, Schatz Energy Research Center
Peter Evans, New Power Technologies

Also present:

Tim Tutt, Sacramento Municipal Utility District
Ed Murray, Aztec Solar
Bernadette Del Chiaro, Environment California
*Al Baez, Air Quality Management District
Andrew McAlister, Center for Energy Efficiency and
Renewable Technologies
Danielle Osborne-Mills, Center for Energy Efficiency and
Renewable Technologies
Ray Pingle, Sierra Club of California

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

2 MAY 9, 2011 9:35 a.m.

3 CHAIRMAN WEISENMILLER: Good morning. Ready
4 to start?

5 MS. KOROSEC: Good morning. I'm Suzanne
6 Korosec, and I manage the Energy Commission's Integrated
7 Energy Policy Report unit. Welcome to today's workshop
8 on Reaching 12,000 Megawatts of Distributed Generation
9 by 2020. This workshop is being conducted by the Energy
10 Commission's Integrated Energy Policy Report Committee.

11 Today's discussions are integral to
12 preparation of the 2011 Integrated Energy Policy Report
13 since one of the Energy Commission's top priorities this
14 year is developing a renewable strategic plan that
15 discusses challenges to meeting Governor Brown's
16 renewable energy goals, including the 12,000 Megawatts
17 DG goal, and provides suggested strategies to overcome
18 those challenges

19 First, some housekeeping items, for those of
20 you who may not have been here before, restrooms are in
21 the atrium, out the double doors and to your left near
22 the glass doors. Please be aware that the exit doors on
23 the south side of the building are for employees only,
24 and you will trigger an alarm if you attempt to go out
25 that way.

1 We have a snack shop on the second floor at
2 the top of the atrium stairs under the white awning for
3 coffee and such. And if there's an emergency and we
4 need to evacuate the building, please follow the staff
5 outside to Roosevelt Park which is diagonal to the
6 building, and wait there until we're told it's safe to
7 return.

8 Today's workshop is being broadcast through
9 our WebEx conferencing system, and parties need to be
10 aware that it is being recorded. We'll make an audio
11 recording available on our website a few days after the
12 workshop, and a written transcript will be posted on our
13 website in about two weeks.

14 Our agenda today will cover four topics
15 related to achieving the Governor's DG goals. We'll
16 begin with a discussion on developing interim and
17 regional targets. Having interim targets will not only
18 break the 12,000 megawatts into more manageable chunks
19 but will also allow us to better track progress over
20 time towards the 2020 goal.

21 Next, because one of the major challenges of
22 the 12,000 megawatt goal will be integrating that amount
23 of renewables into our system, we'll hear from KEMA
24 about Europe's experience integrating large amounts of
25 DG. We'll then have a brief public comment period just

1 before lunch, this is mainly for people who have time
2 constraints and aren't able to stay until the end of the
3 day. And we'll break for lunch at approximately 12:30.
4 We'll continue the integration topic after lunch with a
5 panel discussion of what lessons California can learn
6 from the European experience and then next we'll talk
7 about the Energy Commission Staff's report on developing
8 renewable on state buildings and other state owned
9 properties. As the Staff Report notes, deploying
10 renewable DG and other renewables on public buildings
11 and lands will not only contribute towards the
12 governor's renewable goals but it will also reduce
13 energy costs of state buildings, create new sources of
14 energy for the state by leasing vacant or unused lands
15 and right of way, and will provide cost savings to the
16 state through reduced land maintenance costs that would
17 be assumed by the renewable developers who use those
18 lands.

19 Finally, we'll talk about how research
20 development and demonstration efforts can help advance
21 DG deployment through things like improved forecasting,
22 advanced technologies and a better understanding of
23 where the optimum places are on the distribution grid
24 for these technologies. I will finish up with another
25 opportunity for public comment on any of the day's

1 topics. During both public comment periods, we'll take
2 comments first from those of you in the room, followed
3 by those participating via WebEx. For our in-person
4 guests, we ask that you fill out a blue comment card.
5 These are available on the table out in the foyer so
6 that we may better manage our comments. Please provide
7 your name, your affiliation and the topic on which you'd
8 like to speak and if you need to speak in the morning
9 because of a time constraint or if you can wait until
10 the afternoon. You can give those cards to me at any
11 time during the day. When it's time for you to speak,
12 please use the microphone at the podium near the Court
13 Reporter so we can make sure our WebEx folks can hear
14 you. And it's also helpful if you can give the Court
15 Reporter a business card so we can make sure your name
16 and affiliation are correct in the transcript. For
17 WebEx participants, you can either use the chat or the
18 raised hand function to let our coordinator know that
19 you have a question or comment and also whether you have
20 a time constraint and we'll open your line at the
21 appropriate time. For those of you online that are
22 participating only by phone, we will open the lines at
23 the end of the afternoon public comment period to give
24 you an opportunity to ask questions. We're accepting
25 written questions on today's topic until close of

1 business May 23rd. And the notice for today's workshop,
2 which is on the table out in the foyer and also
3 available at our website, describes procure to
4 submitting comments to the IEPR docket. And with that,
5 I'll turn it over to Chairman Weisenmiller for opening
6 remarks.

7 CHAIRMAN WEISENMILLER: I'd like to thank
8 everyone for coming today and their participation. I'm
9 hoping that the extent of those of you on the WebEx or
10 other audio connections have good opportunity to follow
11 us today. Obviously this is an important topic. We're
12 hoping to cover a lot of ground today and get a lot of
13 meaningful exchanges and good information. So again,
14 I'd like to thank everyone for their participation and,
15 again, encourage all the speakers to stay crisp so we
16 have enough time for a good back and forth.

17 COMMISSIONER PETERMAN: Good morning,
18 everyone. Glad to see you here as well. I see a lot of
19 familiar faces. Looks like an all-star cast and so I
20 think we're going to have some very good discussion.
21 Reaching this 12,000 megawatt goal is very important to
22 the state in terms of reaching our climate change goals,
23 our health goals, and our interest in energy security.
24 I think the questions that we are posing today are the
25 right ones and I look forward to this discussion

1 stimulating the talk we're going to have for the next
2 few months and the next few years. And with that, I'll
3 turn it back over to Chair Weisenmiller.

4 CHAIRMAN WEISENMILLER: Great. Suzanne, you
5 want to kick off the first panel?

6 MS. RAITT: Good morning. I'm Heather Raitt.
7 I'm with the California Energy Commission. I'll be
8 moderating this first panel. Okay. Good morning.

9 So our first panel is focused on setting
10 regional and interim targets towards building up to
11 12,000 megawatts of localized resources that are
12 renewable. And so to kickoff the discussion, staff has
13 created a preliminary for establishing regional targets
14 and this is really a work in progress and we look
15 forward to comments on our proposal.

16 In this approach, staffs using a bottoms up
17 analysis, building off existing programs and planned
18 projects to develop county specific estimates for
19 meeting 12,000 megawatts. We're thinking about this in
20 terms of renewable distributed generations, so projects
21 smaller than 20 megawatts. It's a simplified approach
22 looking at market and program activity to date and
23 scaling that past-trans to meet 12,000 megawatts. We
24 were interested in doing an overlay of additional
25 considerations such as where DG could be most

1 beneficial, looking at an economic analysis and
2 including environmental screens but we may do so in the
3 future. And we welcome your comments on how to do that.

4 So basically the initial cut we did was we
5 split the analysis into two categories - the first at DG
6 behind the meter to serve onsite load and separately DG
7 they could produce energy for wholesale. So we have—we
8 we are assuming 5,000 megawatts behind the meter and
9 7,000 megawatts that could be wholesale.

10 For estimating behind the meter, staff assumed
11 the state would meet its SB1 goals which is 3,000
12 megawatts. And then to get there, we assumed current
13 trends would continue. And then we added another 2,000
14 megawatts that we assume would be installed in the more
15 densely populated counties assuming there'd be the
16 greatest opportunities there. For the wholesale
17 portion, we looked at existing contracts, projects going
18 through the environmental review process on a local
19 level and projects that are in the queue for inter-
20 connection. And this slide shows there's about 1,000
21 megawatts under contract, about 2,500 megawatts going
22 through environmental review on the local level at this
23 point and then we have another 5,700 megawatts in the
24 queue. And we recognize that these aren't discrete
25 buckets, if you will, that there's going to overlap

1 between them. But we also did our best to try to weed
2 that out.

3 For behind the meter, we scaled up the
4 installation trends to estimate the 3,000 megawatts SB
5 target. We looked at the number of megawatts that had
6 been built per county and simply assumed the same trends
7 would continue going forward for the California Solar
8 Initiative and the low-income programs until their goals
9 were met.

10 For the new Solar Homes Partnership, that has
11 a goal for 400 megawatts for installations on new
12 housing and clearly that program has been stalled with
13 the housing market, but we did assume that the goal
14 would be met and we based the build out on 2009 building
15 permit data.

16 For the 700 megawatt public utilities goal
17 portion, we assumed that they would meet their targets.

18 Looking at behind the meter, we also needed an
19 additional 2,000 megawatts after the SB1 goals would be
20 met. So we again began with looking—excuse me, the
21 existing programs and build out from there. Excuse the
22 acronyms on the slide but we looked at the California
23 Public Utilities Commission's Self-Generation Incentive
24 Program and the Energy Commission's Emerging Renewables
25 Program and simply assumed what's already been installed

1 there would double. And then for the remainder, we
2 assumed that the installations would occur in the top 12
3 most densely populated counties. So that's what we did
4 to get to 5,000 megawatts of behind the meter.

5 For the wholesale distributed generation to
6 get to the 7,000 megawatts, we first looked at the
7 projects that are currently going through local
8 permitting process, which the Energy Commission is
9 tracking, and we also looked at projects that are under
10 contract. We cross-referenced these data sources to try
11 to avoid double counting and the analysis yielded about
12 3,200 megawatts that we could identify by county. For
13 the remaining roughly 3,800 megawatts, we looked at the
14 inter-connection queue for the projects that didn't have
15 a contract and weren't going through the local
16 permitting process.

17 Then we put all of this data together and
18 we're showing it here on maps. And this is actually for
19 how, using this methodology, that distribution for
20 behind the meter. And, in this map, the red county
21 shows—the red shows where we expect the most behind the
22 meter installations, followed by orange and then yellow.
23 So the red counties here are basically LA and Orange
24 Counties.

25 This one shows for wholesale generation the

1 highest concentrations here are San Bernardino, Kerns
2 and LA. So we're seeing a little bit more in Southern
3 California and Central California.

4 And then here, it's a little bit hard to
5 decipher, but we basically put the onsite and wholesale
6 together. We purposefully haven't shown numerical
7 targets here because the idea of what we wanted to do
8 was to focus the discussion on the methodology and how
9 to think about developing targets for the 12,000
10 megawatts.

11 So with that we welcome your input and your
12 comments and we'll move on to the next speaker and—

13 CHAIRMAN WEISENMILLER: Heather, just one
14 clarifying questions.

15 MS. RAITT: Yeah, sure.

16 CHAIRMAN WEISENMILLER: In terms of your
17 analysis, how did you define the projects? What's the
18 maximum size?

19 MS. RAITT: 20 megawatts.

20 CHAIRMAN WEISENMILLER: Okay, thanks.

21 MS. RAITT: Thank you. Michael Picker, I
22 think you can either sit there or come up here.

23 MR. PICKER: I think this will be fairly
24 brisk. Next slide. This is just a quick over—this
25 slide is just a quick overview of the Governor's—you

1 can't hear?

2 CHAIRMAN WEISENMILLER: And also Michael, for
3 folks on the phone could you please introduce yourself?

4 MR. PICKER: Identify myself? Sure. (Checks
5 microphone clarity with audience and WebEx attendees).
6 This is Michael Picker. I'm the Senior Advisor to the
7 Governor for Renewable Energy Facilities. And this
8 first slide is just a quick overview of new goals from
9 the new Governor for renewable energy during his term.
10 And the first that we list here, of course, is building
11 12,000 megawatts of localized energy generation,
12 generally projects that are attached to the local
13 distribution grid rather than bulk transmission grid.
14 I'll let you quickly scan the other goals, I'm not going
15 to focus on them today. Next slide, please.

16 Again, I'm still learning a lot about this
17 field of policy. One of the things I observed after
18 really starting to focus more directly on distributed
19 generation local energy resources, is that it's really a
20 different fundamental market in this state. The large
21 cell projects compete to sell power all across the state
22 through contracts. They're generally in remote
23 locations. It's somewhat competitive. These local
24 energy resources are going to be positioned in specific
25 parts of the state and, for the most part, they're not

1 going to be selling energy across the transmission grid
2 to other parts of the state. Which means that they're
3 fixed in place. They're highly shaped by the
4 surroundings that they're located in as well as local
5 markets. And I just wanted to go through some of the
6 issues. Next slide, please.

7 And again, solar installation is different in
8 different parts of the state. It's much more intense in
9 San Diego than it's going to be in Arcadia. Even the
10 large scale markets, people tell me that there's a
11 discount for solar in the Central Valley over the desert
12 that results in higher costs and less affordability and
13 less likelihood of the utility of a project in terms of
14 meeting financial goals and still contribute to meeting
15 the state's RPS goal. The distribution lines and
16 transformers are going to be much newer in a residential
17 community like Elk Grove than they're going to be in
18 downtown LA which is a much, much older community where
19 some of these transformers have been in continuous use
20 for 40, 50, 60 years. Therefore, their reliability and
21 their ability to handle a variable resource is going to
22 be somewhat more limited. The planning landscape is
23 really different in Ontario and Fontana with the heavy
24 concentration of the goods movement industry than it's
25 going to be in downtown San Francisco which is dense

1 high-rise. So per person, the surface area that you
2 could actually expose to (indiscernible) renewables is
3 going to be dramatically different. And, of course,
4 there's many more policy arenas in Northern California
5 but there's much more demand in the south as Heather's
6 last slide—almost all of the organized groups tend to be
7 centered in San Francisco and Sacramento yet there's
8 many economic development groups and economic justice
9 groups who are active in parts of the state where the
10 bulk of the folks live. So these are just some of the
11 issues. I'll give you a couple of others. Talking to
12 the folks who are starting to emerge in the field of
13 community wind, they tell me that local assessors treat
14 the property tax value of the turbines much more
15 differently—dramatically differently. For example, in
16 Solano, which has fairly good wind and is actually the
17 site of a one megawatt wind project that is behind the
18 customer meter and selling into the market through net
19 energy metering. The assessor will continue to assess
20 the value of that based on the constant depreciation
21 whereas in San Bernardino County the assessor
22 immediately discounts the value of the turbine 50
23 percent the moment it starts to run because that's its
24 value into resale market. Those things actually have
25 dramatic impacts as do all these others in terms of the

1 costs to the generator in terms of supplying electricity
2 in cost to consumers. So I think that all of these
3 things, again, are going to have impact in the way that
4 people deal with these issues.

5 Good example that's recently cropped up is in
6 Los Angeles where the LA Fire Department has been very,
7 very active in terms of trying to help develop standards
8 for construction on rooftop has begun to address
9 standards for ground mount. And LA is very hilly. It
10 has a high portion of its land area in chaparral brush
11 and its very fire prone. So there's large parts of the
12 city while on some levels may look good for installation
13 new ground mount but in reality represent a fire hazard
14 and the fire hazard has yet to wrestle with what that
15 means and to set standards and guidelines. I will say
16 that LA Fire Department and State Fire Marshall really
17 helped to structure the underlying tactics that are
18 currently being addressed as part of the International
19 Fire Code for rooftop. So I Have some confidence that
20 they're not just raising issues for the sake of raising
21 issues. I think that they're really concerned and
22 working hard to come up with solutions. But in the
23 midst of all that, we're trying to see the deployment of
24 12,000 megawatts of renewable energy whether it's
25 community wind, bio-fuels, landfill gas or solar. We're

1 going to have to figure out some way to make this real.
2 I started just by trying to figure out what are the
3 markets in California. Next slide, please.
4 And I just came up with a rough way for me to
5 begin to characterize this and since I haven't really
6 had a chance to evaluate Heather's model, I'll defer on
7 how quickly I move to the direction that she's setting.
8 Here's where I started. I just broke it down to
9 economic development communities and started to use what
10 data it was available to start to make some rough
11 assessment as to what seemed achievable. There's--this
12 is heavily weighted towards solar which is probably
13 unfair in some markets, but that was the best
14 information that I was able to find at the time. It has
15 no time access. I was uncomfortable using the existing
16 programs for financing distributed renewables knowing
17 there's a lot of discussion in the legislature about
18 whether to reauthorize SGIP or CSI not knowing what that
19 level of the policy terrain was I just kind of went
20 through and developed some public policy categories for
21 financing and then just started to split it up. I think
22 whatever we eventually all can come to terms with as
23 being a reasonable way to divide up the state and begin
24 to pursue these goals, the underlying reality that I'm
25 confronting is that we aren't yet at a single market.

1 And I think that we may never get to one unified
2 approach that's perfect in every part of the state.
3 However, what I'm starting to see is that there's a lot
4 of issues that we need to begin to wrestle with to
5 create a more efficient market across the state. And I
6 will work with many of the stakeholders here and
7 elsewhere to begin developing some tools through a
8 working conference for later this early summer to try to
9 structure discussions and develop solutions. Thanks.

10 CHAIRMAN WEISENMILLER: Thanks, Michael.

11 MS. RAITT: Thanks. The next speaker is from
12 PG&E.

13 MR. JOHNSON: Good morning. My name is Aaron
14 Johnson and I am the Director of Renewable Energy and
15 Policy at PG&E. I wanted to start this morning by just
16 talking a little bit about some of the DG programs that
17 PG&E already has underway.

18 First of all we have the CSI program where
19 PG&E has installed more than 300 megawatts of customer-
20 side solar installed. We have an existing feed-in
21 tariff program where we've had nearly 40 projects
22 subscribe. And that applies across technologies. We
23 have seen a number of distributed generation size
24 projects sign up with the utility through our existing
25 RPS RFOs.

1 We have over 10 projects representing 140
2 megawatts almost entirely solar, solar PV. A couple of
3 those projects are online and a number of the rest of
4 them will come online later this year and early next.
5 We've also initiated—and I did want to add for our RPS
6 RFO, we will be issuing another solicitation in two days
7 time, again, soliciting offers for the full range of
8 utility scale projects as well as distributive scale
9 projects.

10 The other program—there are two other programs
11 we have underway. One of which is our PV program where
12 we are developing 500 megawatts of solar. Half of it
13 being developed by the utility and the other half
14 through competitive solicitations. We just completed
15 the first competitive solicitation. We got an
16 incredibility robust response and our own projects will
17 be online this fall. Three of the first projects
18 totally 50 megawatts.

19 And then, finally, we have pending before the
20 PUC, the RAM program for over 400 megawatts. Again, of
21 0-20 megawatts sized projects. And once that's approved
22 by the Commission, we'll be having solicitations as
23 early as this fall to begin taking on additional
24 distributed generation programs.

25 I highlight these programs because I think

1 it's worth noting that there's been a tremendous amount
2 of progress and there are a tremendous amount of
3 programs in place already to begin adding significant
4 quantities of distributed generation to the system.

5 As we approach the 12,000 megawatt goal we are
6 sort of looking at this and seeking to understand what's
7 desired and how this fits with existing programs, how
8 does this fit with the existing 33 percent mandate that
9 was just codified earlier this year. How does it fit
10 with the existing programs I just outlined, the CSI, the
11 existing feed-in tariff, our PV programs, the RAM, the
12 RPS program generally.

13 And basically the way that we think about
14 meeting clean energy goals is ultimately what is it
15 going to cost for our customers to do these programs.
16 And as we meet clean energy goals is one of the things
17 that we've observed through our RPS and procurement
18 activities is that generally the smaller projects have
19 been more expensive than the utility scaled programs
20 which is why we've done the vast majority of our
21 renewables procurement through larger utility scale
22 projects. To date, there's a fairly significant gap in
23 price there. I will say that based on some of the most
24 recent information that we've gotten out of our latest
25 PV program, we see that gap starting to close a little,

1 which is encouraging, but we're not sure that we're
2 there yet.

3 So ultimately, the concern that we have about
4 the program is what will ultimately be the rate impact
5 of tackling more clean energy through a distributed
6 approach rather than through a traditional utility scale
7 approach. And we think that's an important lens to look
8 at these programs through. So ultimately some of our
9 questions will center around how much does it cost, what
10 is the technical feasibility; and I know we're going to
11 have a second panel here where we're going to get into
12 some of the technical details and a colleague of mine,
13 Jon Carruthers will comment on some of PG&E's
14 experiences with the technical elements of implementing
15 DG you know like how much of this program would we like
16 to see the IOUs contribute versus the publicly owned
17 utilities versus energy service providers, community
18 choice aggregators. And then, finally, if we're going
19 to move towards this goal, how can we leverage the
20 existing programs that we have. We've made a tremendous
21 amount of progress to have a whole lot of different
22 avenues for procurement and I was very encouraged to
23 hear Michael Picker talk about some of the barriers that
24 may exist to get distributed generation online because
25 one of the challenges we've seen as we've tried to adopt

1 a lot more clean energy is that there's been a lot of
2 focus on what the procurement mechanisms are for the
3 programs and not as much focus on what are the barriers
4 to actually bringing the projects online. We can create
5 lots of different new procurement mechanisms; utilities
6 have demonstrated that we've very good at signing
7 contracts for new facilities, however, those new
8 facilities haven't necessarily come online in the
9 timelines we've looked for. So I think those are
10 important things to consider and we look forward to
11 hearing more about how to tackle this goal. Thank you.

12 CHAIRMAN WEISENMILLER: Thanks. Aaron, a
13 couple of questions. You had mentioned on PV program,
14 the recent one, that you had a vigorous response. What
15 was the ration between bids and what was ultimately
16 signed?

17 MR. JOHNSON: We received 20 times as many
18 bids as what was actually signed-up. I will caveat that
19 to say one of our experiences with that RFO was that we
20 received a large number of bids from developers who did
21 not demonstrate a lot of sophistication with the
22 development process. There was some basic screens that
23 we put in places for projects to pass through in order
24 to be considered viable. Two-thirds of the projects
25 were unable to pass those screens. I just want to

1 caveat those response with not all of those were
2 necessarily viable bids.

3 CHAIRMAN WEISENMILLER: Okay. And typically
4 on your RPS solicitation for utility scale, what's the
5 type of ratio you see?

6 MR. JOHNSON: Certainly what we've seen over
7 time is that it's increasing significantly. We haven't
8 had a general RPS RFO since '09, so it's been about two
9 years; I'm trying to remember back to that RFO, I don't
10 have a good sense of what that number was. It was quite
11 robust in '09 and our expectation in 2011 based on the
12 number of folks that have been approaching us
13 bilaterally is that we will get an extremely robust
14 response.

15 CHAIRMAN WEISENMILLER: Okay. And the other
16 question was DRA, the PUC's Division of Ratepayer
17 Advocates, did a recent report looking at renewable
18 price trends and bemoaned that the distributed gen
19 numbers were coming down much faster than the utility
20 scale. I don't know if you've had a chance to review
21 that report or want to comment on it.

22 MR. JOHNSON: I do think that we have seen
23 that trend in projects coming to us. I would say that
24 that gap, while the trend does exist, the gap still
25 exists as well in that the utility scale projects are

1 still less expensive. Certainly that trend exists and I
2 wouldn't refute that trend that is what we see.

3 CHAIRMAN WEISENMILLER: Okay, thanks.

4 MS. RAITT: Thank you, Aaron. Our next speaker
5 is Gary Schoonyan from Southern California Edison.

6 MR. SCHOONYAN: Yes, thank. My name is Gary
7 Schoonyan. I'm Director of Regulatory Affairs of the
8 Southern California Edison Company and we appreciate the
9 opportunity to participate. I also want to thank you
10 for these really nice name tags. It's a very nice
11 touch.

12 Anyway, although the goal of the 12,000
13 megawatts of localized energy resources is very
14 laudable, in order to move towards it there are many
15 issues that have to be addressed in a thoughtful,
16 equitable, factual and reasonable manner. Aaron
17 highlighted some of existing programs, I'm not going to
18 go through those, basically what I'm going to do is
19 address some of the issues and considerations that
20 Edison has and is suggesting.

21 Key among these is the impact on customers,
22 the feasibility of the goal and the impacts of local
23 reliability and infrastructure needs. To begin with, we
24 need to eliminate the myth that pursuing the goal will
25 not require significant system upgrades both in terms of

1 the wire systems themselves but also of the data
2 collection and control systems necessary to reliably
3 integrate large quantities of various types, brands and
4 configurations of localized energy resources.

5 To begin with, I'd like to make a couple of
6 observations regarding timing and makeup. Regarding the
7 makeup, you may notice that I used the term localized
8 energy resources to define the energy production systems
9 covered. To me, including all clean energy resources
10 seems to make the most sense. This could include
11 systems such as very efficient CHP and energy storage.
12 There should also be consideration for the many
13 localized generation programs that already exist that
14 Aaron alluded to.

15 Regarding the timing, to me there is nothing
16 magic about getting to the goal by 2020. Granted, you
17 have to show sustainable progress towards the goal. But
18 you must do so in a manner that thoughtfully considers
19 the liability and rate impacts. Having an orderly
20 progression only allows the state to not only bounce
21 progress with non participant rate impacts but also
22 allows the state to take advantage of technological
23 advancements as they occur over time rather than having
24 a mad dash to a goal using today's technologies. Anyone
25 who lived through the ISO 4 gold rush and the dormant

1 subsequent years should appreciate this. In my mind,
2 there is a need for sustainable progress but the 2020
3 shouldn't just be the date that we subscribe to that.

4 Regarding the electrical system, I would like
5 to offer a couple of observations. The first is to
6 reiterate what I had mentioned earlier. While there is
7 to be some distribution circuits that can handle large
8 amounts of localized energy resources now, in most
9 instances, there is to be a need for some upgrades.
10 Further, the need for data collection facilities.

11 Finally, as more and more energy systems are
12 added to the distribution system, there will likely be
13 the need for sophisticated control systems to manage the
14 distribution system. This will not only include the
15 systems themselves, but potentially the necessary
16 controls and standards on the localized generators to
17 accept and respond to various signals.

18 The level of concern over rates is directly
19 proportional to the amount of subsidies to participating
20 customers and developers will receive. If the energy
21 produced is valued at market rates, there wouldn't be a
22 concern. However, there will likely be a push to
23 provide these projects with substantial incentives
24 and/or power purchase prices. Unfortunately, the non-
25 participants will be forced to pick up these costs.

1 In closing, I would like to make one final
2 observation. It appears that this effort entails yet
3 another standalone program. The energy industry is
4 currently charged with reliably meeting customer needs
5 with significant demand side resources, 33 percent
6 renewables, the CSI SGIP programs, efficiency HP, energy
7 storage, the RAM and several more I'm sure I've missed.
8 It is hoped at some point the state considers the
9 entirety of these programs together in the context of
10 the impact on the electrical systems and the customer it
11 serves. Thank you.

12 CHAIRMAN WEISENMILLER: Thanks Gary. A couple
13 of questions. Edison had one of the first utility PV
14 programs. What issues have you ran into implementing
15 that. I think everyone has a vision of trying to line
16 the warehouses going into Ontario Airport and trying to
17 understand what you've found when you were trying to do
18 that.

19 MR. SCHOONYAN: Are you referring to the Big
20 Box Solar on the industrial facilities?

21 CHAIRMAN WEISENMILLER: Exactly.

22 MR. SCHOONYAN: A lot of the problems that we
23 encountered had to do with just—actually it went fairly
24 smoothly. Believe it or not, there were inter-
25 connection concerns. Utility projects, just like

1 customer projects, face connecting to the grid and there
2 were concerns along those lines. The biggest thing that
3 we found, and you're probably aware that we petitioned
4 the Commission to scale back that particular program, is
5 that we found the competitively solicitations were
6 substantially lower cost than what we were able to do on
7 that particular program and enhance in the process of
8 requesting the Commission to scale that back.

9 CHAIRMAN WEISENMILLER: Yeah, I think you
10 found much better economics in the ground-mounted
11 opposed to the roof-mounted?

12 MR. SCHOONYAN: Correct.

13 CHAIRMAN WEISENMILLER: And what drove that?
14 Do you know?

15 MR. SCHOONYAN: I do not know at this time.

16 CHAIRMAN WEISENMILLER: In terms of—the other
17 question is in terms of distribution issues, do they
18 tend to be highest in your legacy or in your newest
19 distribution circuits?

20 MR. SCHOONYAN: More in the legacy but they
21 all have some concerns associated with them, for the
22 most part. Predominantly the legacy.

23 CHAIRMAN WEISENMILLER: What sort of ratios
24 have you seen on your solicitations?

25 MR. SCHOONYAN: I do not have an answer to

1 that question Commissioner.

2 CHAIRMAN WEISENMILLER: Well, if you can get
3 back to us in your written comments that would be good.

4 MR. SCHOONYAN: Right. And we do plan on
5 filing fairly detailed written comments.

6 CHAIRMAN WEISENMILLER: Thanks. Jim?

7 MR. AVERY: Good morning. My name is Jim
8 Avery. I am the Senior Vice President of Power Supply
9 for San Diego Gas & Electric Company. I'll try not to
10 repeat some of the comments you've already heard and
11 I'll just touch on some other issues that I think are
12 important.

13 Right now, currently, SDG&E secures about 15,
14 14.6 percent of our resources from a distributed nature
15 within our county. The balance of our resources, right
16 now the largest share comes from out of state. And over
17 the next 10 years we expect that number is diminish
18 significantly as we replace them with contracts coming
19 online within San Diego and Imperial Valley and
20 predominantly most of our new resources are coming in
21 through Imperial Valley. As you know our Sunrise
22 Powerlink is well into construction and is targeted to
23 be in service by the summer of next year. And will be
24 the transmission highway to provide access to renewable
25 resources. From our standpoint, SDG&E follows and

1 believes very strongly in pursuing the loading order of
2 pursuing energy efficiency demand response first, then
3 we look at renewables in our county, then we look for
4 renewables within the Imperial Valley and elsewhere
5 within the state and only after we exhaust those avenues
6 do we look beyond those borders into other regions.

7 There are some significant challenges within
8 SDG&E service territory. Right now, we represent less
9 than 10 percent of the state's portfolio and yet we do
10 have some challenges on what does that mean for
11 deliverability within our system. If you look within
12 San Diego and if you take, for example, Michael Picker's
13 2,000 megawatts of distributed generation within San
14 Diego, you add on top of that 1,700 megawatts that the
15 ISO is planning on connecting to the Sunrise Powerlink,
16 you add on other generations such as combined heat and
17 power, other qualifying facilities, and fossil
18 generation that must run within San Diego in order to
19 provide stability, and you're going to find in the
20 Spring and Fall on Sundays at noon time and Saturdays at
21 noon time, the system is going to want to push thousands
22 of megawatts North through our system because our total
23 system load in 2020 on these time periods in peak
24 conditions during the Fall and the Spring, our loads are
25 only going to be about 2,500 megawatts. Yet, if you add

1 all of the generation that's going to be intermittent
2 connected to our system, wanting to flow through our
3 system, there's no other place but for it to flow North
4 into the LA basin. There's a limitation on that
5 corridor today. That corridor when San Onofre is
6 running is only 400 megawatts of excess room. There is
7 no physical room to put these resources in our basin so
8 that creates a major challenge for us.

9 Another major challenge that we face is we
10 finance the bulk of our distribution and transmission
11 system, utilizing industrial development bonds. These
12 industrial development bonds come with restrictions as
13 to what we can do with operation of our system. Which
14 means we cannot build our system any sooner, or greater
15 or larger than we need for our native load system which
16 means that we cannot be a hub in San Diego for people
17 building generation with the intent to serve it
18 elsewhere in the state without putting our bonds in
19 jeopardy. And to give you a range of magnitude, our
20 industrial development bonds cost on average roughly 200
21 basis points below other market costs so it is a
22 significant opportunity for our customers, a significant
23 cost savings to our customers and it is something that
24 we are deeply concerned about.

25 There's also another thing that we cannot

1 forget and that is the inclusion of distributed
2 generation does not mean that there is an avoidance of
3 transmission. You need transmission in order to
4 integrate the system and balance the system and provide
5 stability for the system. So just by adding distributed
6 generation does not mean that there is or you could
7 avoid transmission expansion in order to satisfy that
8 distribution need. And that's no small charge. It can
9 be and will be significant if we don't do this in the
10 right way.

11 Now the approach that San Diego has taken, I
12 mentioned earlier that we do give preference for
13 resources that can connect to our system on the
14 distribution level within San Diego. Over the last
15 several months, we have announced over 80 megawatts of
16 new solar contracts that will be connected to our
17 distribution system. But we've given emphasis for those
18 projects that can connect directly to our substation so
19 we can avoid massive distribution upgrades and we will
20 be announcing, in the next couple of weeks, a series of
21 contracts as almost as twice as much as what we just
22 announced in the last couple of months. So we do see
23 that there is an opportunity to do this but the approach
24 we've taken is to make sure that it's integrated into
25 our system in such a fashion that does not require major

1 transmission or distribution upgrades to accommodate.

2 Thank you.

3 CHAIRMAN WEISENMILLER: Actually, I need to
4 remind everyone to speak into the microphone. I guess
5 we now have the overflow in the other room. And unless
6 you're really in the microphone they won't hear it.

7 I guess, Jim, the two questions I have for you
8 - one was when you talk about most of your resources
9 being distributed, what definition were you using?

10 MR. AVERY: Well, generation that can connect
11 to our distribution system or distribution substations
12 anywhere within the San Diego load basin. We are a very
13 capacity constrained region and for us, anything that
14 can connect to our distribution substations I would
15 consider to be a distributed resource.

16 CHAIRMAN WEISENMILLER: Okay. So distribution
17 connection, good. And the other question, I think
18 probably for people in general, would you give a brief
19 explanation of the two county rule for the IDBs?

20 MR. AVERY: The IRS basically mandates that
21 any entity that utilizes industrial development bonds
22 must utilize those resources solely for the benefit of
23 the county and perhaps one neighboring county. We
24 cannot extend beyond that region. For San Diego, our
25 counties are San Diego and Southern Orange County. That

1 means in the prohibition on the bonds basically say that
2 we cannot build our system no sooner, no greater, or
3 larger than what is required to satisfy our local
4 distribution need.

5 In other words, we cannot expand our system
6 for the benefit of serving the LA Basin for example.
7 That would be viewed as a violation of those bonds. In
8 addition to that, we cannot be a net exporter for the
9 purpose of satisfying or serving load beyond the San
10 Diego and Southern Orange County regions. Now there are
11 provisions that allow us to do certain transactions that
12 might be economy in nature but it cannot be built with
13 the purpose of satisfying something beyond the San Diego
14 need.

15 CHAIRMAN WEISENMILLER: Right. And again for
16 people general information, the City of San Diego issued
17 the bonds so it's their credit that's tied up in this
18 and if SDG&E were to violate this then the bonds would
19 lose their tax exempt status and this phenomenal
20 economic impacts to the bond holders. So anyway, I've
21 testified on this in the merger case so it is a serious
22 issue.

23 I guess the last issue for Jim is what has
24 been your experience on the SDG&E PV program?

25 MR. AVERY: Well, we haven't been allowed to

1 issue the RFO at this stage but we're anticipating we'll
2 be anticipating the RFI I believe it's later this week
3 which will be in conjunction with the overall RFO for
4 resources. Our RFO, the solar energy program, is a
5 little bit different than that that was structured by
6 Edison in that we were predominantly looking for, or
7 initiating a program, looking for ground-based systems.
8 Although, we have then agreed to open that up to provide
9 anybody to bid into that whether it's on rooftop,
10 whether it's on ground mounts and it'll provide us a
11 good opportunity to see what the relative cost
12 differences are. Now we do have two solar programs in
13 our company already. One of them is our sustainable
14 communities where we have been out actually testing the
15 market and building solar on rooftops and in addition to
16 that we have been doing a solicitation or taking
17 bilateral contracts for larger scale distributed
18 generation connecting to our distribution systems. And
19 when I say connecting to the distribution system, they
20 can come into the substation at 12KV or they can connect
21 in at the 69KV bus in the substation itself. But we
22 have seen a number of very competitive bids on the
23 distributed side connecting into our substations.

24 CHAIRMAN WEISENMILLER: Thanks, Jim.

25 COMMISSIONER PETERMAN: A quick follow-up

1 question. Of the 80 megawatts solicitation you recently
2 had, how much of that were projects that could connect
3 directly to the substation?

4 MR. AVERY: All of those had been. They're
5 connecting into two substations at, again, 12KV or 69
6 KV.

7 COMMISSIONER PETERMAN: And for applications
8 that were not connecting directly to the substation,
9 what type of price differential were you seeing?

10 MR. AVERY: We have not received any bids or
11 bilateral bids of any size at this stage.

12 COMMISSIONER PETERMAN: Thank you.

13 MS. RAITT: Thank you. Next is Jim Shetler
14 from SMUD. Thank you.

15 MR. SHETLER: Thank you. Good morning. My
16 name is Jim Shetler. I'm the Assistant General Manager
17 for Energy Supply with the Sacramento Municipal District
18 and I'll walk through my presentation relatively quickly
19 and I'll try not to repeat.

20 We are a publicly owned utility and that means
21 we are governed by an elected Board. There's some
22 background information here which I won't spend a lot of
23 time on. One thing I want to make clear is that we do
24 have very aggressive energy policy goals that have been
25 established by our Board. We did meet our 20 percent

1 RPS goal and 3 percent green energy goal last year. We
2 actually exceeded that. Our Board prior to the
3 legislation already told us we will be 33 percent RPS by
4 2020. Through our existing program, we have sufficient
5 renewables through 2016 and we have options in place
6 that will get us to 2020. We also have very aggressive
7 energy efficiency goals and our Board has established a
8 greenhouse gas reduction goal. First of all, we'll meet
9 the electric sector by 2020 but our other goal is to
10 decrease our 1990 levels of emission by 90 percent by
11 2050.

12 In looking in how we approach things, and I
13 want to talk about that as a publicly owned utility, we
14 recognize we owns us as our customers. We spend a lot
15 of time trying to understand what they want. And very
16 clearly, they want a safe, reliable, environmentally
17 responsible and cost-effective electric system. Our
18 Board has directed us, in looking at those competing
19 demands we have to come up with a sustainable approach
20 to do that.

21 On the resource standpoint, looking at our
22 current renewables. We tried to do a few things. One,
23 balance between utility scale and distributed resources
24 but also balance between base load and variable
25 resources to try and minimize the impacts.

1 Looking at our distributed resources,
2 obviously solar is a major player but biomass is also a
3 player and about 200 megawatts of our renewables right
4 now are coming from distributed resources.

5 From SMUD's perspective, we're really looking
6 beyond 2020. We feel we aren't going to be able to meet
7 the renewables goals and the greenhouse goals with our
8 existing program. So we're very focused what happens
9 2020. And we're in the process of doing an integrated
10 resource plan and finalizing that with our Board. And
11 we're focused on objectives around greenhouse gas
12 reduction for liability and renewable energy.

13 In looking at the results of our preliminary
14 IRP, we're looking at a lot more renewables coming
15 forward, primarily central plant but we're also looking
16 at distributed around solar and biomass and biogas.

17 From the standpoint of looking at a mandate, I
18 guess I'll make a couple comments. First of all, SMUD's
19 approach is that we'd like to be told what the policy
20 goals are, and allow us to figure out how to implement
21 them. And we're not overly in love with more mandates
22 on how to get there. We also believe our existing
23 programs will get us to 2020 so we don't feel that
24 there's a need for mandates to get to 2020. We do have
25 concern of moving too fast on standing distributed

1 generation. We support it. We have throughout our
2 history but we want to make sure it's done in a
3 sustainable manner. We have concern about the costs,
4 both direct and indirect costs going forward. The
5 reliability impact from both the grid operations and the
6 distributions systems standpoint and also just a
7 permitting and land use issue associated with starting
8 to move in that direction. If we are going to talk
9 about a new mandate we believe it should be based on a
10 needs based concept to reflect the fact that we're
11 seeing, as many others are, zero load growth and to
12 address the fact that we had existing accomplishments to
13 our renewable program.

14 The other thing, and some others have noted
15 this, we got a lot on our plate this decade. We're
16 expanding energy efficiency, we're expanding renewables,
17 we're launching smart grid; we have greenhouse gas
18 reductions and a cap-and-trade program coming our way.
19 And I think that we need to make sure that we've
20 evaluated all of this and understand the impacts before
21 we add more uncertainty to the mix. But overall, we
22 still support renewables. We support distributed
23 renewables, we just want to do it in a sustainable way.
24 Thank you.

25 CHAIRMAN WEISENMILLER: Yeah, Jim. Do you

1 want to talk for a minute about your experience with
2 feed-in tariffs?

3 MR. SHETLER: Ah, yes. We did launch a feed-
4 in tariff program in January of last year. Our mandate
5 under the state is about 30 megawatts; we did a 100
6 megawatt program. We wanted to see what the impacts
7 would be. We opened it up for solicitations January 3rd
8 and within a week we had 100 megawatts solicited—more
9 than 100 megawatts solicited. And we did the feed-in
10 tariff kind of with a benefits-based pricing and it
11 averaged around 14 cents a kilowatt hour, it varied hour
12 to hour but on average it was 14 cents a kilowatt hour.
13 We've had very little withdraw from the program. The
14 first from the major feed-in tariff projects will be
15 coming online later this summer with the rest through
16 next year. And right now they appear to be pretty well
17 worked their way through the permitting process and will
18 be starting the construction later this month and early
19 next month.

20 CHAIRMAN WEISENMILLER: Great. And what sort
21 of interconnection issues have you found with them?

22 MR. SHETLER: Well, one of the things we did
23 do when we put our feed-in tariff program together, we
24 had our distribution services group look at what
25 circuits would have the last impact on us and we made

1 that information available to the developers. So they
2 did review that. In general, we haven't seen a lot of
3 impact. WE have had a couple of areas where we will
4 need to do upgrades to the system in order to
5 accommodate. And for our program, that saved developer
6 costs similar to what you heard from San Diego as a
7 public entity our bonds are revenue based and tax exempt
8 and we have to use that money towards serving our
9 customer. So for individual impacts that a developer
10 might make, we require that the developer pay for that.
11 But overall no major impacts and we're able to
12 accommodate it.

13 CHAIRMAN WEISENMILLER: Okay. Last question
14 is do you want to talk about your experience with solar
15 highway?

16 MR. SHETLER: Well, if we can get through a
17 couple of negotiations with an entity called the State
18 of California we might find out.

19 (LAUGHTER)

20 MR. SHETLER: We're in the middle of—we do
21 have an R&D project underway, it's about one-and-a-half
22 megawatts located in two locations, one along Highway 50
23 not too far from the SMUD headquarters, and then a
24 little further out Highway 50 near a little town called
25 Rancho Cordova on your way to the foothills. We're in

1 the middle of going through the CEQUA process, we're
2 finalizing the CEQUA document and bringing that to our
3 Board in the next month. We have had a bunch of public
4 outreach with both the two cities involved, the City of
5 Sacramento and the City of Rancho Cordova. In general,
6 we have gotten a lot of public support for the project.
7 It's interesting negotiating with Caltrans, let's put it
8 that way, and we're working our way through that and
9 hopefully once we get the lease agreements finalized
10 we'll be going forward later this year with online
11 probably next year.

12 COMMISSIONER PETERMAN: The final question on
13 your feed-in tariff program, so to focus on areas where
14 there's preferable circuits, how did that effect your
15 geographical distribution of projects?

16 MR. SHETLER: It just turned out that most of
17 the favorable circuits tended to be rural where there
18 was low load on them already and that's most of the
19 projects in the southern part of Sacramento County. So
20 if you're familiar with Sacramento, Elk Grove, Galt
21 areas with the projects ended up.

22 CHAIRMAN WEISENMILLER: Thanks. Jeanne?

23 MS. CLINTON: Good morning. I'm Jeanne
24 Clinton with the Energy Division at the Public Utilities
25 Commission in San Francisco.

1 For the benefit of the Commissioners and
2 Advisors behind me, there's a sheet that looks like this
3 (holds up document) that was at this corner, if you
4 could pass those down you'll have the handout that I'm
5 using for those of you in the audience it was a one page
6 legal size sheet.

7 I'm going to start by focusing on the
8 procurement mechanisms we have in place to encourage
9 distributed generation both at the system side and on
10 the customers side. I'm not going to go through each of
11 these. I think the information is self-explanatory.

12 The points that I would like to make is that
13 perhaps we have three families of procurement
14 mechanisms. One family is exclusively for renewables on
15 the supply side such as feed-in tariff, renewable
16 options mechanisms and the solar utility-owned solar PV.
17 Then we have a middle category which is sort of a hybrid
18 category of qualifying facilities and heat and power
19 projects, which may or may not be renewable and which
20 may or may not be DG depending on the size of the
21 facility. But they do include substantial maps of DG
22 and a significant portion of renewables. But they're a
23 unique animal as a result of 30+ years of PURPA history.
24 And then we have the customer side generation which we
25 currently incentive through our CSI, the California

1 Solar Initiative, and the Self-Generation Incentive
2 program.

3 I would also point out that when the SGIP
4 program began it was primarily fossil-based distributed
5 generation technology and the objective was to reduce
6 peak demand. It then migrated to legislative direction
7 to be a renewables only program excluding any fossil and
8 now we're under another legislative mandate to return
9 consideration of fossil-based technologies if they're
10 clean and meet certain greenhouse gas emission
11 reductions. So that has been a bit of a roller coaster
12 over time in terms of what technologies and fuels and
13 performance characteristics are acceptable or not.

14 The important take away from this menu of
15 mechanisms that we have in place today, which are
16 administered by the investor-owned utilities is that we
17 have between 6-7,000 megawatts of distributed
18 generation, either developed or authorized to be
19 developed through this existing mechanisms.

20 Now I want to turn my attention to how do we
21 figure out how much more can be integrated into the
22 procurement system for the investor-owned utilities. We
23 have a process that we work on with the utilities and
24 many stakeholders called the Long-term Procurement
25 Planning Process, LTPP, and that process goes through a

1 somewhat complicated modeling and analysis process to
2 figure out what are the best ways to lineup the
3 resources to meet the expected energy demand in
4 California and specifically for the investor-owned
5 utilities. The factors that that process considers is
6 economics, the timing of resources and the reliability
7 of resources, what might be necessary in supplemental
8 resources to firm up say an intermittent resource. We
9 also look at grid-integration issues. Location factors,
10 environmental and greenhouse gas factors. And in the
11 case of CHP, we are of course also looking at the
12 implications of avoiding fossil fuel use for the heat
13 that's avoided as a result of the CHP process.

14 So right now that process is underway. One of
15 the scenarios that we're looking at is looking at an
16 additional 9,000 megawatts of DG on the supply side,
17 separate from the CSI and SGIP program.

18 Besides that LTPP process, which we have
19 parallel studies and policy proceedings underway on
20 interconnection issues. The two primary processes that
21 we're involved with are the Renewable Distributed Energy
22 Collaborative, also known as Re-DEC, and the Role
23 Working Group Process. And in those processes, issues
24 of interconnection are looking at both "Can we identify
25 preferred locations?" "Can we streamline the process for

1 getting analysis and acceptance (inaudible)
2 interconnections?" "Can we better understand the
3 investment needs necessary to accept the generation
4 interconnections?" and "How to allocate any costs
5 associated with that." And then more specifically in
6 the case of solar PV through our separate CSI and RD&D
7 program, we have spent a fair amount of attention
8 focusing on grid integration issues as well as other
9 issues and specifically have supported projects to look
10 at high-penetration and solar PV and what that would
11 mean for integration at the system level. So that's
12 sort of the lay of the land at the analysis in planning
13 front. I expect that these proceedings will enable us
14 to make determinations at the PUC on appropriate targets
15 and procurements strategies going forward, beyond those
16 that we have already committed to.

17 I would like to sum up just by indicating some
18 of the questions that I think that we're looking forward
19 to answering. First on economics, at what price or what
20 subsidy will we be wanting to accept renewables and
21 renewable DG. Secondly, in the case of reliability how
22 do we match the availability of these resources with the
23 demand for energy and look at what kind of firming
24 resources might be needed as companions to these.
25 Third, in the area of interconnection there's a

1 tremendous amount of work that needs to be done to
2 improve our knowledge and be able to figure out how to
3 update standards for interconnections, how to have
4 better predictive tools, how to streamline procedures
5 that were not necessarily put in place to consider
6 thousands of systems at the 1-20 megawatt level and to
7 understand the factors that are driving the costs of
8 interconnection and then how to either minimize those
9 costs or allocate those costs.

10 So those are the kind of questions we're
11 contemplating.

12 CHAIRMAN WEISENMILLER: Jeanne, thank you very
13 much for coming up. The one thing that I was going to
14 flag for you was for the upcoming panel on the KEMA
15 analysis of Europe, it seemed like one of the big
16 differences is the European requirements for having some
17 sort of metering on projects over say, 100 kilowatts, to
18 provide some sort of visibility more to the system
19 operator of what's really going on. I don't know if
20 that's tee'd up at this point. I guess there's also--
21 another KEMA key difference between California and
22 Europe I guess is the ability to curtail projects,
23 again, by the system operator on the need for
24 reliability. I don't know if those sort of issues have
25 been discussed or if the PUC has had a chance to look at

1 the KEMA study yet.

2 MS. CLINTON: Well, I think our staff has
3 looked at the KEMA study, I haven't myself. But in the
4 question of metering, in CSI and SGIP, we already
5 require metering. That's on the customer side. And of
6 course you would have metering on any wholesale side.
7 So we have production or performance metering required
8 at least down to the 10 KW level on solar PV and below
9 10 KW it depends on the cost of the feasibility. We
10 thought from the beginning of the solar program that it
11 was essential to have the customer have a feedback loop
12 to know how their system is performing.

13 CHAIRMAN WEISENMILLER: Right.

14 COMMISSIONER PETERMAN: Jeanne, the 9,000
15 megawatts in the LTTP that you referenced that you
16 identified, these megawatts then that will be funded
17 through all the other programs besides CSI and SGIP?

18 MS. CLINTON: The 9,000 megawatts are all on
19 the supply side so they're not on the customer side, so
20 CSI and SGIP would be separate. This is sort of a
21 planning study, this is one of several scenarios.
22 There's not really a commitment yet to fund the 9,000
23 megawatts, it's one of the scenarios being looked at in
24 the long-term procurement plan and that process will
25 inform us for the different scenarios which are

1 optimizing cost, timing, environmental considerations
2 and things like that, what are the tradeoffs and
3 choices.

4 COMMISSIONER PETERMAN: So that would be 9,000
5 megawatts of DG, correct? I just wanted to make sure I
6 understood that.

7 MS. CLINTON: Yes.

8 COMMISSIONER PETERMAN: Thank you.

9 MR. LONG: Okay. So assuming I can hop in?

10 MS. RAITT: Go right ahead.

11 MR. LONG: My name is Noah Long. I'm
12 representing the Natural Resource Defense Council,
13 pinch-hitting for Carl Zichella who had a scheduling
14 conflict so I hope you'll understand the replacement,
15 the last minute replacement. And I'll try and just
16 address a couple of the questions and thoughts we have
17 on this.

18 First, I'll just say that I really appreciate
19 and NRDC really appreciates the statewide focus—
20 increased statewide focus on both renewable energy
21 generally as well as distributed renewable generation.
22 The signing of the 33 percent RPS recently is a huge
23 milestone and, I think, everybody in this room can
24 really appreciate that. And it's great to see this
25 administration not just sign that bill but move the ball

1 forward with further commitments to this area and the
2 fact that there's so many folks in this room and even a
3 spill over room and folks on the phone, really is a
4 great sign of a thriving industry and better times yet
5 to come for renewable energy generally as well
6 distributed renewable generation.

7 That said, I want to take a little bit of a
8 step back and take a look at how distributed generation
9 fits into our goals of meeting the renewable energy
10 commitments already on the books as well as our larger
11 goals of reducing local pollution as well as greenhouse
12 gas emissions from generational electricity. I think in
13 order to set the right regional goals, which is the
14 focus of this panel as well as the right statewide goals
15 for distributed renewable generation, we really need to
16 take a focus at what the kinds of benefits are that we
17 hope to achieve from use of distributed renewable
18 generation or for that matter any renewable generation.
19 There can be some areas of overlap, obviously, in terms
20 of benefit from distributed and large scale and in some
21 ways, some of the costs can also overlap. So to assume
22 because it's DG there will be no land use conflict, for
23 example, I think would be an inappropriate assumption;
24 to assume that the system costs of integration will be
25 lower may be true but not always true. So I think to

1 the extent that we can keep those in mind, we'll be set
2 better goals but also set better milestones in terms of
3 getting those goals enacted.

4 Location matters. And of course that's true
5 with both large scale and small scale renewable
6 generation. And to the extent that we can set these
7 goals with those planning processes at the same time so
8 we're considering both not just how much but where we
9 want to focus these generation and the characteristics
10 of the generation we want, I think we'll be in a better
11 place to say that it's these targets.

12 Distributed renewable generation isn't
13 necessarily going to have, like I said, less land-use
14 benefits if you have lots and lots of small projects out
15 in the desert they're going to have very similar impact
16 in terms of land-use as a few really big projects. So
17 we want these small projects, less than 20 megawatts is
18 often the sort of shorthand for DG, to also be cited in
19 places that reduce the system costs that reduce the
20 transmission needs and also reduce the land-use impacts.

21 I think, to some extent, we can try to 'hurry
22 up and wait' and get a lot of projects signed up but
23 then have to make sure that the interconnection process
24 goes smoothly or wait to make sure that the land-use
25 citing process goes smoothly and then put a lot of

1 excess pressure on those processes because we didn't
2 think about them in the first place when setting either
3 the statewide or the regional goal.

4 So that said, I think that it's great to have
5 an additional distributed generation goal for 2020. I
6 think we should also be thinking about where we want to
7 be before 2020 so the interim goals between now and 2020
8 as well as what the long terms are—goals are beyond
9 2020. 2020 is—you know we started talking about the 33
10 percent RPS by 2020 some years ago and now 2020 is a
11 little bit closer and now I think we can start talking
12 about the goals that stretch beyond 2020 like the
13 gentleman from SMUD was talking about.

14 I just want to say a couple more things which
15 is there was also a question to the panel about what
16 sorts of additional programs might be necessary. I think
17 from the very helpful chart here from the PUC you can
18 see if we are serious about increasing the amount of
19 distributed generation after 12,000 megawatts - whether
20 it's by 2020, or before 2020, or after 2020 - we are
21 going to need more programs, I think, to the extent that
22 we are going to have greater procurement programs, we
23 should integrate those into other planning processes and
24 the barriers that the folks at PG&E and others were
25 talking about but also build on the successes of the

1 existing programs. Some of these programs are really
2 quite successful. Some of them are just getting
3 started, the reverse auction mechanism is a really
4 exciting program, I think, that a lot of folks in this
5 room and around the country are really excited about.
6 We should build on what we learn from those project
7 programs in order to increase the procurement side as
8 well.

9 I guess the last thing I'll say in summing up
10 is that these regional goals should be a starting place
11 for developing the right state goals because the whole
12 benefit of distributed generation is that it has local
13 benefits and reduces some of the both timing
14 considerations and the land use impacts. So to the
15 extent that we're developing a statewide goal we should
16 do some of that and use some of the analysis that's
17 already been done to build that goal from the bottom up
18 both in terms of timing and finality. With that, I will
19 leave it to the rest of the panel members. Thanks very
20 much.

21 CHAIRMAN WEISENMILLER: Yeah, Noah, thanks
22 very much. I have a couple of questions. Obviously
23 your colleagues Carl and Joanna really gave a lot of
24 thought as far as the ready process to environmental
25 screening of the larger scale projects. I don't know

1 how far you've gone in terms of thinking about similar
2 environmental screening or weighting factors for the
3 distributed projects.

4 MR. LONG: My understanding is that the ready
5 process didn't go as far into that. They did take a
6 little look, and Carl mentioned this to me, how long it
7 would take to meet 33 percent through the CSI and I
8 think it was something like 100 years. I guess our view
9 is that a lot of those screening process--screens should
10 probably be the same. As far as larger projects, there
11 may be system benefits but, like I said, a lot of 20
12 megawatt projects can end up taking up the same amount
13 of land and have the same conflict. Potential land
14 conflicts of a large project. And also that's true as
15 far as where it's located. Being on the distribution
16 grid may imply being closer to load but doesn't
17 necessarily imply less land use conflict.

18 CHAIRMAN WEISENMILLER: Exactly. In that
19 context I think there's a lot of emphasis and I think
20 Carl and Joanna are using disturbed land and so the
21 question in part is how much should we be focusing on
22 disturbed land as opposed to, say, rooftops.

23 MR. LONG: Right. And I would say in either
24 of those before places that are not (indiscernible).
25 And I think that has to be part of a bottom up analysis.

1 And you know some of that analysis has happened at the
2 PUC and I believe here as well to look at where are the
3 rooftops, how much rooftops are we talking about. And
4 then if you screen that by integration requirements of
5 the circuits that they will be going on to I think that
6 has a pretty big limiting factor, at least on the low
7 cost, low hanging fruit DG. Going on to disturbed lands
8 increases the amount of total megawatts we can put on
9 considerably but even still 12, 000 megawatts is a lot
10 and it's going to take up a lot of space. So I don't
11 think that we can assume it will all be rooftop and
12 disturbed land. And I think, as a result, we're going
13 to want to start taking a serious look in the beginning
14 at the kinds of environmental screens that we want to
15 make sure that we're locating with the lowest impact.

16 CHAIRMAN WEISENMILLER: Exactly. So I guess
17 part of the question is trying to make sure that somehow
18 we tee up the activity to come up with the environmental
19 screens as early as possible opposed to say the permit
20 processes are wrapping up to a decision and somehow
21 discovering as you said location really matter.

22 MR. LONG: Right. Thanks.

23 CHAIRMAN WEISENMILLER: Next.

24 MS. RAITT: Nicole?

25 MS. CAPRETZ: My name is Nicole Capretz. I'm

1 with the Environmental Health Coalition. And first we
2 just want to thank the Commission and the Governor's
3 Office for giving our communities a voice and as
4 importantly giving us a seat at the table.

5 I do have a quick PowerPoint. I'm going to
6 kind of digress away from the high-level technical
7 conversation and just kind of focus in what's happening
8 on the ground in our communities just so we can see how
9 people are being directly impacted by these programs.
10 Next slide please.

11 Environmental Health is a 30 year old
12 grassroots based organization in San Diego. We build
13 grassroots campaigns to improve the health of children,
14 family, neighborhoods and the natural environment in San
15 Diego and the Tijuana region. We are also part of a
16 statewide coalition called CEJA, California
17 Environmental Justice Alliance; we are a coalition of
18 base building organizations and there's six of us kind
19 of representing different geographic areas of the state
20 from North to South to inland. And kind of one of our
21 biggest success stories thus far is the, we believe, is
22 a really instrumental role we played in defeating Prop
23 23. We contacted, along with environmental justice
24 organizations, over 250,000 people of color. As
25 everybody knows, the people of color vote was truly

1 instrumental vote was truly instrumental in defeating
2 Prop 23.

3 So needless to say our communities are really
4 excited about the opportunities that are presented by
5 distributed generation but what's really pivotal for us
6 is making sure that we develop programs and policies
7 that integrate our community members.

8 So just quickly, next slide, I'm doing my
9 presentation in tandem with Bill Gallegos, who's also a
10 member of CEJA's Communities for Better Environments.
11 I'm going to quickly go over what's at stake for our
12 communities in these programs, what's the solutions and
13 then I have a quick video of some of our community
14 members because, again, we really wanted to drive it
15 down to the ground and the perspective of people who are
16 living in communities that often don't get the benefits
17 in these new technologies.

18 So what's at stake? As most of you know our
19 communities, unfortunately, by income level alone are
20 surrounded by a lot of polluting activities, freeways,
21 oil refineries, diesel equipment, buses, trucks, they
22 have high asthma rates, high poverty levels and high
23 unemployment which obviously is being exacerbated by the
24 current economic situation. And again, I'm from San
25 Diego, so just looking at San Diego numbers we have 10

1 percent unemployment, in our communities it's 16-20
2 percent. Our community members, frankly to the
3 Commissioners, are really counting on you. They really,
4 really are counting on you to be a voice for them and to
5 make sure that they're needs and opportunities are
6 considered. And unfortunately, the future doesn't look
7 any better for the communities that we serve.
8 Obviously, we have all the existing conditions but
9 report after report repeats and reminds us that things—
10 the communities that we serve are going to suffer the
11 worst impacts from climate change. We really have to
12 equip our community members to be prepared.

13 And so really quickly, obviously some of the
14 impacts are the heat island effect because there's not a
15 lot of green canopy. What you see is a lot of concrete
16 and asphalt which just exacerbates when heat waves start
17 coming in, next slide—

18 Lack of air conditioning, the cost of air
19 conditioning, lack of transportation, increased air
20 pollution and higher asthma rates. So there's a lot at
21 stake here and so again that's kind of way we appreciate
22 the opportunity to be here.

23 So the solution is really investment, it's
24 investment. Clean energy investment in our economy, our
25 communities and what jobs we can bring into our

1 communities. I mean it's interesting to sit here and
2 hear all the utilities about all the barriers and all of
3 the costs, but the question from our communities is:
4 "What's the cost of not doing this? "What's the cost of
5 not investing in communities in rarely get investment?"
6 And so that's the frame we're coming from when we hear
7 those conversations. Because, look, the benefit of if
8 we do invest in these communities in terms of cleaning
9 the air, providing jobs, making their homes healthy and
10 a lot of the intangibles of neighborhood revitalization
11 and just feeling control over their future. Having
12 control over their energy sources. And bringing money
13 into the community, often these communities see a lot of
14 money going out and obviously that's true for most of us
15 as ratepayers that we don't generate our own source of
16 energy so we spend a lot of money on assets outside of
17 our region. But what are the possibilities? Like what
18 is the vision that could occur if we actually started
19 investing in these communities? So we kind of are
20 hoping that the utilities take a wider frame as they're
21 evaluating where they're going to be investing their
22 distributed generation resources.

23 And I don't want to suggest that there's
24 nothing going on because there have been a lot of
25 training programs even in our communities and we are

1 grateful for that because of the stimulus package. So
2 we have a lot of trained workers but here's the really
3 disheartening part, because I actually speak at one of
4 the training programs, is that there are no jobs. So
5 here we have some of these community members that are
6 very excited and really feeling like this is a new
7 opportunity but then they get trained and they have
8 nowhere to go. And I think there's nothing more
9 demoralizing than getting someone's hopes up and kind of
10 having them dashed.

11 So again, trained workers but few jobs. Solar
12 is still not accessible to a majority of low and I would
13 even say low-moderate income residences. And the
14 utilities—I want to more speak for my experience from
15 San Diego, from our experience still going for larger
16 scale solar. We're still not seeing investment in our
17 communities even if there's some distributed generation
18 resources that are going in San Diego County they're not
19 going into the communities we serve.

20 And then here's just a map. It's a map that I
21 use often in San Diego to kind of capture what's
22 happening. We have SDG&E's renewable energy which one
23 percent is in our county and I don't know how much
24 percent of that is even in the communities we serve. I
25 know they're trying to improve on that but we still have

1 a major imbalance and we'd like to help change that.

2 And then this next slide kind of captures
3 where all the solar is in San Diego and the darker the
4 area on the map, the more solar they have. Our
5 communities are outlined in green so that's the kind of
6 light shade of yellow which again reinforces the trend
7 that solar distributed generation is not being invested
8 in the lower income communities.

9 And then finally this is just a quote. We're
10 surrounded by freeways, our children have asthma, invest
11 in redevelopment to clean up our community. And so to
12 just drive that point home we did interview a few of our
13 community's members.

14 (VIDEO SHOWN)

15 MS. CAPRETZ: That's it, thank you.

16 CHAIRMAN WEISENMILLER: Thank you very much
17 for coming today and also for pulling together the
18 videos for us. Obviously, a lot of hearings we look at
19 sort of the technical side of stuff in terms of grid
20 interconnection, or we look at the program side of
21 stuff. It's always good to have more connection into
22 the communities that are affected by our energy choices.

23 I think in terms of a couple of follow-ups,
24 one thing I was going to suggest if you get a chance to
25 talk to Jeanne Clinton. I know that PUC has a low

1 income component to the CSI Program, one they're
2 certainly trying to extend and expand and certainly
3 there may be ways that that program can reach out to
4 your community.

5 The other thing that I was trying to figure
6 out was, in the connect of the early 2000s period, San
7 Diego communities under SANDAG had pulled together a
8 community plan for energy and part of the question is
9 it's probably time to revisit that and look at it more
10 in terms of merging distributed gen and how that can fit
11 in. I'd certainly encourage you with Jim and everyone
12 as you're taking the plan flight home to sort of
13 continue the dialog from today and figure out what is
14 the plan for San Diego. Obviously we're trying to move
15 forward but I think, as Michael Picker indicated, it's
16 sort of good not to just have the top down but much more
17 the community-based planning and so we can try to
18 connect those through this process but certainly trying
19 to move forward on that would help.

20 MS. CAPRETZ: Yeah, I appreciate that.

21 CHAIRMAN WEISENMILLER: And just finally, just
22 to flow everyone, one of the things that'd be good
23 following up on Noah's suggestion community wise where
24 you prefer not to have these admittedly cleaner
25 technologies but still all energy production that

1 involve some environmental impacts. So trying to figure
2 out how, again, during this screening upfront so we're
3 not marching down the road and we've reached a number of
4 dead ends.

5 MS. CAPRETZ: Great, thank you. We're
6 fortunate because the author of the Community Power
7 Board is here, Bill Powers. And the only downside to
8 the low income program of CSI and you know there's a lot
9 of great aspects about it but you do need to be a
10 homeowner. So unfortunately for a lot of our community
11 members that leaves them out. It is a great program.

12 COMMISSIONER PETERMAN: Nicole? Following up
13 on Chair Weisenmiller comments regarding preferred
14 locations for the DG. I'd also be interested in having
15 more information about fossil fuel generation in your
16 communities relative to the larger utility service area.
17 Thanks.

18 MR. GALLEGOS: Good morning. My name is Bill
19 Gallegos. I'm from Communities for a Better
20 Environment. We're a statewide environmental justice
21 organization and we're part of the California Justice
22 Alliance. I noticed that so far only Nicole and I are
23 smiling. I have to say that when we start talking to
24 our community member about this possibility for
25 distributed generation they kind of respond out of feign

1 or the name of the great Etta James song "At Last"
2 because it seems like now there's an opportunity to get
3 something very, very positive from our energy
4 infrastructure because pretty much they feel like
5 they've had the consequences of--the negative
6 consequences of our fossil fuel infrastructure. So this
7 is something that's really right on-time and it has a
8 number of wins for everyone, improving our air quality,
9 healthy economic growth which we desperately need as
10 Nicole pointed out in her presentation. Our communities
11 were in recession before there was a recession and now
12 it's been doubled up. So there's a very, very serious
13 situation in which we not only have wealth lost with
14 high mortgage foreclosures, small business failure, high
15 unemployment rates. People are just getting hammered
16 and they feel like they need a lifeline and I think
17 we're here to say that--and I think on behalf of the
18 California Environmental Justice Alliance, we want to
19 work with you on designing this project so it really has
20 a benefit for the communities most in need and the state
21 as a whole.

22 And I'm also not going to go on the technical
23 side because that's not my area of expertise but we want
24 to share some recommendations that we hope will be
25 considered as you're designing this program.

1 First of all, I think, we want to be certain
2 that 12,000 megawatts really means 12,000 megawatts.
3 The goal of this program, as conceived by Governor
4 Brown, as described by the overview of this workshop is
5 to develop "a renewable strategic plan to identity
6 challenges and strategies to achieving Governor Brown's
7 Clean Energy Jobs Plans Goal of adding 20,000 megawatts
8 of renewable generating capacity to the California
9 system." We would disagree with folks from the
10 utilities who say that we should not have a clear target
11 with clear timelines. We think there should be a
12 definite target of 2020 is a good one. There was quite
13 a bit of thought that went into the consideration of the
14 RPS bill was being considered and we think that we need
15 a program with firm targets, not soft targets that will
16 never be achieved because that's the unfortunate history
17 with our previous efforts of achieving renewable energy.

18 Secondly, we should acknowledge the 12,000
19 megawatts of renewable generating capacity is reasonable
20 and doable. We already have 6,000 megawatts of
21 distributed generation programs and this is a solid
22 foundation so let's build upon it. California has
23 wisely decided that we need to increase our renewable
24 portfolio standard to 33 percent and if we are
25 thoughtful and creative we can achieve this ambitious

1 goal through the development of a range of solar
2 technologies - solar, wind and fuel cells.
3 Technological developments make our task reasonable,
4 affordable and feasible.

5 And thirdly, let's make sure to get things
6 right. We must design a program that products genuine
7 renewable distributed generation. For instance the
8 program would get off to the entirely wrong foot, in our
9 opinion, if the state adopts the utility proposal to
10 include the combined heat and power as a renewable. CHP
11 targets currently being considered would take up nearly
12 all of the remaining capacity above the 6,000 existing
13 renewable DG programs. So let's keep our eyes on the
14 prize and not exclude renewables from the governor's
15 increased target. Furthermore we need to ensure that
16 most of our renewable portfolio benefits local
17 communities and is not primarily located in remote sites
18 that require the construction of expensive and wasteful
19 transmission projects. We should create a program that
20 emphasizes small scale renewables so that benefits
21 accrued to our poor, inner-city and rural communities.

22 Concretely, we recommend that two-thirds of
23 this new project be established and commercial and
24 residential buildings or parking lots and one-third from
25 ground-mounted locations. By the way this is completely

1 in-line with the recent recommendations from the LA
2 Business Council, one of our nontraditional allies.
3 And, of course, we will need to create policy mechanisms
4 to make small scale work which include revamping the
5 California Solar Initiative to capture more low income
6 homes and adopt a feed-in tariff that can make small
7 scale projects affordable and effective. And I would
8 say that if we're going to think out of the box, let's
9 really think of something that I know never gets
10 considered and I know is a huge challenge we should
11 think about when we talk about needs based. Let's
12 retire these old facilities. They're poisoning our
13 communities. They cause enormous health problems.
14 They're inefficient. They're wasteful. So let's see if
15 we can connect these two things - the building of this
16 new infrastructure with getting rid of the old one.

17 Fourth, we need to establish a fair allocation
18 of regional targets, if we do so we will be assured that
19 all parts of the state will benefit, not simply our
20 wealthiest communities. Actually the Governor's
21 proposed allocation seems like a good initial estimate.
22 But the current gross estimate megawatt targets are too
23 general to make certain that we meet the social,
24 economic and environmental justice goals that should be
25 central to this program. Let's not make the same

1 mistakes that we made with the CSI program which really
2 marginalized those concerns.

3 Fifth, community participation is essential to
4 the success of this program. You can see from Nicole's
5 video, and we can make that video in every low income
6 community in California, folks want to participate.
7 They want to help make this happen. We would like to
8 see a robust community participation component to help
9 make sure that local distributed generation really is
10 constructed and that these projects are in accordance
11 with the real needs of each community. We would like to
12 see the Commission take the lead in designing this
13 program and we would recommend that the Governor, who's
14 an activist, play an active role in ensuring that the
15 PUC carries out its implementation as intended.

16 Sixth, we recognize the technical challenges
17 to increasing renewable distributed generation and we
18 are fully aware that utility companies always insist
19 that it cannot be done and we heard that this morning,
20 just one barrier after another. We disagree with this
21 pessimistic and even self-serving assessment. I can
22 assure you that the environmental justice community is
23 in this process for the long haul and we want to work
24 with the CEC in this to help address the technical and
25 institutional challenges in a way that improves

1 reliability, minimizes cost and protects the
2 environment. We can do it. Energy storage, demand
3 controls that other feasible measures which we will be
4 glad to share with the Commission, can reduce the need
5 for fossil fuel and increase the potential for
6 integrating renewable distributed generation. This is
7 what California needs. It's what the planet needs and
8 it is what our communities need.

9 And I want to just close by saying that the
10 farm workers movement created a phrase that captures
11 this optimistic spirit better than any other - Sí, se
12 puede.

13 CHAIRMAN WEISENMILLER: Thank you for your
14 comments. And thank you for participating today.
15 Certainly, we're hoping that this, again, kicks off the
16 dialogue both here and in the communities.

17 MR. GALLEGOS: And as our former Governor
18 said, we'll be back.

19 CHAIRMAN WEISENMILLER: Next?

20 MR. POWERS: Thank you. Bill Powers,
21 independent energy consultant, San Diego. Thank you for
22 inviting me to be here. I am going to say a few
23 positive words about rooftop solar.

24 First, I'd like to see who has solar on their
25 rooftop? Good, that's a good sign. And I want to thank

1 the Governor's Office for allocating 2,000 megawatts of
2 distributed renewables to San Diego. I'm sure that
3 SDG&E shares my excitement about that allocation. I do
4 though want to point out the Governor's office to again
5 recognize Jim's statement this isn't happening in a
6 vacuum. For example, in San Diego we do have a two
7 million dollar transmission line that has been permitted
8 and approved under the idea that we will be bringing our
9 solar energy in from afar. I do disagree though that
10 it's a done deal. There was an adjunction meeting on a
11 transmission line on Monday that's been postponed so we
12 don't know where that's going to go. But the argument
13 that has been raised is one that I had not heard before.
14 Because we have a transmission project in the works,
15 this cannot happen, that we cannot do this level of
16 distributed generation in San Diego or in another
17 situation, I suppose, where we have this. I think that
18 this is really the ball game and the Governor's Office
19 should be aware of that. I'm glad we're having this
20 discussion.

21 The comment about the PUC and the Re-DEC
22 process is one of the options that were looked at which
23 is called the High DG option, 15,000 megawatts of
24 distributed PV instead of essentially all of the solar
25 coming in from remote utility scale sites on

1 transmission lines and one of the—it's striking to look
2 at the graphics for that because what disappears are the
3 transmission lines. And so that's really a lot of what
4 we're talking about.

5 It looks like I may have been the only one who
6 went through the questions that Heather asked so I will,
7 since I did that, now go through this.

8 First off, the suggested methodology for
9 interim and regional targets. A great document that has
10 come out of the utilities and they did it jointly, PG&E,
11 SCE and SDG&E, was The Energy Efficiency Strategic Plan.
12 That plan has very ambitious targets for energy
13 efficiency and for photovoltaics in California we
14 identify rooftop solar as energy efficiency measure.
15 Number one in the energy action plan. And that document
16 does include targets for existing residential and
17 existing commercial. And I did run the numbers which I
18 show on the answer to the first question. And based on
19 my calculations if we do what we say we're going to do,
20 and this isn't just a guidelines this is approved rule
21 making at the PUC, we will need to put in somewhere
22 between 12 and 15,000 megawatts of PV on rooftops to
23 fulfill our obligation to the Energy Efficiency
24 Strategic Plan.

25 And I disagree that rooftop solar, even on

1 residential rooftops, is more expensive than business as
2 usual. All of the residential IOU customers who are
3 using a considerable amount of electricity pay in the
4 range of 30 cents per kilowatt hour or more for a
5 significant amount of the photovoltaic electricity that
6 they use. Those, again, running the numbers on the
7 quantity of these so-called tier three customers that
8 are paying 30 cents a kilowatt hour or more, we can put
9 in approximately 12,000 megawatts of PV over the next
10 ten years and that would essentially push out these high
11 tiered customers and that is cost effective today to do
12 that on residential rooftops.

13 The other issue that Lawrence Berkeley
14 National Labs came up with a report a month ago where
15 they pointed out the obvious. You invest 15 or 20,000
16 dollars in a solar system on your home, the next day
17 that home is worth 15 to 20,000 dollars more money and
18 that one of the unfortunate developments in Berkeley
19 they developed a Property Assessed Clean Energy That
20 Pays program, great program, got stalled for reasons
21 that are still unclear. But one of the issues is that
22 the lender couldn't recover the money from the use for
23 this PV system if the house had to be sold under
24 unfavorable conditions. But the fact that the home's
25 value increases at least on par with the PV that went

1 into it is a critical piece of information.

2 Getting to Number Two, Rule 21 restriction on
3 DG inflows, the KEMA report on what's going on in
4 Germany, I thought was exactly on point. The Germans
5 are doing what we said we'd be doing here years ago. In
6 fact, the California Energy Commission in the 2007 IEPR
7 said given that the utilities are spending two-thirds of
8 their capital budgets on the distribution systems, on
9 upgrades and new substations, everyone of those upgrades
10 at substations should be to make those substations smart
11 grid compatible, which means the flow can go both ways.
12 We don't need Rule 21 anymore. Those substations can
13 handle flows, they're monitoring the flows, they're
14 monitoring inverters, they know what's happening. And
15 that's what's going on in Germany. I think that the SEC
16 representative was exactly right. Yes, the utilities
17 need to know where the DG is coming from. They need to
18 monitor it in real time. They need to have the
19 capability to shut it down, if they have to in an
20 emergency for perturbation but that is relatively easy
21 to do and we just need to do it instead of continuing to
22 talk about doing it.

23 CHAIRMAN WEISENMILLER: Bill, one thing.
24 Given the time, I think you can assume we're going to
25 read all the comments so if you can hit the high points

1 that would be great.

2 MR. POWERS: The third high point is that we
3 talked about the cost of this. We don't know the cost
4 of the alternatives. We don't know what the cost of the
5 contracts are for the big solar. We don't know what the
6 contract costs are for the gas turbines. We do know
7 based on Green Rush that was produced by the DRA, that
8 we're now six billion dollars over what's called the
9 above market funds. We have to have transparency in
10 these contract costs or we can't really say whether or
11 not one option is more cost effective than another.

12 One thing, I think, that we also need is I
13 don't see us getting very far if the utilities retained
14 administrative responsibility for either energy
15 efficiency programs or for feed-in tariff programs.
16 That simply has not worked. It is not moving forward.
17 The utilities are signing contracts for utility scaled
18 solar at above market rates, I think at PG&E that 77
19 percent of their contracts are above market rates yet
20 we're holding CHP. We're holding PV to 10 cents less
21 per kilowatt hour and that, just in my professional
22 opinion, the value to the utilities the so-called
23 avoided cost to PV is at least 20 cents a kilowatt hour.
24 If we are designing our feed-in tariff programs like the
25 LA Business Council program in that range, we will have

1 a dramatic expansion of PV. If we hold these feed-in
2 tariff rates at 10 cents a kilowatt hour we will get no
3 PV out of these programs.

4 And to conclude, what I'd like to do if we can
5 go to the next slide, is what I would like California to
6 be in 2020 is what Germany is in 2011. This is a
7 download that I did Friday and the slide that is the
8 first slide shows a yellow crown. Well that's the
9 Germany electricity demand on Friday and noon to 1
10 o'clock they were getting 22 percent of their entire
11 electricity supply from primarily rooftop PV. That day
12 it was not a perfectly clear day in Germany. This slide
13 to the right is showing an orange swath in Western
14 Germany as cloud cover. And down below, what I found
15 striking about the German data, is what I think is
16 exactly what happens in California on summer days. We
17 don't have clouds in the load centers so we get all the
18 solar that we have installed when we need it, which is
19 during the top 100, 200 hours of peak demand. What we
20 don't get is the wind power. Germany has twice as much
21 wind power as they have solar. And this is not to
22 scale, the lower right is the wind power. Twenty-seven
23 thousand megawatts of wind power but less than a
24 thousand at peak on this particular day. This isn't
25 definitive for all days in Germany. That is the value

1 proposition. When the solar is in, you don't need gas
2 turbines to back it up. It will provide reliable power
3 and at least the reliability of the peaking gas turbine.
4 But if you're relying heavily on wind power you need to
5 back it up. I think that one thing that will hopefully
6 come out of this discussion is coherent loading order
7 for renewable energy. Why we do what we do for economic
8 reasons. Thank you.

9 CHAIRMAN WEISENMILLER: Bill, couple of
10 questions. If you look back at Nicole's slide on the
11 sort of area, where she's trying to focus at least some
12 development, do you have a sense of in a community what
13 are the best--in her community what are the best
14 locations for the distributed gen?

15 MR. POWERS: In very low?

16 CHAIRMAN WEISENMILLER: Yes.

17 MR. POWERS: Commissioner, I don't have
18 specific locations but again to commend SDG&E they
19 headed an excellent effort five years ago to inventory
20 every rooftop with a GIS system to partition the solar.
21 I don't see that neighborhood as that different from
22 some other mixed industrial residential. There are
23 plenty of good commercial rooftops on a smaller scale in
24 National City. There are also some substantial parking
25 lots. It also goes right down to the water. And so, as

1 I recall, there are some pretty good sized parking lots.
2 I would expect the split to be maybe a third
3 residential, two-thirds commercial rooftop parking lot.

4 CHAIRMAN WEISENMILLER: Okay. I guess the
5 last question is that you talked about peakers and the
6 one issue for San Diego is a lot of the power comes in
7 on SWIPL and can be knocked out or can be knocked out by
8 fires. And so the question is assuming that we lose one
9 of those line after midnight, how would you back that up
10 at this stage to do the 1,000 megawatts in 10 minutes?

11 MR. POWERS: You actually bring up a wonderful
12 question about utility planning. What has happened in
13 the last 25 years is that we have gone transmission
14 heavy and generation light. And one of the reasons we
15 got into trouble in 2007 during the fires and those
16 transmission lines were cut, and that was happening
17 during the day as well as during the evening, is that we
18 did not have enough local generation of any kind to
19 cover us at a time of modest load. So it's not so much
20 of an issue of PV. The solar coming from the desert
21 isn't going to be there at night either so it's not a
22 question of whether it's PV in the desert or PV in San
23 Diego. It's a question of not having enough load in San
24 Diego of any kind to cover us in times of emergencies.

25 CHAIRMAN WEISENMILLER: Any questions?

1 MR. POWERS: I should say generation of load.

2 CHAIRMAN WEISENMILLER: Mary, go ahead.

3 MS. LESLIE: Yes. Thank you. My name is Mary
4 Leslie. I'm President of the Los Angeles Business
5 Council and I'd like to thank the Commission for
6 inviting me here today. Heather, I feel like I owe you
7 answers to your questions specifically.

8 But meanwhile, I'd like to share with you some
9 of the research that we've done and the policy
10 recommendations we're making at the local level. We're
11 also working with Michael Picker on the goals he's
12 assigned us. Those aggressive goals for the City and
13 County of Los Angeles because we think that a lot of the
14 work we've done has regional application.

15 To begin with I should say the Los Angeles
16 Business Council is a group of predominantly industrial,
17 commercial, retail owners of property citywide in Los
18 Angeles. They're large owners. But we also represent a
19 lot of large non-profits like hospitals and schools.
20 And we've done a lot of work with LA USD, LA CCD and our
21 major universities. With that those are the different
22 hats that I have on. We've also done a lot of work in
23 the affordable housing area for years on workforce
24 housing issues. That becomes relevant in a minute when
25 we talk about our solar rooftop potential.

1 We started really the last eight or nine years
2 really working with our then new Mayor with some really
3 aggressive clean energy goals. And then got really
4 involved in establishing some green building codes and
5 energy efficiency. We see that as the first line of
6 defense on all of the things you're trying to
7 accomplish.

8 However, our Mayor almost two years ago issued
9 the LA solar energy plan. I don't know if you've seen
10 it but it represents a vision for over a gigawatt of
11 solar energy for LA from the Department of Water and
12 Power. And in it, it contains 150 megawatts of solar
13 FIT. We really as a business group tracking these
14 issues had no idea what a solar feed-in tariff was and
15 whether or not that we would be interested in it. So we
16 engaged in some research and we found that the Energy
17 Commission had done a study in '08--back in November '08
18 encouraging that if you were interested in a solar feed-
19 in tariff, I think Karen might have been there when this
20 was occurring, Commissioner Douglas, that you had to go
21 through kind of a rigorous investigation of how to
22 develop an indigenous feed-in tariff based on what was
23 going on in your community. The KEMA report that you
24 issued, we actually used it as an outline, I don't know
25 if people tell you that, we actually did. And the

1 reason we did was because it was really difficult
2 getting at the data sources that we needed to make a
3 decision. So we also entered into a partnership with
4 our university, with University-UCLA and their public
5 policy school and we engaged an economist to work with
6 us because the key to the feed-in tariff is of course
7 what you're going to pay. In addition to what the
8 availability was and at what price you could deliver it.

9 So we did many studies, actually three last
10 year. We did the first one on what the design of the
11 feed-in tariff would look like which we can make
12 available to you all. Then what the price would be
13 based on the design and the availability of our rooftop
14 space. Just this year, we went a little bit deeper and
15 engaged another university, USC this time with UCLA, to
16 take a look at the equity issues around solar. Because
17 it became very apparent to us because solar was for
18 something that people owned and then other people were
19 not participating in the program. So we were very
20 interested in that. We were also very interested in
21 that from the perspective of a gigawatt and a half solar
22 rooftop potential we saw on multi-family rooftops,
23 apartment buildings. That got into the work we did on
24 workforce housing.

25 We have a new study, we just released it,

1 called Making a Market regarding these issues. And this
2 research is really pretty interesting. Unfortunately, I
3 don't have the slides for it but I can send them to you.
4 What it shows is that some of the best rooftop potential
5 in the City of LA is in the lowest income areas. And
6 that starts to make sense to you because if you think
7 about it, in LA 1.7 million of residents are renters and
8 they live in about 96 percent of the apartment buildings
9 are for renters. Much of which is low income and they
10 have the largest, biggest flat roofs. Wealthier people
11 tend to live in condos that have smaller roofs, with
12 less solar potential. So, this is a very interesting
13 study because it says four places in LA really work -
14 central LA, Korea Town, Westlake and the Valley. So
15 it's a very nice distribution as well for our city.

16 So with that, I'd like to turn to for a
17 minute, and excuse the presentation of this because we
18 are partnered with academics so you'll still see it says
19 teach, so you'll see that the way this is structured is
20 posing a question and then answering it. The motivation
21 for us, I should say as well, is really the economic
22 development implications of this policy because we are a
23 business group. We wanted to know whether or not if
24 this was an opportunity for businesses to invest.
25 Another way to meet energy efficiency goals, Bill I

1 liked what you said that these are inner energy
2 efficiency goals. And then, as I said, what policy
3 could we be advocating for that could make a difference
4 in LA.

5 So with that, I don't really need to go
6 through the basics with this group. You know what a
7 feed-in tariff is. Next. Next. And we are always
8 explaining what a feed-in tariff is, we really don't
9 like the name. In fact, we have gone to Clean Energy
10 Solar for the Ground because we did a lot of research.
11 We actually commissioned a poll by Richard Mullen that
12 looked at what the support for a solar policy would be
13 in LA and were ratepayers willing to pay more. And by
14 the way, 80 percent of LA Angelinos are willing to pay
15 more, up to one dollar more a month which is really
16 important data we think for our council people who will
17 help decide.

18 So here's the solar feed-in tarfff. You know,
19 basically you have the ability now to generate energy
20 off your rooftop and sell it back directly to the grid
21 at a price. Next.

22 We also have to explain it relative to what
23 net metering is because of course we always have a very
24 large net metering program in Los Angeles. What we like
25 best about the FIT is that it allows you to maximize

1 your rooftop potential. You don't just put up as much
2 solar as you need, right. You actually expand to how
3 much solar you're capable of. Next. Next.

4 We looked at the benefits of the FIT because
5 we wanted to see whether this was really worthwhile as a
6 policy objective in LA. We think there's tremendous
7 economic development benefits in terms of investments.
8 Thanks to the federal tax credits there is much to be
9 gained, and we'll show you the numbers later, in
10 addition to we made a commitment to a clean tech
11 corridor and clean tech in Los Angeles to grow our
12 economy. We're at 15 percent unemployment right now.
13 It represents billions in new investment. It represents
14 an ability for people trained in our communities to have
15 jobs. It helps us meet our RPS goals. It reduces our
16 outer basin transmission requirements and cost. Next.

17 In terms of the local development and the job
18 creation. This is something that's really discussed a
19 lot in Los Angeles. How do you know that people are
20 actually going to get these jobs. So we spent some time
21 on what these solar job chain looks like and so this is
22 just identifying all the sorts of jobs, and for most of
23 our analysis we don't even count the manufacturing jobs
24 because we're not counting on those. We're assuming PV
25 is going to be purchased elsewhere. So we're really

1 just focusing on the construction, installation and what
2 little maintenance there is of the systems. Next.

3 In Los Angeles, where we came down with UCLA
4 is that our criteria for solar feed-in tariff program is
5 that it would be cost effective and provide a savings
6 over time. As we've discussed today here already is
7 what will ratepayers be willing to pay and can you show
8 that renewable programs can be cost effective. The
9 magic number for us was 600 megawatts. That's 600
10 megawatts over a 10 year program which is really, of
11 course, a 30 year program. That's where you can say the
12 program is cost-effective and provides a savings over
13 time and that will show you how we got to that. But
14 meanwhile, we live in a political world of what can we
15 do that and when can we do it first. The Mayor's
16 initial program of a gigawatt of solar, the 150
17 megawatts of solar feed-in tariff can be done without
18 any grid upgrades. So this is something that our
19 Department of Water and Power can do now. We've been
20 using that number. We've also been using that number
21 relative to the federal tax credits that run out in 2016
22 because we want to maximize the federal tax credits. So
23 you can see that we designed a program that incentivizes
24 at different program levels different costs, and I'll
25 show you those. We also designed a program that really

1 will emphasize large commercial, industrial and multi-
2 family apartment buildings with much less emphasis on
3 residential homes which is really covered under SIP and
4 CSI. We also are advocating that we get the program
5 going now, this year. We don't really want to—we've
6 been discussing this program for two years. We would
7 like a program up and running this year, which I think
8 we have now both the leadership in the Council and the
9 Mayor agreeing to this would be SB 32. That's the
10 program that we're—which will be our pre-program pilot.

11 You can see here on the 150 megawatt program
12 what the implications are - private investment would be
13 over 500 million. That we would reevaluate the program
14 every one to two years to reset the price. That the
15 program would need to have an easy application process.
16 We did an analysis of all the solar FIT programs in
17 North America for best practices that we can also share
18 with you. The simple application, the transparent fare
19 and the timely manner in which the program is
20 administered is critical. We know that there will be
21 over 4,500 direct jobs created from a program like this.
22 And we know that we'll reduce, at least, 2.2 million
23 metric tons of CO2. This will also power over 34,000
24 homes in Los Angeles, just 150 megawatt program by 2016.
25 Next.

1 One of our major investment groups did the
2 analysis on the 600 megawatt program over 10 years and,
3 again, this shows you the solar chain. And it also
4 shows you where the investment is. So from an economic
5 development standpoint, this is a multi-billion dollar
6 program to the City of Los Angeles. It would not be
7 insignificant. Next.

8 We did an analysis of the different systems at
9 the different levels and what the tariff level would
10 need to be. There's a lot of data behind this work.
11 What we came up with is that 19 cents is kind of a magic
12 number. That 19 cents is starting to be a number we
13 think that will really incentivize the large scale roofs
14 and the large multi-family rooftops, that we can do both
15 at this number. Next.

16 As I said before, in addition to the federal
17 tax credits, you have the depreciation as well and then
18 many of these projects we're talking about would be in
19 an enterprise zones so you get an additional 10 percent.
20 So you could almost have 50 percent of your solar
21 installation paid for if you do this in a timely manner.
22 I would encourage timeliness from an economic
23 development standpoint is to be noted here. Next.

24 I think I've reviewed all the reasons why we
25 think that this is a good idea. Now the multi-family

1 housing this is really the surprise of the initial
2 studies of last year. Just how large this is of a
3 sector and how many people you can reach. So we started
4 to analyze the different ways this is presented. And of
5 course is the CPUC areas, you have programs like MASH
6 and Virtual Net Metering. These are programs we do not
7 have in the municipal areas. We wish we had these
8 programs in the municipal area. We are working with our
9 department on ideas on how to do this. I think that
10 there is an interest in seeing how they could do this,
11 particularly in the pre-pilot program. Next.

12 Okay. The physical potential. We worked with
13 the County of Los Angeles, with the GIS mapping, we ran
14 it through the parcel tax, we know the age, we know a
15 lot about these buildings. We know that there's 19
16 gigawatts of solar potential in LA County, which is a
17 huge amount of potential. We know the way it's
18 distributed by the different utility districts. This is
19 what you'll see up here. Edison having the lion's
20 share, Department of Water and Power having half as much
21 and then Vernon and the others having less. Next.

22 We know in the City of LA that over 2
23 gigawatts is commercial and industrial. Almost 1.7,
24 1,700 megawatts is single family, 1,400 is multi-family
25 and then 156 megawatts of government non-profit. Next.

1 The mapping is interesting for the county.
2 There are very easy ways to determine where the optimum
3 areas are. Next.

4 We started to overlay them with the economic
5 development maps. You can see the enterprise zones on
6 top of where the solar rooftops potential is. Next.

7 We've broken it down by our council districts.
8 Each of our council people know where their best solar
9 potential is, their largest projects. With this, it
10 actually tells you for LA what I said earlier. That the
11 Valley, the San Fernando Valley in Los Angeles, and the
12 downtown and along the Alameda Corridor are all rich
13 areas for solar. Next.

14 We did an analysis of the tariff pricing where
15 we would reach grid parity on the costs. Our initial
16 analysis was around nine years depending on at any given
17 time what was going on with natural gas and other
18 sources this number moves. But the fact that you can
19 get to parity is what's important. Next.

20 We looked at the ratepayer impact. You can
21 see here that initially you pay more but that over time
22 you pay less. So from the ratepayer's perspective this
23 is a much better deal than what has potentially be
24 represented to them. We've had a lot of great
25 conversations in Los Angeles and all of them associated

1 with renewables have been negative. Particularly the
2 ones we had last year over the ECAP increase. I don't
3 know if any of you followed it in Los Angeles but it was
4 pretty horrendous. It was almost as if all renewables
5 were responsible for all increases so that was
6 unfortunate. But through education, we can explain this
7 over time that this is not true and that this can
8 actually be beneficial to you over time. Next.

9 As I said before, this is the impact to the
10 ratepayer. Obviously, not everyone will solar so some
11 people will be paying into a program that they may or
12 may not be using. However, Angelinos who like solar,
13 which 80 percent do, are willing to pay more even if
14 they don't personally benefit from it. We're very happy
15 with that outcome. Next.

16 I'm not going to belabor these but these are
17 actually cost analysis by the size of systems. We do do
18 this because it explains to owners how it would work.
19 Next.

20 This is a large commercial system. Next.

21 As you can see the price of installation—and
22 as you can see, these are high. These were done over a
23 year ago. All of these numbers are actually all lower
24 now. But you can see that this system will pay for
25 itself and actually payback. Next.

1 This is a smaller commercial system, same
2 thing. Next.

3 And then this is the coalition that we formed
4 that is extremely diverse in businesses, educational,
5 environmental, labor and also elected officials that are
6 supporting our 150 megawatt feed-in tariff program and
7 600 megawatts in our IRP, our long term IRP, by 2020.
8 And then our shorter term goal of having a program, the
9 SB 32 program up and running this year.

10 Okay. Thank you.

11 CHAIRMAN WEISENMILLER: I guess the question I
12 was going to ask you was that my impression was that LA
13 had suspended this whole program due to great
14 popularity. You want to discuss that?

15 MS. LESLIE: Our CSI program? Or SIP program.

16 CHAIRMAN WEISENMILLER: Yes.

17 MS. LESLIE: They've suspended it for 90 days
18 because they were so oversubscribed. They have 50
19 kilowatts of solar currently committed. What they did
20 is they let the program run but without payment. So you
21 were notified that if you wanted to have the solar
22 incentive, you would be given it, but you wouldn't be
23 paid back for 1-5 years. Something to that effect. So
24 that is the SIP program in Los Angeles and it is
25 oversubscribed.

1 CHAIRMAN WEISENMILLER: Next, Heather.

2 COMMISSIONER PETERMAN: I just wanted to make
3 one extra point. In your written comments, it would be
4 nice to see more detail on the 12 kilowatt residential
5 system, where there's not a separate slide for in the
6 presentation. Thanks.

7 MS. SANDERS: Good morning. My name is
8 Heather Sanders. I'm with the California Independent
9 System Operator. We're responsible for the reliable
10 cost-effective operation of the transmission system. So
11 I appreciate the opportunity to come and provide our
12 perspective on distributed generation.

13 Wow. What a great time to be in this
14 industry. I really enjoyed hearing all the different
15 perspectives. As Noah pointed it, it's important for us
16 to think about the kinds of benefits that we could get.
17 You know, contributing to the 33 percent renewables
18 goals. The expectation about reducing environmental
19 impact. Creating jobs and enabling the consumer to take
20 an active role in managing their costs.

21 And as we work together to achieve this, and I
22 think we need to, because we all depend on where we are
23 bring a unique perspective. We need to take a
24 deliberate approach. We need to respect the
25 constraints. And we need to seek to, and I think we'd

1 all agree to this, in putting this out there we need to
2 seek to maximize the distributed generation that we get.
3 We don't have to compromise reliability. I mean the
4 worst possible case is that we put it all out there and
5 it doesn't get us what we expect.

6 Finally, we do this in the most cost-effective
7 way possible. And I think each person that has spoken
8 with has given some ideas about how to do that. If we
9 think about that priority, maximizing output, reducing
10 environmental impact, not compromising reliability and
11 minimizing cost we could get incentives created or
12 adjusted that would align with us. There's additional
13 benefits in taking a prioritized approach in that we
14 learn as we go. We need to understand, this is complex,
15 this changes how we've done this in the past. I think
16 several people have talked about that and so we need to
17 think about how we're going to get the information from
18 these entities, do we need control, how are we going to
19 back them up. It is a local problem as well. Michael
20 Picker picked out a number of things in looking at this
21 problem.

22 I've heard a lot about location and if we want
23 to maximize the output of this generation location does
24 matter. So what information do we need to think about
25 those goals? One of things is that there's a lot of

1 information out there about solar irradiance, where's
2 the best place to put these things. There's also, I
3 would expect, some information about environmental
4 impacts where again, locationally, would the least
5 impact be.

6 The component that the ISO can contribute to
7 the most is the cost. There are a lot of costs
8 associated with doing this and this has been hit on as
9 well by different entities. Maintaining the reliability
10 and trying to minimize cost are very interrelated. We
11 can all think about that this system was designed in a
12 particular way that didn't have local generation so we
13 can—it makes sense that upgrades are going to be
14 required once we do this. I think we all understand
15 that. And I think it's important that we all understand
16 the components of that upgrade. From a system operator
17 perspective, and I'll talk a lot more about this in the
18 second panel when we talk about the technical
19 considerations, but from a system operator perspective,
20 we need to make sure that we know where this is, how
21 it's going to impact the system, we can see it, we can
22 dispatch it. And then, also, how it feeds back into the
23 transmission system.

24 One of the things that's interesting about
25 this is that we have a lot of places that we can put it,

1 we have to update the distribution systems to support
2 it. But then this generation's coming back on the
3 system in a way that it wasn't designed for or is
4 expected. We also have a lot of renewable generation
5 coming on to the bulk transmission system. We need to
6 understand where this is coming, it's going to change
7 the power flows on the system especially in areas of
8 significant constraints right now, we need to understand
9 that component along with this. It's all connected.

10 Just my thought it, as Jim Shetler pointed
11 out, there's got to be a way that with the knowledge of
12 where the best solar places are, minimizing
13 environmental impact, and then also input from the
14 distribution system owners and operators from an upgrade
15 cost perspective. We could prioritize our approach to
16 this. It sounds like SMUD has done this a bit in their
17 first round of this. What we really want to avoid,
18 again, as I said is a scenario where we do contribute to
19 the 33 percent, we minimize environmental impact, we
20 allow customers to participate in lowering their energy
21 costs only to increase that delivery component so much
22 and also increase the overall system cost in terms of
23 operating reserve and load following and backup
24 generation that has to be there to ensure reliability.
25 So this is something that as a system operator we look

1 at when we're doing studies looking at the transmission
2 planning side.

3 Again, the distributed generation changes
4 where the source of our energy comes from. We will
5 need, as we do on the transmission system, the ability
6 to know where these are, forecast for them, understand
7 for them, adjust our reserve requirements for them, to
8 make sure in the event that there are clouds. Or again
9 there are technical challenges. The way that the
10 inverters are set up now that is if you have a fault on
11 the system all of those inverters are currently,
12 according to standards, supposed to switch off. If you
13 have 12,000 megawatts of distributed generation of PV or
14 8,000 or whatever it is and it all goes away at once,
15 that all has to be replaced. Depending on where it is
16 it can cause—a fault on a distribution system can
17 cascade all the way back up to the transmission system.
18 Thinking about all of these things together, where's the
19 best place from a solar perspective, minimizing
20 environmental impacts, and then also understanding all
21 those different cost components. It's not a simple
22 answer. I think that with the people that we have here
23 we can put those things together and get to an organized
24 approach. Most of what I've said here has already been
25 said. I'll talk a lot more about the technical aspects

1 in the other panel but I just really appreciate the
2 opportunity to be here and talk about it from a
3 transmission system operator perspective.

4 CHAIRMAN WEISENMILLER: Well, thank you very
5 much for attending. I'd like to again thank the panel
6 and remind everyone that we do need comments followed
7 along Heather's questions. And certainly as part of
8 that, encourage people to file comments reflecting on
9 the panel discussion today. If we had more time, I
10 would do a round robin but we really have to move on to
11 the KEMA speaker who has limited time available. I do
12 want to leave time for public comment.

13 MS. KOROSSEC: Yes, given the shortage of seats
14 in the room I suggest the panel go ahead and stay where
15 you are for now. So next we have Christian Hewicker
16 from KEMA.

17 MR. HEWICKER: Good morning. Although from my
18 side, it's getting close to 9 p.m. but I hope I won't
19 fall asleep during the next half an hour or so. I will
20 try to give you a bit of overview of the more technical
21 aspects of the situation with regards to renewable or
22 distributed renewables in Germany and Spain, in
23 particular.

24 Maybe just a few brief comments on the front.
25 First of all, my main responsibility within Europe is to

1 lead our European activities in the areas of market
2 regulations and most of my work is actually related to
3 the market design of issues around scarce electricity
4 markets however much of my work is also related to the
5 technical aspects with regard to network operation and
6 system operation but obviously for this work we work
7 with a number of colleagues from Germany and Spain. If
8 you have any more detailed questions afterwards, I hope
9 that I will be able to respond to them but please do
10 take into account that I'm not a day-to-day network
11 planner or system dispatcher.

12 Also since we just the comments from the
13 California ISO, I briefly wanted to point out that we
14 are here and very thankful for the invitation not only
15 by the California Energy Commission but also by the
16 California Independent System Operator because actually
17 the work we've done was done jointly with both
18 institutions.

19 Now let's me see. Did I get it started? Yep.
20 So I will effectively comment on a few of the pages and
21 try to give you a bit of the story before then focusing
22 on some of the major conclusions afterwards.

23 Just as a background, just an overview, as I
24 said that we're going to speak about Germany and Spain
25 today so two of the larger countries are you can see

1 here not only in terms of geography but also in terms of
2 population and load growth. So in total, they've got
3 something like 130 gigawatts capacity, Germany being
4 significantly larger than Spain. But what is quite
5 important afterwards, once we talk about system operator
6 reserves, I mean both of these countries are fairly
7 large. Spain is electrically just about the same size
8 as California. Germany is obviously significantly
9 larger. But the two of them are part of the UCTE, which
10 is the interconnected power system in continental Europe
11 and often one of the largest interconnected systems in
12 the world. So just the two systems together are just
13 about a third of UCTE. This actually means that both of
14 them are integrated at a very large interconnected
15 synchronized power system which obviously makes a lot of
16 things in terms of system control and frequency control
17 a lot easier than a smaller system. So for instance if
18 you compare to the situation of the U.K. or Great
19 Britain and the all Irish market and island systems,
20 they obviously much quicker faced with certain issues
21 which also do appear in Spain or Germany but which are
22 not yet as prevalent there.

23 Also to just give you an indication,
24 unfortunately for some reason we didn't manage to put up
25 the numbers here, but just to give you an indication

1 here for Spain we are talking about a system of round
2 about 90 gigawatts of installed capacity with a peak
3 load of 50 gigawatts. The bar on the right hand side,
4 you can see, the green part the renewables, or the new
5 renewables as this would say excluding traditional hydro
6 that is about 25 gigawatts including 20 gigawatts of
7 wind and almost 5 gigawatts of solar. This is more than
8 50 percent capacity wise of Spanish peak load. In
9 Germany you can also see there is some 50 gigawatts of
10 renewables by now, largely 30 gigawatts of wind or by
11 now actually more. We are getting closer to 20
12 gigawatts of solar. You're obviously talking here today
13 about the 12 gigawatts of renewables goal by 2020 or
14 let's say in this decade. Now just about a month ago,
15 the German Renewables Energy Act had its 10th anniversary
16 and so effectively what you can see on the right-hand
17 side that capacity was more or less all built in the
18 last 10 years. Very few of this was available 10 years
19 ago. It was mentioned before that much of this was wind
20 but for instance if you take a look at Germany's 18
21 gigawatts of capacity which we are approaching to at the
22 moment, most of this actually was built in the last two
23 to three years. You can really see the way you design
24 the feed-in tariffs and the way that they are structured
25 and all the feed-in tariffs but also interconnection

1 issues. This can really lead to an explosion of the
2 development. There's a number of other countries like
3 for instance the Czech Republic which is a smaller
4 country of something like 6-8 million people. Just two
5 years ago after they set the feed-in tariffs too high
6 within one year they had more than 1,500 megawatts of
7 capacity so they very rapidly scratched the regime
8 because they thought it was just too costly and we've
9 seen some of these things happen in other European
10 countries.

11 Another brief comment on the similarities and
12 differences between these two European countries,
13 Germany and Spain on the one side, and California on the
14 other side. I don't want to go into the details about
15 all the different voltage levels but you can see by and
16 large they are more than comparable between Germany,
17 Spain and California. Obviously the individual nominal
18 voltages are slightly different. You can also obviously
19 see that fences in California seem to have far more
20 voltage levels especially at the medium voltage level.
21 This used to be the same in Germany but, for instance,
22 over the last 10-20 years the German utilities have
23 spent a lot in standardizing it and phasing out some of
24 these voltage levels. What, however, you can see that
25 probably on average we are more using slightly higher

1 voltage levels instead of the medium voltage levels than
2 what is obviously prevalent here.

3 And when we talk about distributed generation
4 it varies a bit by the different countries but in
5 general what you can say in Europe when we talk about
6 distributed generation is everything that is connected
7 by distribution or more specifically medium and low
8 voltage networks. Take into account that for instance
9 in Germany the high voltage networks are considered to
10 be part of distribution as well.

11 Now a little bit more technical background on
12 just comparison between Europe on the one side and
13 California on the other side. These are just two
14 typical network designs of medium voltage networks in
15 Germany. I don't want to go into detail. They
16 obviously look slightly different whether in Germany,
17 whether you're in rural areas or urban areas. They also
18 look different in Spain. The basic principle and that
19 is as far as I know the same in California that
20 sometimes they are quite often operated in a radar
21 manner or simply they are almost stretched in a way that
22 you do have closed loops so that you can always ensure
23 your supply from two different points so that you abide
24 by the N-1 principle and that you can assure very high
25 reliability. This more or less is the same between all

1 through countries but it is different at the low voltage
2 level.

3 In this case if you take a look at California,
4 Spain and the rural parts of Germany you, by and large,
5 have radial networks so which means that every customer
6 only have a single connection to the grid. If this
7 connection fails, not only the connection but also the
8 line to the next transformer point, if this one fails
9 you're out of power. But if you go into the urban areas
10 in Germany you can actually supply a large part of the
11 population. This also includes some semi-urban areas
12 and also the larger villages, etc. Then typically you
13 still find some sort of true meshed low voltage so which
14 means the in the urban areas, where most of the
15 population is living, you still have alternative
16 supplies for customers which is one of the factors
17 explaining on one hand higher grid costs but also
18 explaining like why German for instance from a European
19 perspective has one of the highest reliability—let's say
20 network reliabilities compared to other countries. For
21 instance, if you compare Germany to Spain German
22 customers are used to a much higher reliability than
23 Spanish customers. This is obviously one of the reasons
24 but it also comes back when you talk about distributed
25 generation that obviously you have more flexibility in

1 the system and it's also more powerful.

2 Another important difference is that

3 throughout Europe, that applies to all the countries,

4 definitely Spain and Germany that even the low voltage

5 connections are full three-face circuits. We typically

6 have the three-face circuits with or without a neutral

7 face down to the individual customer connections. So

8 for instance at my home today, I have a standard three-

9 face connection, I actually have it within my own house,

10 and it's even the same if you go to rural areas. I

11 know, for instance, that summer cottages in the former

12 Soviet Union also they do have the three-face

13 connection. I know that this is an important different

14 to some parts of the U.S., including California, that

15 quite often you only have a single face connection of

16 the individual houses.

17 Now taking into account that you have

18 relatively strong networks, despite the massive growth

19 of renewables over the past 10 years that has only been

20 a limited amount of problems of distribution level.

21 However, you also need to consider that the countries

22 have applied to different principles opposed just to

23 that one. So for instance in Germany, you very seldom

24 have problems so far in the urban areas. But there are

25 two reasons for that. On the one hand, the urban areas

1 or the urban networks are quite strong and on the other
2 hand, well so far, most of the renewables used to be
3 wind and we hardly have any wind in the cities. By now
4 it has started with solar but once again with solar most
5 of the development so far has been in the rural areas,
6 most importantly in the South and most importantly it
7 has been a program for farmers. If you travel through
8 Southern Germany today you see solar PV panels more or
9 less on every second farm, every second house in the
10 small villages but you see very few of them in the
11 villages.

12 That is one reason. On the other hand if you
13 go to the rural areas, and in particular with the recent
14 growth of solar PV, there have been more and more
15 problems in rural areas in particular with voltage
16 limits which have required sometimes quick upgrades or
17 most importantly, let's say that you just need to
18 relocate the location of the interconnection point of
19 the DG. It was mentioned here before that you could,
20 for instance, just interconnect them to the next
21 customer point instead of the direct service point for a
22 customer. Or let's say to the next higher voltage
23 level. That is actually being done as a standard
24 procedure in Germany. The only thing that you need to
25 consider here that is being done in practice but because

1 of the legal arrangements it doesn't really matter for
2 the customer is if you want to connect distributed
3 generation to the network, by law, you only pay the
4 effective or virtual cost to the closest point of common
5 coupling which would theoretically be the closet point.
6 However, if, for whatever reasons you need to reconnect
7 it to a point that is further away this obviously needs
8 to be done but then the corresponding costs are being
9 socialized so the distribution company has to pay for
10 these costs and then they are passed on to the
11 distribution tariffs.

12 There's a different approach or a different
13 approach has to be taken in Spain. In Spain the
14 utilities have been a lot more powerful. I would say
15 that the politicians have not been as strong so they
16 haven't put in place a number of constraints on the
17 amount of distributed generation that can be connected
18 to any individual circuit or to any individual
19 transformer which means that quite often in Spain it is
20 not possible for a developer to directly connect to the
21 closest point of common coupling but they have to go to
22 a more distant point or to the next highest voltage
23 level. So that in Spain, in contrast to Germany, the
24 costs are actually moved to the developers and are not
25 socialized. This has a twofold effect. First of all

1 it's more attractive let's say from this perspective for
2 developers to move these things or let's say there's
3 less risk involved with investing into renewable
4 generation in Germany. On the other hand also it has
5 helped Spain to avoid problems with back feed. So Spain
6 has almost no back feed issues in her distribution
7 networks.

8 If you go to Germany, the situation is quite
9 different. We have voltage issues in rural areas and
10 rural networks. That's one thing utilities are
11 struggling with. I'll come back to that later on in
12 terms of system operation. We also see more and more of
13 a trend toward back feed and it started actually at the
14 high voltage and medium voltage level and right now it's
15 going more and more. Let's say the low voltage
16 networks, in principle, this can be resolved through the
17 use of four-quadrant relays. I've heard this mentioned
18 here. Quite often they are already in place there
19 today. Sometimes they still need to be installed. What
20 was actually interesting for me to hear that this was
21 being considered as part of smart grids from a
22 California perspective. From a German perspective, we
23 would never think about this being part of smart grid.
24 This is just standard traditional protection equipment.
25 I mean that are just slightly different traditions on

1 practices but what we see more and more that all these
2 transformers needs to be replaced and this really moves
3 up to the transmission levels offenses in the Northeast
4 of Germany 50 hertz. The transmission operator of that
5 region, I think in about one-third of the network design
6 of the transmission transformer is being determined by
7 renewable back feed instead of by supply to load.

8 I already mentioned that everybody let's say
9 that renewables have priorities or even guaranteed
10 access so the grid and this isn't only for the initial
11 interconnection, it's also for feeding in. It actually
12 comes back from the European Directives, one European
13 Directive from 2009, which mandated—made it mandatory
14 all across Europe. It used to be the case in Germany
15 and Spain before. Renewables distributed generation has
16 a right to be connected but they also have the right to
17 feed into the network. Now again, you have a slight
18 difference between the two countries. So for instance
19 in Germany, I've already mentioned the cost of
20 interconnection but for instance you can be curtailed by
21 the DSO, by the distribution system operator of the
22 distribution company. But even in that case, they can
23 only do it if they've taken all possible measures on the
24 network side on the market side, and if they can't avoid
25 it, they're allowed to curtail you but they still have

1 to pay for the energy. So effectively, as an operator
2 of renewable generation you don't face any financial
3 risks again as these are socialized.

4 In Spain, it's bit different. In these cases,
5 there's also some remuneration but in Spain it's easier
6 for the network operators to curtail renewable
7 generation in generally including distributed
8 generation.

9 Now having said all of that it looks quite
10 optimistic and it's fairly easy to integrate renewables
11 into the system however this is more or less the status
12 where we are now today. Looking forward into the
13 future, we do see these investments will need to be
14 done. These are just two examples from Germany from two
15 recent studies. There was a high profile study done by
16 more or less the entire industry together with the
17 German Energy Agency and a number of German
18 universities, etc. last year which took a look at the
19 development mostly of wind and its impact on power
20 system or system operation transmission over the next 10
21 years. They estimated that in order to integrate wind
22 power, particularly offshore wind farms from the North
23 Sea and the Baltic Sea, into the system Germany would
24 need an additional 3,000 kilometers of new transmission
25 lines meaning effectively 400 KV lines at an annual cost

1 of about one billion Euros.

2 Just recently, I think, about a month ago the

3 German Energy Association published the draft of another

4 study which took a look not at transmission but at

5 distribution so the full report is not yet available but

6 they estimated that based on the future development of

7 solar PV, there's one governmental goal that says 30

8 gigawatts by 2020, there's another one which also is

9 included in our initial plan for the development of

10 renewable energies for the European Union which

11 specifics that we should have 52 gigawatts by 2020.

12 This is what resulted of some need for somewhere between

13 200 and 380,000 kilometers of new high voltage and

14 medium voltage lines that cost somewhere between 13 and

15 27 billion Euros so if you convert this into dollars it

16 costs somewhere between 20 and 40 billion dollars. So

17 even for a large country this is a significant amount of

18 money. Obviously, you should take into account in

19 particular for the distribution numbers these come from

20 the industry so they might may be biased on the high

21 side but in general there's quite of a lot of agreement

22 that we will need to invest a lot into our networks in

23 order to reinforce them if you really want to go for a

24 massive large scale and integration of distributed

25 generation.

1 So what you can say also to a certain extent
2 is that the easy part of it has already been done but
3 now we're increasingly getting into the more difficult
4 part of the transition.

5 Now turning away from the physical network
6 infrastructure from interconnection on system operations
7 so what have the Spanish and German TSLs taken. The
8 TSLs but also the distribution companies to facilitate
9 the integration of renewable distributed generation.
10 First of all, there are a lot of strict requirements for
11 remote control and / or monitoring either by the system
12 operators or by the distribution companies. So for
13 instance in Germany, all projects above 100 kilowatts
14 need to be equipped with remote control. This actually
15 applies for the distribution companies, so it's remote
16 control for the distribution company not by system
17 operator. While Spain has said that all projects above
18 10 megawatts have to have a direct control and direct
19 monitoring by the initial system operator.

20 Also, technical rules in recent years have
21 been adjusted to mandate fault-ride-through capabilities
22 for voltage control and to avoid voltage collapse or
23 let's say massive disconnection of small scale
24 distributed generation if there are voltage problems in
25 the grid. Initially, this started mainly with the wind

1 power plants at the higher voltage levels. These were
2 also supplemented by financial incentives. For
3 instance, two years ago the latest revision of our
4 Renewables Energy Act in Germany introduced a bonus for
5 renewable distributed generation effectively for wind
6 power and biomass plants which are able—you have fault-
7 ride-through capabilities and which are able to provide
8 corrective power control to the grid. Similar steps
9 were also taken in Spain but in that case only as a
10 transitional solution for old, existing wind power
11 plants that were investing to the plants to make them
12 capable of doing this. In Germany, actually, the trend
13 is already moving forward. Now just last month, the
14 requirements for the ability to provide directive power
15 control were rolled out to the medium voltage grids, so
16 since the first of April, this also is mandatory for all
17 new units that are to be connected to the medium voltage
18 grids and by summer, it is expected that similar rules
19 will also be enacted for the low voltage grids;
20 including the solar PV, fuel cells, etc. which means
21 that by then probably all units will give off something
22 like 13-14 kilowatts will have to be able to provide
23 directive power control however it was quite interesting
24 for me to see the numbers from LA. If you take a look
25 in Germany I would argue that probably 99 percent or 90

1 percent of the installations are more on the range of 4-
2 10 kilowatts. Presumably, even in the future, most of
3 the solar PV installations will not be bound by these
4 new rules.

5 Another area that (indiscernible) TSLs from
6 other countries have invested quite a lot within real-
7 time controls and in fact in Spain they're extremely
8 proud of their dedicated wind control center. The
9 national system is operated by the Spanish System
10 Operator (indiscernible). And actually what you can see
11 in these photographs on the right-hand side you see the
12 dedicated grid control center, CECRE, which is actually
13 used just for wind forecasting and for running
14 continuity real-time simulation of grid falls and
15 analyzing the impact on the grid. On the right-hand
16 side you see the traditional national control center for
17 the power system; that's located not in the same
18 building but relatively close to each other and are just
19 supporting each other. And besides this national
20 control center, Spain also has four regional control
21 centers which actually for the regional generation
22 distribution companies so they have a hierarchal
23 structure with all the wind power plants and all the
24 larger renewable generators above 10 megawatts being
25 directly connected to the regional control centers which

1 aggregate this information and provide it to the
2 national control center.

3 Now obviously, as I said here, they do a lot
4 of simulations, etc. amongst others to take a look at
5 the reserves and frequency of control which they need.
6 Again, if you compare it to the U.S. or to California
7 the basic principles are by and large comparable. It is
8 a big different. You also have frequency response. We
9 have regulation and load following which is actually a
10 single product for us. We also have operating reserves.
11 It also depends a bit on the market design. In Spain,
12 this is all being dealt with by the standard traditional
13 products and by the regular interlay market of a
14 mandatory pool. In Germany, where we have a financial
15 market with self-scheduling and self-dispatch of
16 generators so there's no centralized control by the
17 system operator. We only have reserves which are
18 procured on the day ahead or even advanced. Until last
19 year, the German system operators actually started to
20 procure a special product for wind reserves which was
21 for the timeframe of a few hours ahead. They are no
22 longer allowed to do this. The regulator has told them
23 that they must not do this. But now they have to
24 resolve all these issues at the interlay market of the
25 German Energy Exchange, the EX. What is quite

1 interesting, a number of studies in recent years that
2 took a look at the impact of renewable energies and
3 intermittent generation reserve requirements and
4 generally there was quite an expectation that we would
5 need significantly more reserves and frequency controls
6 in the years to come. So for instance, I think 4-5
7 years ago, there was another big study of the German
8 Energy Agency and based on those forecasts you could
9 estimate that by 2020 that Germany would need 5-10,000
10 megawatts of additional reserves to cope with all the
11 wind and limited amount of solar at that time. Now,
12 just in December they came up with a new study. The one
13 that I mentioned earlier which also took a look at
14 transmission expansion and in that one they came to the
15 conclusion that effectively we won't need any additional
16 reserves at all. It seems to be a miracle but the
17 explanation is quite easy because the only thing that
18 they really changed were the assumptions of the forecast
19 accuracy.

20 This actually comes back to the question of
21 renewable forecasts or forecasting wind and solar power.
22 What you can see in the top right is a figure from Spain
23 which shows the evolution of the—or the accuracy of wind
24 forecasts between 2008 and 2005. And also across the—
25 with the time horizons starting with one hour ahead time

1 forecast and up to 48 hour forecast. And what you can
2 see is that they have made massive improvements over the
3 recent years and have really been able to reduce
4 forecast errors significantly. If you take a look at
5 the German experience, it looks by and large similar.
6 If you express this in the RSME what you can see in the
7 table at the bottom is you see that we've got a standard
8 deviation of the error of less than 5 percent on the day
9 ahead, compared with something like 10-15 percent in
10 California. Now this looks like California is far worse
11 than Germany and Spain but to put this into perspective
12 if you go into the other European countries they are
13 also significantly worse than Germany and Spain which
14 are definitely the front runners. This definitely has
15 been a focus area of the system operators in both
16 countries and has helped them to make it a lot easier to
17 manage the system and to cope with all of these
18 challenges. More recently, the German TSLs have started
19 to invest more and more into solar power forecast and
20 since April this year, the regulator could not mandate
21 it but it has been something like a very strong
22 recommendation for distribution networks to provide also
23 similar forecasts for the regional and local
24 distribution systems to the TSLs. By now if you go to
25 the national scale of the solar power forecast has just

1 about the same forecast error, the same quality as wind
2 forecast. So this definitely has been one of the major
3 main levels in terms of measuring the whole thing.

4 Now just to summarize-taking a few-summarizing
5 a few of our observations and also some of the
6 conclusions which one may draw. I mean as I said,
7 distributed generation is not precisely defined in the
8 countries but loosely defined by just everything that is
9 connected to the medium voltage grids and below, so
10 something like 50-80 megawatts is a bit higher in
11 Germany than in Spain.

12 What we've seen so far is that network
13 planners have not been forced to really enhance the
14 networks dramatically as a result of the integration of
15 distributed generation. But the situation is slowly
16 starting to change, in particular in Germany. What they
17 need to do is that typically network planners always
18 need to take a global perspective. They do not only
19 take a look at the interconnection of renewables but
20 also of the future development of load and organization
21 and replacement of existing grids. In both countries,
22 these costs are more or less completely socialized. At
23 least if it's completely on the network's side from the
24 interconnection. If you go to Spain, as I mentioned
25 before, the network operators have before able to shift

1 the significantly larger cost to plant developers
2 meaning in those cases where they have forced plant
3 developers to relocate the interconnection point. Just
4 a side note this is one of the areas that is under
5 discussion in Spain.

6 Now in terms of the rules regarding
7 reliability, this is something that I can't really
8 assess myself so I have to believe my U.S. colleagues
9 but it appears to be the rules in Germany and Spain
10 arguably are at least as strict or perhaps even stricter
11 than in California so the national operators of Germany
12 and Spain do not accept any risk or reliability. You
13 can see here for instance in Germany for voltage
14 fluctuations of steady state, voltage extraction of only
15 2-3 percent are accepted. It used to be two percent.
16 Now, more recently, it has been increased to three
17 percent compared to five percent as I understand in Rule
18 21 here. And then as I also mentioned the four-quadrant
19 protection systems have more or less or are becoming
20 standard to German medium voltage substations and also
21 let's say high voltage substations in order to allow for
22 back feed conditions. So which is an important means of
23 allowing for the increased integration of renewables
24 into the distribution networks in Germany? This as we
25 thought, and have already heard today, would obviously

1 require some changes within California if you wanted to
2 do the same.

3 Now one thing also is that TSLs and system
4 operators in both countries have mandated a remote
5 control and metering either for, let's say, very small
6 systems of above 100 kilowatt or above 10 megawatts in
7 Spain. And then in both countries, network operators
8 are able to curtail renewables. If there are any grid
9 reliability issues, again, the detailed ones are a bit
10 different in Spain. They have a lot more discretion
11 whereas in Germany they have very strong level
12 restrictions. But on the other hand they can do it.
13 But they've spent a lot of effort in this area in order
14 to develop certain plans and policies, etc. so that they
15 can also enact it and that they don't run into any legal
16 liabilities here.

17 Then quite importantly besides the changes and
18 the investments on the physical infrastructure are
19 perhaps as least as important as have been the
20 investments and efforts in the development application
21 of improved analytical tools and better control systems,
22 most importantly in renewable forecasting but also what
23 we've seen first of all as a result of liberalization
24 but also increasingly in recent years that the system
25 operators are investing and are mandating dispatcher

1 training but not so much for training the dispatchers
2 for the daily duties on the job, that's one part of it,
3 but also increasingly the entity is out training between
4 different TSLs and system operators that work together
5 to be highly interconnected to European networks, but
6 also training the interaction between the system
7 operator, producers and distribution networks.

8 One thing that I have not covered so far which
9 is quite a lot in the discussion but which is not useful
10 for new or incendiary technologies like for instance
11 storage. Similar to the U.S., there's quite a bit of
12 discussion on it, partially in the political arena and
13 obviously in academics but so far this is not really
14 used at all and it's not being considered as an imminent
15 solution either in Germany or Spain. First of all
16 because we don't need it for other reliability issues
17 and the distribution grids and obviously because of the
18 related cost.

19 I hope that this was at least something like a
20 very quick tour through the experiences we've had and I
21 will be happy to answer some questions.

22 CHAIRMAN WEISENMILLER: Thank you very much.
23 A couple of questions. First in terms of looking, at
24 say Germany, what's been the range of hourly ramps up or
25 down?

1 MR. HEWICKER: I can't tell you off the top of
2 my head of the exact figures but if I'm not mistaken for
3 wind we are talking about something like, maximum, 10-20
4 percent of installed capacity. Solar is obviously a bit
5 quicker but with solar we've had less experience so far
6 and also we don't have so much visibility. Maybe one
7 thing that I forgot to mention was that last year we had
8 some cases that, due to the very rapid expansion of
9 solar, the system operators did not see what happened to
10 the distribution networks. For instance, last year what
11 is now Tenet or formerly Eon, at some point during the
12 year they had something like 6,000 of megawatts of
13 uncertainty due to solar PV. Due to forecast errors,
14 for instance, they were forecasting lots of sun the next
15 day but then there was lots of fog in the south of
16 Germany so there was very little output. And there were
17 few cases, for instance, in September because of such
18 errors where they had to use all operating reserves that
19 they had available just to compensate the forecast
20 errors. So this was one of the reasons for the
21 regulator to get involved, I think, in November last
22 year and to ask the distribution companies to come up
23 with better forecasting.

24 CHAIRMAN WEISENMILLER: And do you have over
25 generation problems or how deep of an over generation

1 problems could you have on some evenings?

2 MR. HEWICKER: You mean excess generation. So

3 far, typically not that much because I think the trough

4 load that we have in Germany is about 40-45 gigawatts.

5 Now what do you need to consider is that obviously we do

6 not only have the wind power but we also have nuclear

7 and quite a bit of lignite power plants which you also

8 can't switch off. There's one thing that makes life

9 easier for Germany that we are very, very well

10 interconnected with a number of other countries. The

11 Netherlands, for instance, in the West of us they are

12 fairly small but they have a similar problem but to the

13 South we have Austria and Spain which are very well

14 interconnected to the German market. These are

15 hydropower systems. So what you see actually that they

16 export to Germany during the day and they are importing

17 during the night. So, which has actually facilitated it

18 but we have increasingly come into such situations and

19 the Danish, who have actually had such problems for the

20 last six or seven years, they started with negative

21 prices a few years back. I think a few years ago

22 Germany made the same changes and in 2009--sorry, three

23 years ago, we had a number of instances where we had

24 negative prices on the market. Since then, producers

25 have learned how to react and more recently in 2010 I

1 think there were very few cases with very low negative
2 prices. So it doesn't occur very often.

3 CHAIRMAN WEISENMILLER: Okay. My last
4 question is here we look a lot at quote unquote smart
5 grid as one way of easing on the distribution of DG.
6 Have there been elements in the European systems of
7 making the grid quote unquote smarter? And if so, what
8 are the key ones?

9 MR. HEWICKER: Similar to the U.S., there's a
10 lot discussion about smart grids and there's lots of
11 policies about starting pilots, etc. Where the
12 discussion and the initiatives are focusing so far is on
13 smart metering but generally it is seen that smart
14 metering is not directly related or doesn't really, on
15 its own, help in facilitating the integration of
16 distributed generation because you also need to have the
17 other communication and etc. As far as I know, there
18 are slightly different perceptions on what a smart grid
19 is. For instance, we discussed about the protection
20 relays, etc. and remote control of distribution networks
21 and etc. Much of this is already standard in the German
22 and Spanish networks. This is not being considered
23 smart grid in Europe but it is more or less a common
24 practice. Lots of the discussions on smart grid really
25 focus on the decentralized control of load and

1 generation. So far little of this has been implemented;
2 it's all at the research site.

3 CHAIRMAN WEISENMILLER: Yeah, I was thinking
4 about my last question. How much demand response is
5 there in Europe, if any?

6 MR. HEWICKER: Depending on the countries, if
7 you go to Norway there's a lot but that's because they
8 have a large proportion of energy in terms of industry
9 and they also have all electric heating and direct
10 resistance heating. If you go to the other countries
11 like Germany and Spain, etc. there's very little demand
12 response. There is a little bit from more or less
13 historic times from electric night heaters and there's a
14 little bit from energy intensive industry. So for
15 instance, Belgium has done quite a bit. The Netherlands
16 and also in Germany a few industrial companies have
17 actually entered the, what we call, balancing market
18 which effectively is the market response services but I
19 would argue for Germany that that is probably less than--
20 the potential behind might be something more like a few
21 hundred megawatts. What's actually being offered to the
22 market is probably below 100 megawatts in Germany. If
23 you go to Belgium, which is a 14 gigawatts system, I
24 think they're contracted for something like 6-800
25 megawatts. But other than that so far there's also no

1 demand response.

2 CHAIRMAN WEISENMILLER: Okay. Thank you. No
3 questions. Thanks again. I think we need to move to
4 the public comment now. Thanks.

5 COMMISSIONER PETERMAN: Thank you.

6 MS. KOROSEC: I've only received two cards
7 from those who need to comments this morning that can't
8 wait until this afternoon, one in the room and one
9 online. In the room, Ed Murray.

10 MR. MURRAY: Good afternoon. Thank you
11 Chairman and panelists. I'm Ed Murray and I'm the
12 President of Aztec Solar, a local solar contractor and
13 also the Treasurer of the California Solar Energy
14 Industry's Association. I'm here today to talk about
15 solar with the big S, including solar thermal. We seem
16 to miss that all the time. It's kind of the fair haired
17 stepchild of solar. So what'd I'd like to do is talk
18 about it. And I represent solar thermal today.

19 Solar thermal includes water heatings, space
20 heatings and solar cooling. The advantages of solar
21 thermal is that there are no interconnection and
22 therefore no grid impact. There is no impact on
23 ratepayers individually as the rebates are spread out—or
24 the people pay for the systems when they install them.
25 Solar thermal reduces natural gas which unfortunately is

1 used to create electricity in these peak power plants
2 that we're hearing about will be using natural gas.
3 About 90 percent of the water heating in California is
4 heated by natural gas and so we can reduce that natural
5 gas.

6 Taking from Nicole's slide on PV, solar
7 thermal provides clean air by GHG mitigation, clean
8 infrastructure, certainly plenty of jobs, healthy homes
9 and money flowing into the community. Solar thermal is
10 significant also, and I'm surprised that Christian
11 didn't have it on his slides, it's significant in Europe
12 and Asia, and especially in Germany. There's quite a
13 bit of solar thermal there. It's truly the sleeping
14 giant and we would like to include it in the 12,000
15 megawatt program. Thank you.

16 CHAIRMAN WEISENMILLER: Thank you.

17 MS. KOROSSEC: All right. We do have one more
18 in the room. Bernadette Del Chiaro.

19 MS. DEL CHIARO: Thank you. My name is
20 Bernadette Del Chiaro. I'm the Director of Clean Energy
21 and Global Warming Programs with Environment California.
22 We're a citizen funded, statewide environmental advocacy
23 organization. I want to take a second to applaud
24 Governor Brown. I don't this has been said yet but for
25 having the guts and vision for putting out a big goal in

1 distributed generation. Usually when I'm in energy
2 forums like these, I'm the one person standing up and
3 saying "What about distributed generation?". Here the
4 whole day is on distributed generation so it is really
5 great to be here and I'd like to really applaud the
6 Governor for having that vision and putting that out
7 there. California is ready for this. We know the
8 public warmly embraces distributed solar power. As
9 Nicole mentioned, our community colleagues, our
10 technical schools, the workforce of California is
11 embracing clean energy. And our policy makers need to
12 catch up with the rest of the state.

13 So how do we do that? The question at hand,
14 one of the big ones for today is how do we develop the
15 planning, the regional targets and the goals. We think
16 12 gigawatts is more than doable and in fact it might
17 even be low for what California can do if we put our
18 mind to it and our policies to it. We think at least 50
19 percent of that goal needs to be on the customer side of
20 the meter. That California can support 6 gigawatts of
21 customer side solar distributed and other forms of
22 renewable distributed generation, especially if you
23 count the existing programs like the three megawatts
24 from the CSI. A quick note on that, CSI to date, our
25 analysis shows we're about 26 percent of the way toward

1 our goal. We're probably going to get there ahead of
2 schedule if we fix a couple of key things on the
3 industrial side. Prices have dropped within this
4 program 40 percent since it started. And we're likely
5 to see residential break even. The residential market
6 break even by 2015. And 30 percent of the country's
7 solar companies are located in California. On to the
8 jobs question, I just want to highlight the successes
9 we've seen so far on the customer side of the meter.
10 These kinds of companies employ about 30,000 people and
11 the solar industry roughly has doubled in size in
12 roughly the last three years. So, huge significant
13 progress on the customer side of the meter and there's
14 potential to do much more. If you take what we've
15 grown, the markets grown 40 percent in the past year, if
16 you assume we see a continued growth in the market
17 between now and 2020 we will easily install about five
18 gigawatts of customer side of the meter just solar PV.
19 And that's if we don't do any additional policies to
20 expand California's market, which we think we can do and
21 should do.

22 We should minimize utility owned distributed
23 generation. I think we've seen from the testimony this
24 morning from the utilities themselves, it is one of the
25 more expensive ways to go and a questionable program in

1 and of itself. At the very least, we need to have
2 greater transparency into those programs.

3 In terms of regional applications, there are
4 really some surprising leaders when you look at where
5 our actually market is today when it comes to
6 distributed generation. If you assume continued growth
7 in these regions that that growth is not going to slow
8 down. There's no reason to think that growth would slow
9 down in these hot regions. You would see, and going to
10 Heather's presentation, the areas that have the greatest
11 potential over 500 megawatts between now and 2020
12 actually are exceeding Los Angeles' so the South Bay,
13 the San Jose region, the Central Valley, Merced to
14 Bakersfield is an area of huge growth and huge
15 potential, Sacramento and north to Redding. The North
16 Valley as well. Marin Country and Sonoma Counties have
17 tremendous growth. Then San Diego. The inland desert
18 as well as the Bay Area proper, the East Bay and San
19 Francisco. Most of them all have greater than 500
20 megawatts of potential, if not more.

21 In closing, some key points. As we look to
22 move forward on the policy and the visioning process, we
23 need to priority customers out of the need to maximize
24 private investment and energy efficiency that comes
25 along with that. We need to include solar hot water

1 into our program. We need to look at retiring the old
2 power plants including the nuclear power plants that
3 will soon need to be retired once we hit the 2020 mark.
4 We need to include greater transparency and also
5 consistency. And one of the things that we should, as
6 policymakers in California, is have a consistent way of
7 analyzing the costs. Utilities often talk about the
8 cost of ratepayer impacts of these programs but never is
9 there a consistent way to look at the net benefits of
10 distributed generation and net costs. A buzz word that
11 was really popular about a year ago but I haven't heard
12 once today is the notion of building integrated
13 distributed generation. I realize that the building
14 market is somewhat at a standstill right now but it's
15 going to pick back up again and there's tremendous
16 potential to achieve cost reductions, efficiency
17 benefits as well as just a huge market that we need to
18 tap into. We need a medley of policies over across the
19 street in the StateHouse. It's often heard that there
20 are too many policies on distributed generation. We
21 need a one size fits all. I couldn't agree more with
22 that. We need a medley of policies that support that
23 variety of markets we have in California. We need to
24 expand net metering. We need to get SB32, the feed-in
25 tariff, off the ground. We need Los Angeles to get its

1 feed-in tariff off the ground. We need a whole host of
2 other policies to get moving so that we can get to this
3 12 megawatt and then some goal.

4 Last but not least, we need, in terms of our
5 key policy priorities and in terms of, Commissioner you
6 talked about environmental priorities, we need to have
7 that as one measure. Obviously, we've brought up
8 reliability, cost issues. One of the other things that
9 we need to keep in mind when we develop this policy is
10 that this is still an emerging market and we need to
11 keep that in mind as a policy priority, that we need
12 this market to get off its feet and sort of level the
13 playing field between distributed generation and other
14 renewables, as well as renewable energy compared to
15 fossil fuels. So with that, I'll leave the rest of my
16 comments in writing. Thank you very much for the
17 opportunity to say something today.

18 CHAIRMAN WEISENMILLER: Thank you. Thank you
19 very much for coming. We're running late.

20 MS. KOROSSEC: I actually have one more on the
21 phone. I'm sorry, Commissioner. Al Baez from South
22 Coast.

23 MR. BAEZ: Thank you, Char Weisenmiller and
24 Commission Board members. Good afternoon. This is Al
25 Baez. I'm with the South Coast Air Quality Management

1 District. As you might be aware, we just released an
2 RFP recently making \$30 million dollars in funding
3 available to cost-share the deployment of several
4 megawatts of in-basin renewable distributed generation
5 and energy storage to support electric transportation
6 technologies. Part of the success of this RFP for the
7 deployment of clean, renewable DG technologies depends,
8 to a large extent, on available SGIP incentives.
9 However, the current proposed levels are substantially
10 lower than previous levels in terms of the dollars per
11 watt. My question here is are there considerations for
12 possibly increasing these new proposed levels?

13 CHAIRMAN WEISENMILLER: Thank you for the
14 question. I actually was going to turn to each of my
15 fellow agencies on the panel and give them a response to
16 wrap up on about a minute levels so Jeanne do you want
17 to take the first response to that comment and any other
18 comments you want to use to summarize now.

19 MR. BAEZ: Thank you.

20 MS. CLINTON: Sure. I'll do this quickly
21 since I wasn't forewarned we would have a wrap-up
22 opportunity. To the question from the South Coast Air
23 Management District on the SGIP incentives, there is a
24 staff proposal up now following with legislation we were
25 directed to undertake two years ago to renew and revisit

1 the SGIP incentives. To make a long story short we've
2 proposed reducing the incentive levels while broadening
3 the range of eligible technologies and part of that is
4 motivated by the fact that we now have a legislative
5 sunset at the end of this calendar year for no more
6 collection for that program. So we are trying to spread
7 the available collection as far as possible. There is
8 legislation pending to extend the program but we have no
9 sense as to whether that will succeed or not. The
10 simple answer is the staff proposal is to reduce the
11 incentives for current levels based on quite a bit of
12 analysis.

13 I guess in a way of summation, I would say
14 that I think that a lot of folks here sound like we're
15 all on the same page. The devils always in the details
16 of trying to figure out how to do this integration and
17 how to do it in a sensible manner in terms of figuring
18 out the micro places in the grid where we can absorb DG
19 and also figuring out how to spread the costs. I
20 noticed the term in Europe is socializing the cost. We
21 do have to understand that there are costs and we do
22 need to, at least it appears that there are costs, maybe
23 this afternoon from the R&D Panel we'll hear that there
24 are breakthroughs where the costs can be minimized so
25 I'm hopeful in that regard.

1 The one other comment that I would make is
2 referring to some comments on multi-family housing
3 participation in the solar program. We do have set
4 aside for multi-family housing and also for low income
5 single family housing, it's roughly \$200 million dollars
6 that's been set aside. It's not insignificant but at
7 the higher levels that we're offering incentives for
8 solar for the low income housing it doesn't go very far.
9 It's not producing very many megawatts. We're open to
10 ideas on how to increase funding for CSI so that we can
11 expand that market and hopefully maybe in that
12 legislative session this year we'll have some progress
13 on that.

14 CHAIRMAN WEISENMILLER: Thanks Jeanne.
15 Heather, do you want to say any wrap up? Michael Picker
16 - Any wrap up? Okay. Anyone else on the panel want to
17 do a one minute wrap-up? Okay. Thanks again.

18 MS. KOROSEC: We'll return at 1:30. Thank
19 you.

20 [Session break. Group resumes at 1:35 p.m.]

21 MS. KOROSEC: All right. We're going to go ahead
22 and get started now. It looks like the room is a little
23 less full than it was. But just in case there's a need
24 for overflow, we do have a second room. We lost our
25 room across the way so it's up on the second floor up in

1 the second floor conference room. If you go up the
2 stairs and just go around to this side of the building,
3 there's a big fishbowl looking room and use in there.

4 So we're going to start up with our discussion
5 of European Experience in Degrading Large Amounts of DG
6 with Heather as our moderator.

7 MS. RAITT: All right. Thank you. If we
8 could hear from Jon Carruthers from PG&E that'd be
9 great.

10 MR. CARRUTHERS: Good afternoon. My name is
11 Jon Carruthers. I work for PG&E as an Electric Engineer
12 in San Francisco. I'm in the Electric Distribution
13 Planning and Engineering Organization. First, I'd like
14 to thank you for allowing us the opportunity to
15 participate in the panel. And I think it's great that
16 the CEC contracted with KEMA to look at the experiences
17 in Germany and Spain and start to get down to some of
18 the technical issues so we can understand and leverage
19 off of that kind of experience.

20 My comments don't focus on a particular level
21 of megawatt penetration at the distribution level but
22 rather, more generally, about high levels of penetration
23 on a distribution system. But whatever the state
24 ultimately decides, what the stakeholders ultimately
25 decide, with amount of penetration of DG, I hope that we

1 can continue to agree that we need to interconnect DG
2 safely and reliably, and safely for both the public and
3 the workers and DG installers and operators and
4 everything like that. And that we don't inadvertently
5 degrade power quality or power reliability. And we
6 should always be thinking about cost effectiveness.

7 The good news is that there are definitely
8 steps that we can take to integrate more DG into
9 distribution systems. The solutions identified by KEMA
10 in their report that are used in both Germany and Spain
11 are very similar if not identical to many of the
12 solutions engineers in California would use today to
13 integrate DG into our distribution systems. And then
14 there's some other elements that we could further look
15 forward to helping the integration of DG. Namely items
16 like smart grid, we talked about a little bit earlier,
17 smart grid technology like Volt/VAR optimization,
18 distribution management system programs. And then from
19 the DG vender side, things that we can consider from an
20 inverter based type, you know what kind of inverters are
21 they using, what features do they bring. One element
22 that came up in Christian's presentation was talking
23 about smart meters and the ability to how that might
24 facilitate integrating DG into distribution systems and
25 for the smart meters PG&E is installing we'll be able to

1 get voltage reads from them. I think it's the kind of
2 case where more information at a detailed level, as we
3 understand that and can synthesize it appropriately, I
4 think that might help us understand the distribution
5 system performance and be able to potentially integrate
6 some more DG into the system than we otherwise might
7 have if we did not have that kind of information. So I
8 think that's potentially useful.

9 Moving on to the questions that Heather posed
10 in her outline for the meeting today and specifically
11 the first question with respect to how distribution
12 systems are similar or different than from California.
13 There are certainly some similarities. And there are
14 certainly some things that rung a bell for me as I went
15 through the report that KEMA had prepared. Notably, the
16 distinction between urban and rural circuits and those
17 kind of characteristics that present themselves; like I
18 had mentioned previously, the technical options
19 available to engineers for dealing with distributed
20 generation interconnection or operational issues. And
21 also, at some point when you desire to integrate more
22 distribution generation into a distribution system,
23 there will, depending on the ultimate value selected,
24 there will be cost and they will be significant. When I
25 look at the number from the KEMA report of about, I

1 think it was about 200,000 kilometers of distribution
2 line that translates to 120,000 miles. PG&E's
3 distribution system, total line mileage, is 140,000
4 roughly, just trying to kind of put thing in perspective
5 in terms of size and thinking from that perspective.

6 In terms of the similarities. Yes, many of
7 the medium voltage levels are quite similar. At PG&E,
8 our primary voltage is 12KV. We have 21KV and we have 4
9 and 48KV that was mentioned in the KEMA report. What I
10 would have liked to see in the KEMA report is a better
11 breakdown of the voltages, how much, how prevalent.
12 Because as it's correctly pointed out in the report, the
13 level of voltage does have a significant factor on how
14 much distributed generation can be integrated into that
15 particular circuit. The other thing from the report
16 that I saw was a potentially big difference in really
17 how the low voltage networks work. PG&E, most utilities
18 I would venture to say in the United States, they're'
19 really single phase and they're smaller in nature; much
20 smaller in nature. I wasn't aware of how big the low
21 voltage networks in Germany and Spain could be until I
22 read this report. Transformer sizes for PG&E that would
23 serve low voltage networks would typically be 25, 50,
24 75, 100KVA single type phase transformers. At Germany
25 and Spain, based on the information in the report,

1 they're like 400KVA to 1,000KVA transformers with meshed
2 secondary in urban areas and they serve a lot of load.
3 That makes a very significant difference from those kind
4 of systems that might be installed behind the meter
5 feeding some commercial applications or specifically
6 residents and so on. That's a pretty significant
7 different.

8 As I mentioned before, at least at PG&E, we
9 certainly have a greater number of lower voltage, medium
10 voltage circuits in the 4KV and for that that means they
11 are less suitable for larger integration of distributed
12 generation.

13 Another difference and I'm not still sure how
14 much of an impact this is, in California the voltage
15 limits for providing service to customers are defined by
16 Rule 2 which is plus or minus five percent. As best as
17 I can tell from the KEMA report in Germany, Spain and
18 perhaps other parts of Europe as well, it's plus and
19 minus 10 percent. So they have a bigger bandwidth in
20 respect to the service voltage variations that customers
21 can receive. On the other side, in the KEMA second memo
22 report, they talk about the voltage rise allowable on
23 medium voltage circuits saying it's two percent. No
24 problem. I'd like to know more about how they're doing
25 that and also the driver behind what the report inferred

1 as a move from two to three percent, which in my mind
2 they're using a certain amount of their service voltage
3 bandwidth to define distribution voltage issues and
4 they're increasing it, I would anticipate that they're
5 increasing it, in some ways perhaps to facilitate more
6 DG. I think at the end of the day, I think that we have
7 to look at voltage standards, what's in California, I
8 think we have a little bit less elbow room of what to
9 work with from that perspective. The reference in
10 Christian's presentation with respect to the plus and
11 minus five percent at the point of common coupling,
12 knowing how things work in California, I've been
13 involved with various Rule 21 and distributed generation
14 working groups and this and that for awhile, I bet a
15 dime to a dollar that the plus or minus five percent
16 just purely came out of Rule 2. I don't think there's
17 any, to my knowledge, there's certainly a statewide
18 requirement in terms of a voltage rise allowable in
19 distribution—or what would be called medium voltage
20 circuits in Germany and Spain. So I think those are
21 kind of concerns.

22 Moving on to the question with respect to what
23 challenges have European countries encountered in
24 degrading DG. I think the challenges would be very
25 similar. I think it's really going to be primarily a

1 voltage issues. I think it's primarily going to be
2 getting through issues associated with volumes of DG on
3 distribution circuits and making sure that all the
4 inverters and technology work appropriately so that when
5 we have faults on the system they're cleared and can
6 then get back on in a reasonable amount of time. We do
7 not want, obviously, inadvertent 10:01:2 eyeletting or
8 anything like that. And I think the thermal loading
9 considerations and some of the other protection schemes
10 stuff, that seems pretty doable and we can work around
11 those items from a technical perspective ultimately.

12 But, from a technical perspective, after
13 reading through all the KEMA stuff, I would say that I
14 think that we're a little behind and I'm a little
15 concerned relative to where California's positioned with
16 technical requirements for connecting large amounts of
17 DG to distribution systems as compared to Germany. I
18 think that this is a consideration moving forward.

19 Finally, with respect to building out of a
20 distribution system what can we learn there. Again,
21 just to put it in perspective, when I first saw the
22 question I thought, "Oh, we're building out the
23 distribution system." I started thinking about the
24 infrastructure associated with the distribution system
25 and as I mentioned PG&E has about 140,000 line miles

1 with 800 substations and about 3,000 circuits. In any
2 one year, we might grow those numbers by about a percent
3 or two, if that. Some years less, some years more. So
4 the modifications in and of itself aren't going to come
5 through the distribution infrastructure but have to come
6 through other ways. I think one of those potential ways
7 is communications. We saw in the presentation from KEMA
8 in Germany 100KW and that was, as I understood it,
9 remote control from distribution system operators. And
10 then 10MW from Spain. I was kind of blown away by a
11 couple orders of magnitude in terms of the difference in
12 level of control. So that's really something that we're
13 going to have to think through because we're at levels
14 do we really need to have control at what makes economic
15 sense from that perspective. And, then again, moving
16 forward I think it's not so much a distribution
17 infrastructure question, at least as we move through
18 picking the low hanging fruit, as it will be like I said
19 communication, programs like volt/VAR optimization
20 software, inverter design and inverter types and then
21 also another factor would be electronic relays. At
22 least PG&E, they're still a lot of the old
23 electromechanical relays and that's not going to be
24 suitable for back feed operation to any significant
25 degree, that's for sure. And so that would have to

1 change as well. And that concludes my comments.

2 CHAIRMAN WEISENMILLER: Thank you. I guess
3 the one question that I have for you is that all the
4 utilities have their distribution systems which really
5 grew a lot in the 50's and 60's and so at this point,
6 probably since about 1998 or so, we've been going
7 through a massive reinvestment program. In a
8 distribution system do you have a sense of where you are
9 in those upgrades? Or what the average age of your
10 distribution system is, where we are in the upgrades and
11 how much, not responding to growth, but just replacing
12 the existing stuff to do that smartly.

13 MR. CARRUTHERS: In terms of age of system, I
14 would think that the relevant elements would be, when we
15 think about incorporating distributed generation, would
16 be line conductors, protective equipment and
17 transformers. And let's start at substation
18 transformers. Yeah, PG&E has replaced older
19 transformers over time but still the bulk of our system,
20 at the substation transformer level, is still probably
21 older than industry average. So that's where I put
22 that.

23 Line conductors I'm less concerned about that.

24 Moving on to the protective relay elements, I
25 don't have numbers in my head, but PG&E still has a

1 large number of electromechanical relays and at
2 substations we also have quite a bit of the electronic
3 relays as well. But there's still quite a few of the
4 electromechanical type and I could definitely wind up
5 seeing spending money there to accommodate DG on
6 distribution circuits depending on the volume, the
7 location and on distribution systems it's all about
8 location, location, location, volume, type of DG and so
9 on. The distribution system is a lot less homogenous
10 than the transmission system.

11 CHAIRMAN WEISENMILLER: And I assume, the
12 other dominant characteristics for PG&E and a lot of the
13 utilities, is that if you look across your system, say
14 San Francisco probably is very old vintage while if you
15 go out to the suburbs you might have much newer
16 circuits.

17 MR. CARRUTHERS: Oh, oh. Certainly. I think
18 we would generally would find in all the urban areas of
19 PG&E, whether they be in San Francisco, Oakland,
20 downtown San Jose, even the cities that line the Central
21 Valley from Stockton and Modesto, those systems that are
22 more urbaners would generally tend to be older. That
23 doesn't mean that they can't provide good service life
24 and that DG cannot interconnect with them but I would
25 anticipate that's where we would find most of the older

1 equipment. It's also, I would say, where we'd find most
2 of the lower voltage, medium voltage type circuit, that
3 4, 4KVA circuit type of stuff.

4 CHAIRMAN WEISENMILLER: Thank you.

5 MR. CARRUTHERS: You're welcome.

6 MS. RAITT: Robert Woods, please.

7 MR. WOODS: Good afternoon. My name is Bob
8 Woods from Southern California Edison. I'm Director of
9 Electric System Planning. First, let me thank you for
10 the opportunity to provide input to this program. I
11 have to admit I was heartened when Mr. Picker commented
12 that this program is a technical issue rather than an
13 administrative issue.

14 At the outset I'd like to say that at SCE we
15 are committed to trying to figure out how to help
16 California achieve these targets. We've done a lot to
17 try and work with the various agencies to try to develop
18 the ideal location for generators and we will continue
19 to work in that vein.

20 As Mr. Schoonyan indicated the best chance of
21 achieving these program targets will require all types
22 of resources. As we've heard, resources such as wind
23 and solar can actually be complimentary. So while we've
24 heard quite a bit about adding solar to the system today
25 we think narrowing the types of resources would actually

1 be a mistake and would probably increase the likelihood
2 of problems.

3 One point that has been made several times but
4 bears repeating, as we found in Europe and to date in
5 California, is when it comes to localized energy
6 resources location is the key. You have to locate these
7 localized energy resources where the load is, otherwise
8 the connection costs and the transmission could actually
9 come into play which is where it actually gets
10 expensive.

11 As my role as Director of Electric System
12 Planning, it's my folks that do the studies. We do the
13 system planning. I have to tell you that there's a
14 concern. We have so many programs going on now and
15 trying to complete the studies on time and keep things
16 moving have become quite a strain. To date, Edison has
17 over 850 applications or requests for interconnections
18 and trying to work through those is going to be a chore.
19 We truly do not have the resources today, and it takes
20 years to develop a good system planner. So that has to
21 be a concern. We believe that we can get there, we want
22 to get there but it has to be considered that this isn't
23 plug and play. When you put it on the distribution
24 system you can't just say "Okay. I'm going to connect
25 here." and go. It does require a study. There may be

1 cost involved and a number of initiatives. The key
2 point here is to integrate these resources with
3 reliability and safety in mind.

4 As Chairman Weisenmiller pointed out, one of
5 the big differences between the European model and what
6 we have today is that the European model has actual
7 control of the resources. They actually are able to re-
8 dispatch and roll back and curtail. We do not have that
9 capability. When you start looking at a smaller
10 distribution system, as Jon indicated, we don't have the
11 large distribution networks that Germany has. Our
12 typical distribution system is about 10 megawatts.
13 That's what we try to keep it at, at about 10 megawatts.
14 So when you start connecting generation of 20 megawatts
15 you're starting to push the limits of where you can put
16 it on the system. The interconnection costs and all
17 that come into play.

18 What I think is that Jon covered most of the
19 technical issues and safety and reliability are chief
20 among them as my role with system planning and from that
21 perspective that would be a quality program. Those
22 would be considered in developing a program that we
23 would define as a quality program. If safety and
24 reliability are, in fact, included then we think it
25 would be defined as a quality program. While I think

1 it's great to set a date for a target every time,
2 everybody should have a target to shoot for I would
3 strongly suggest that we focus on quality as opposed to
4 meeting a date. Thank you.

5 CHAIRMAN WEISENMILLER: First, similar
6 question. You also have an aging distribution system.
7 In my recollection is that's a key part of your pending
8 GRC?

9 MR. WOODS: Yes, it is.

10 CHAIRMAN WEISENMILLER: Again, similar in
11 terms of following back up on the PG&E commentary on
12 which part of their system, on that distribution system,
13 were going to be the most stressed by these transitions
14 and where you were in terms of trying to replace or
15 phase those along.

16 MR. WOODS: In our system, Long Beach is the
17 largest city and it's probably the oldest. We have
18 transformers that go back 80 years there. That is an
19 issue. To try to figure out what the average age is
20 really would be almost impossible if you figure that
21 Long Beach has gone through several redevelopment
22 efforts over the years. So you could have the 20s, you
23 could have the 60s, you could have the 90s and all of
24 that and you will have equipment from that period. I
25 think probably where the two areas where we'd be the

1 most vulnerable in terms of reliability from aging
2 infrastructure are probably the substation transformers
3 as Jon indicated but additionally I think that it's
4 underground cable. When they built underground cable,
5 back in the 80s, it had a 20 years life and I think that
6 everybody thought that 20 years was forever. Well, 20
7 years is a long time ago from when that cable was put in
8 and that is a real concern because it costs a lot more
9 to replace the cable today than it did to put in
10 originally. Where the load is right now is in the
11 metropolitan areas. If you were to add generation to
12 those areas you'd have to be concerned about where
13 you're actually connecting. The good news for Long
14 Beach is that you have some new and some old right next
15 to each other. But as cities have developed over the
16 years not all of them have that meshing of the old and
17 the new. Some of them are pretty old, such as Santa
18 Anna, which is pretty old, and adding generation there
19 could be very difficult with the older systems that we
20 have.

21 CHAIRMAN WEISENMILLER: Obviously one of the
22 key purposes of regulation is safety reliability along
23 with equity issues. But having said that, one of the
24 things that was most striking as people looked into the
25 San Bruno incident was that one of the aspects of that

1 was simply that PG&E had 22 planning engineers dealing
2 with the gas system, which certainly effected the rate
3 at which they could roll out stuff, and obviously one of
4 the things which we're all struggling with now is why
5 22, why not 32 or something which could have been a more
6 timely replacements there. So I guess the question for
7 you is how many people do you have in system planning
8 and how do you determine that that's enough?

9 MR. WOODS: That's a good question today. I
10 can tell you that. Five years ago we would have told
11 you that if we had 30 that would have been the right
12 number. We're probably in excess of 50 on the
13 transmission side alone today as a result of
14 transmission interconnection requests and increasing
15 mandates for reliability criteria, development and
16 maintaining data and understanding the impacts from the
17 various resources. But what we also have is—I have a
18 whole group on the distribution side that works on this.
19 Today that group that does the interconnection requests
20 for the distribution side is nine. There years ago that
21 was zero. So we are focusing on what resources we need
22 and we're trying to develop an expandable group which
23 means we don't want to go out and hire 100 people only
24 to have to let them go in future years. What we'd like
25 to do is to develop contract resources, try to develop

1 part-time resources, things like that to help us handle
2 this. But as far as exactly what the number is, we
3 really are struggling with that as a matter of workload.
4 I can't tell you today what the exact number is because
5 each year it has gotten progressively worse or, I should
6 say, the workload has gotten progressively larger and
7 I'm not sure when that's truly going to end.

8 CHAIRMAN WEISENMILLER: I guess the last
9 question I had was does Edison have a goal of its role
10 in terms of modernizing its distribution system of when
11 you'd want to basically be switching out all the
12 mechanical stuff? Is it 2015, 2020, 2030. What is it?

13 MR. WOODS: I would say, similar to Jon, we
14 have a lot of electromechanical relays and what we are
15 working on is—we replace those on a, I'll say, an on-
16 needed basis. Let's say if it makes sense to put in an
17 electronic relay which will reduce ONM or provide some
18 information data to the operators we would probably
19 replace it. One example would be if you have to send
20 out an operator to a remote area every time there's a
21 relay or a problem that you have to check it out, it
22 might make sense to go out and replace that with an
23 electronic relay that feeds the data back. Where the
24 substation is right next to the operating center, it
25 probably makes less sense, where you can send a

1 substation operator right next door to get the data that
2 you need. The factors that we try and include in our
3 decision are the actual condition of the equipment, the
4 functionality of the equipment and the necessity of
5 replacing it.

6 CHAIRMAN WEISENMILLER: Next.

7 COMMISSIONER PETERMAN: Just one follow up
8 question. Bob, you mentioned in the beginning of your
9 comments the length of the queue for projects planning
10 to interconnect. Can you elaborate more on what the
11 bottlenecks in the process are?

12 MR. WOODS: I'm not the contract manager but I
13 know that a number of them have to do with getting a
14 generator, once you've given them the information, to
15 make a decision. There's a lot of money at stake. We
16 give them an impact study that says you have to front
17 this much money, if you continue for five years you'll
18 end up getting that money back but there's a lot of
19 hemming and hawing, there's a lot of reluctance on the
20 part of lenders to provide money. And, quite honestly,
21 there's a lot of negotiations saying, "Well. Maybe you
22 should pick that up and we'll pick this up." Our system
23 is not quite as black and white as apparently as Germany
24 is what I gathered from the KEMA study. There's still
25 room for negotiation. It's not uncommon to restudy

1 something two or three times before someone signs a
2 contract.

3 COMMISSIONER PETERMAN: Okay. So these are
4 mostly cost related versus physical limitations to
5 interconnect?

6 MR. WOODS: I would say, for the most part,
7 yes.

8 COMMISSIONER PETERMAN: Thank you.

9 CHAIRMAN WEISENMILLER: Yeah, just a follow up
10 on that, what about in the transmission area we've gone,
11 obviously, from the sequential to more of the cluster so
12 I guess because you kept getting in this iteration
13 process. On the distribution system how are we going
14 there in terms of moving there more toward a cluster
15 approach?

16 MR. WOODS: I think ultimately we may, in
17 fact, get to a cluster approach depending on the
18 magnitude of the requests that we get. As of today, we
19 still are handling them fairly serial.

20 CHAIRMAN WEISENMILLER: Okay. Thanks.

21 MR. TORRE: I'm Bill Torre. I'm Manager in
22 Charge of New Technology, Innovation and Development in
23 the Electric Transmission and Distribution Engineering
24 Group at San Diego Gas & Electric Company. Glad to be
25 here today.

1 I just wanted to use as a reference the
2 questions that were distributed for this session. The
3 first question was how are European Electric
4 Distribution systems similar to or different than
5 California. In my reading of the KEMA reports, and
6 looking at other reports related to the European system,
7 there are some fundamental differences of our systems.
8 One key thing that I see is that the DG is not monitored
9 or controlled here in California and in Europe it
10 appears that they have direct control and monitoring
11 over the DG. I think that's important to point out
12 because when system operators are operating the system,
13 if DG is going to become a more significant portion of
14 the resources in our system they need to have that
15 visibility of knowing how much generation is online. I
16 think we've been able to get by without knowing that up
17 until this point but as we move toward a 12,000 megawatt
18 goal that is going to represent a significant portion of
19 generation in California.

20 I think in some ways we're playing catch-up
21 with Germany and Spain. I noticed in the report, in the
22 design of their networks on their distribution system,
23 it's a much more robust design than what we have, say,
24 typically here in the U.S. or California. Our
25 distribution systems are generally radial in nature.

1 Most of theirs in the urban areas are a meshed network
2 both at the medium voltage and low voltage. Our systems
3 are radial and tend to, as they go out toward the end of
4 the circuit, the wire size tends to drop down. We had
5 some cases where we do have loop back with ties that can
6 feed back on a distribution circuit but you typically
7 can only pick up a portion of the circuit, whereas their
8 system is fully redundant and you can pick up the entire
9 distribution circuit.

10 The other thing is, I think, in general is
11 that it's a balance between reliability and cost. They
12 haven't incurred tremendous cost up to this point
13 because of the robustness of their distribution
14 circuits. But I do know that their energy costs are
15 quite high right now, especially as compared to our
16 energy costs. The proposed capital cost they've talking
17 about going forward is in the range of \$19-40 billion
18 dollars to go from a roughly 16 percent penetration of
19 renewables to roughly around somewhere of 30 percent by
20 2020. They're talking, at least in their report, a
21 significant increase of cost.

22 With regard to the second question, what
23 challenges have the European countries encountered as
24 compared to what we may have to face here in California.
25 I do notice that they have identified some pretty

1 serious voltage regulation problems; in particular the
2 voltage rise problem is one of their biggest issues.
3 And we're facing the same thing here, I'll talk about it
4 later in the other session, especially with PV. We have
5 right now in our system--there is no voltage regulation
6 or control of reactive power and so when you have high
7 concentrations of photovoltaics in distribution circuits
8 you get a voltage rise problem, especially during medium
9 and low load periods. And the solar tends to peak
10 before our system load peaks. So you get this voltage
11 rise issue and it drives the voltages up over our CVR
12 limits which we put in place to create energy
13 efficiency. As a result, when you go outside that you
14 start reducing efficiency overall for the loads and for
15 the system losses. So it's a concern that we have.

16 There could be significant increases and
17 upgrades on our distribution and maybe even our
18 transmission lines. The DG in Europe has frequency
19 droop control as well as reactive power control. Our PV
20 here, rooftop PV, conventional PV, does not have
21 frequency droop. So an example is that if you have a
22 frequency excursion on our system, our PV right now is
23 designed right now to reject or disconnect from the
24 system. Now if your DG is a substantial part of your
25 general, let's say 12,000 megawatts, you have a

1 frequency excursion say where you lost a major generator
2 or import tie and the frequency tends to drop down,
3 you're going to get this rejection of all 12,000
4 megawatts of DG off the system driving the frequency
5 down even further causing a potentially serious system
6 stability issue. I think we need to address that.

7 There's also some maintenance and safety
8 concerns that are brought up. Also, I want to mention,
9 that we need to start looking at some changes in our
10 regulations like W. Rule 21 that will allow us to
11 implement some of these things like reactive power
12 control, voltage regulation, reverse power flow. Right
13 now, for example, on their system they've designed it so
14 that they can have reverse power flow. As you get
15 higher and higher levels of PV generation on the
16 distribution system you're going to start getting
17 reverse power flow on the system. Our systems are all
18 designed for power to conventionally flow from the
19 generator down to the load. We've got to make some
20 changes there as well.

21 And then lastly, question nine is as
22 California builds out the distribution system what
23 lessons can be learned. I just think that we need to
24 provide the proper incentives to encourage the DG to
25 show up places locationally. Somebody mentioned

1 location, location earlier. The closer that you can be
2 to the substations, the less we're going to have to
3 paying upgrading the systems. The further away you get
4 the more you're going to have these voltage regulation
5 issues and voltage rise issues. We need to encourage
6 incentives for where they're located and we also have to
7 address the issue of who pays for the cost of these
8 transmission distribution system upgrades that are going
9 to occur.

10 So I think that concludes my comments.

11 CHAIRMAN WEISENMILLER: Bill, thanks. I guess
12 the couple of questions that I had. One was if we did
13 locate the DG just at the substation do you have a sense
14 of what that would mean in terms of technical potential
15 as opposed to looking at a more thorough developmental
16 process.

17 MR. TORRE: I think what you're asking, and
18 we've kinda started doing this, is looking at, for
19 example, all of our substations the capacity available
20 and then looking at the land that's available nearby
21 both disturbed land and undisturbed land and how much DG
22 or PV could be installed, and how close would it be to
23 the substation. Is that the kind of thing you're
24 asking?

25 CHAIRMAN WEISENMILLER: Yes.

1 MR. TORRE: We have done that and we're in the
2 process of doing that. We don't have a complete answers
3 at this point. We're developing maps that would have
4 the capability of showing where the locations are and
5 the concentrations.

6 CHAIRMAN WEISENMILLER: And when do you expect
7 to have this available?

8 MR. TORRE: You know, I'm not sure that I have
9 a date on that. It's being developed and reviewed right
10 now.

11 CHAIRMAN WEISENMILLER: But sometime this
12 year, maybe?

13 MR. TORRE: I would hope so. I would hope
14 that it would be sometime this year.

15 CHAIRMAN WEISENMILLER: And similar question to
16 that I had asked of your colleagues from PG&E and Edison
17 in terms of the nature of your system, the age of it and
18 characteristics.

19 MR. TORRE: Well, one thing I will say to that
20 is that we have been going through a cable replacement
21 program in our underground system. About, roughly, 65-
22 70 percent of our distribution system is underground in
23 San Diego, a pretty high percentage. And a lot of the
24 cable that was installed originally was unjacketed PVC
25 cable and we're in the process of going through and

1 upgrading those systems so our underground system is
2 gradually becoming newer and newer. Transformers are a
3 concern on our system. Especially as we get more and
4 more new customer loads such as electric vehicles and
5 things like that. Our protection system on our
6 substation, we've been changing all of our relays out--
7 we're about halfway through so changing relays out to
8 electronic relaying, solid state relaying. We do have a
9 program for modernizing--we're finishing up a project
10 called OpEx 20/20 which includes a new OMS/DMS system, a
11 new conditioned based maintenance system that will
12 monitor all of our transformers and substation equipment
13 real time and evaluate so it's conditioned based
14 maintenance and then we're putting--finishing up a new
15 graphical information system for mapping all of our
16 distribution facilities.

17 CHAIRMAN WEISENMILLER: That's good.
18 Certainly one of the--in looking at the gas system issues
19 one of the things that was heartening was that Sempra
20 seems to be implementing a policy of making all of its
21 system peaceable and certainly at this point PG&E is
22 struggling with the 2020 stuff but again trying to get
23 to a more proactive strategy there. So certainly would
24 encourage people to have a proactive strategy on the
25 distribution system.

1 What about in terms of your distribution
2 planners? What's the current size of your group and how
3 are the demands changing over time for interconnection
4 requests?

5 MR. TORRE: We kind of developed some new
6 groups dedicated to distributed renewables. We have a
7 new group of engineers that are handling all the
8 contracts, W DOT and FIT bids and everything. So we've
9 kind of expanded that area. The distribution planning
10 side is addressing mainly our existing infrastructure
11 and meeting our system load requirements so, in some
12 respects, in anticipation of the impacts of the FIT and
13 the DG and the renewables, at least on a distribution
14 side, we've basically a whole new group of engineers and
15 managers to manage that.

16 CHAIRMAN WEISENMILLER: The last thing that I
17 am going to note is that Jeanne Clinton had--when we
18 talked about the metering limitations earlier Jeanne
19 Clinton had noted that even for the CSI program, that
20 PUC has a pretty extensive metering requirement. And so
21 it would seem like that's the next step forward here
22 would be, on the DG, to start looking at the metering
23 and the standards as part of the Rule 21 or as a general
24 industry standard.

25 MR. TORRE: And I think that I did hear her

1 comment on that. There is metering on the DG but it's
2 not monitoring, per say. The European, I think that
3 there's a little bit of a disconnect there, the
4 Europeans actually have tele-metering and monitoring
5 that sends the amount of generation at a particular
6 generation facility back to its operating center which
7 they aggregate together and know exactly how much DG is
8 online at any point in time. So maybe it's semantics
9 but the metering doesn't necessarily have that—it's not
10 necessarily set up that way. For example, AMI typically
11 doesn't go back to the operators, it goes into a
12 database that can be monitored and just aggregated that
13 way for billing purposes and stuff. It's a little bit
14 different.

15 CHAIRMAN WEISENMILLER: Okay. Thanks for the
16 clarification.

17 COMMISSIONER PETERMAN: One follow up
18 clarification question Bill. Regarding your comment
19 around the treatment of PV when we see the frequency
20 drop, the technical fix to that - where does that lay?
21 Is that on the distribution side, with the PV system?

22 MR. TORRE: I think the best place for that
23 solution is in revisiting Rule 21 and the requirements
24 for the generators for when they connect to our system.
25 That they have the capability of frequency response.

1 That they have the capability of reactive power control.
2 They have the capability of sending a signal to tell us
3 how much power they're generating. They also have the
4 ability to accept set points from the utility so that
5 they can put in set points, that way you would have two-
6 way communication and control for the DG. That's
7 essentially what they have in Europe and that's what we
8 would need, I think, especially as you would go to
9 higher levels of DG. It becomes a significant resource.

10 COMMISSIONER PETERMAN: Thank you.

11 CHAIRMAN WEISENMILLER: Yeah. Do you have a
12 ballpark cost for that?

13 MR. TORRE: You know, I was afraid you were
14 going to ask that. I did take, for example, I took what
15 they have on page 20 in their report number of KEMA
16 which outlines the \$20-40 billion dollar number and I
17 tried scaling that to California. I kind of hesitate
18 telling you what I came up with because I did take, by
19 the way I took the existing renewables - the same
20 numbers that were used earlier - and I looked at going
21 to the 12 gigawatt number for DG and I tried taking
22 their numbers and scaling it just to get an idea. Just
23 to say it's in the billions of dollars, I'll say that.

24 CHAIRMAN WEISENMILLER: Let's say slightly
25 different question. Mine was more of if we were to put

1 that type of metering on a DG system, any idea of what
2 the cost would be for that, for say a one megawatt
3 system?

4 MR. TORRE: I would say it's in the thousands
5 of dollars. It's not really big dollars in terms of a
6 burden on the DG supplier. I don't think so because
7 it's not that big of a change to the inverter and the
8 functionality and as far as control capability, I don't
9 think it's that big of a change. I think that they
10 could do it for a few thousand dollars. On the utility
11 end, we're going to have to make sure that we have the
12 communication control infrastructure in place to do the
13 communication control. So there's cost on our end as
14 well as on the part of the DG supplier.

15 COMMISSIONER PETERMAN: I would be happy to
16 see more information about those costs in your written
17 comments.

18 CHAIRMAN WEISENMILLER: Dave? Want to go
19 next?

20 MR. BROWN: Good afternoon, Commissioners.
21 I'm Dave Brown from Sacramento Municipality Utility
22 District. I'm a Principle Distribution System Planning
23 Engineer. Actually, one of two who does the
24 interconnections in our company so it's more hands-on.

25 I thought I'd throw up a slide here real quick

1 that's been really useful in explaining--this little
2 color codes here we applied to our GIS mapping system,
3 some of you have seen this before, and to identify where
4 we have low costs interconnection opportunities. One of
5 the things when you can't decide who should be paying
6 the costs, the easiest solution is to try and not have
7 costs. Next slide, please.

8 This one might take a little bit to fire up.
9 It's actually from our website and you can drill down to
10 the point on this map that I can see the court that I
11 live on, on this map. It doesn't have any street names,
12 it doesn't have any utility facilities on it at all. It
13 was designed around some homeland security guidelines.
14 We didn't want to give up any information but at the
15 same time folks could look on this and see about how big
16 of a system they could put in without encountering any
17 significant costs. We've made this available for our
18 Feed-in tariff project and the challenge that it
19 produced was that how many people do you think wanted to
20 go in the purple area? Nobody went in the purple area.
21 That's the area that can take projects well over 5
22 megawatts without any real cost associated with them.
23 Almost everybody located in the white area is to the
24 south, that basically are the areas that wouldn't
25 accommodate much of anything without going onto our 69KV

1 system and most of them did. Although, the blue areas
2 down at the south border and the green around the towns
3 of Galt and parts of southern Elk Grove accommodated
4 quite a few projects at very low cost so that we were
5 kinda of happy that they weren't always picking the most
6 challenging locations. Next slide.

7 Now this was based, not on the 15 percent, but
8 on 100 percent of our minimum day time load. We decided
9 to modify the 15 percent because that was from the Rule
10 21 working group and that was based on any technology,
11 including those that might be on at night. We wanted to
12 modify that to be 100 percent of our daytime load, which
13 is something probably closer to 30 percent of our peak.
14 That worked out reasonably well and it was based on the
15 fact that, unlike the European models where they're
16 designing their substations to work in reverse, ours not
17 only aren't designed to work in reverse but bad things
18 happen when they're made to run in reverse. The bad
19 things happen proportional to how much reverse so we
20 figured a little inadvertent reverse, not going to be a
21 problem for us. Luckily, we've got—or thankfully, we've
22 got some management that will let us eh maybe every now
23 and then be wrong. By having the flexibility of being
24 able to go out and fix something that maybe we didn't
25 get right the first time we're able to push the envelope

1 just a little bit more than maybe we were previously.

2 This is just a quick printout and I had hoped

3 that it would be large enough to read and it really

4 isn't. Back in March we had a real spike in

5 applications for our net energy metering and the reason

6 for that was that our dollar amount was running out in

7 one of the tiers so it was going from, I think it was,

8 about \$1.80 a watt down to \$1.25 a watt. Something

9 like. And we had a lot of folks come in on that. The

10 other thing is that a lot of people are stuck in their

11 houses and they can't get out of them and so they're

12 reinvesting in them. The other thing is that there's no

13 federal credits for a lot of the energy efficiency that

14 used to be available so all the sliding salesman type

15 folks are migrating over to solar. And it shows in the

16 applications that we're seeing. One of the interesting

17 things in the upper chart, it doesn't show, but these

18 bars are a combination of the easy projects, the ones

19 that you can take five minutes to do a review and the

20 hard projects, that take considerably longer to do a

21 review. The bottom, for the feed-in tariff, we were

22 knocking those out, in turnaround time, of about two

23 months. The upper projects tend to run between five

24 minutes and an hour, except for a few exceptions. We

25 put six megawatts in out in the Aerojet plant and we're

1 still working up the loose ends on that one.

2 The Siemens Assembly Plant here in Sacramento,
3 they're got a two megawatt rooftop that has the
4 distinction of being the largest, single solar pane on a
5 roof. They extended the steel of the building when they
6 built it to support a single lean-to. It's pretty cool
7 looking. And then that came to the telemetry question,
8 we're requiring telemetry at one megawatt. They put it
9 in in three units of eight. When they were informed
10 that that was still going to fit the requirement, then
11 we had to go back and retrofit to get the telemetry that
12 we're requiring.

13 One of the things in our larger projects,
14 including some of our feed-in tariff projects, that is
15 one of the things that we see from Europe is they're
16 allowing interconnection on solar systems that are based
17 on the 1,000 volt DC. We've got no provisions for that
18 in the U.S., the UL requirement that most of the
19 permitting authorities are holding these installations
20 to, they're required a UL stamp that only goes up to 600
21 volts. On the ones where they're just a big old field
22 of solar, we've talked some of the permitting agencies
23 into letting it go if it meets the Europe standard. But
24 we're not ready to give any advice along those lines for
25 anything that's on a structure, an occupied structure.

1 That's one place where we could go in the future.

2 One of the things that's kind of exciting is
3 that we've actually even done some projects with the
4 state. I know that's a separate matter later down the
5 line, I'm not on that panel but we just commissioned a
6 co-gen plant at the state heating and cooling plant.
7 That went really smoothly. They did a wonderful job on
8 that design. We had already integrated solar in at that
9 site and we're pretty happy with the way that one turned
10 out.

11 We've done net energy metering, a surprisingly
12 large net energy metering, like Intel up in Folsom.
13 They took a one megawatt plant behind the meter. You'd
14 hardly know it was there. The simplest interconnection
15 ever. If everything went like that, this would be
16 great. Unfortunately, the idea that we heard thrown out
17 of looking at all the circuits and saying "What would it
18 be if there was 15 percent on those circuits?" I don't
19 see, even if we could, there's a lot of those circuits
20 that nobody's coming on, that nobody's interested in
21 sighting on. There's no facility there. We've got some
22 places where they'd like to give us a lot but we don't
23 have the place to take it. Van Vleck Ranch out headed
24 towards Ione, probably a big chunk of the eastern part
25 of the county, he'd love to give us 30 megawatts, he's

1 on the number six copper farm circuit and that farm
2 circuit isn't going to take that kind of load anytime
3 soon and we're really not in the business of running
4 collector lines. Anyway, I know I'm going around in
5 circles here but one of the things that I didn't hear
6 Jon mention was the network with the big N. I don't
7 know if you guys have ever heard about what a network is
8 but there's only three of them in the State of
9 California that I know of. There's a little one in Long
10 Beach, there's most of them in San Francisco and then
11 there's one here in Sacramento. And what they are is a
12 highly reliable, antiquated distribution system from
13 circa 1930-40s that will probably keep on serving
14 reliably for another 100 years. Whenever they cut into
15 it and take parts apart and look at it, it hasn't aged
16 since the day they put it in. It's a really wonderful
17 system except one of the features of that system is that
18 each of the transformers is connected to the customer
19 through a reverse power flow relay that shuts off power
20 if power ever goes the wrong way through it. And that's
21 for protection because they're delivering as many as six
22 feeders to the customer so that if anyone shut off the
23 customer would never know the difference. State Capital
24 has that kind of provision. When we've talked to folks
25 at the Department of General Services about the State

1 Capital, which by the way has a roof that is just not a
2 good candidate, [LAUGHTER] when they took into account
3 all of the shading, there's only about 100 KW of roof
4 space worth bothering with and they're on a network
5 service that has five transformers climbing off five
6 different feeders, each protected by a network
7 protector. So what we would do, and we've done like in
8 the case of the CalPER's building, we just ignored that
9 system and connected them up to a different distribution
10 system on their solar and then just worked it out in the
11 paper. So we've done what we call virtual net metering
12 a number of times.

13 Anyway, for the first 100 megawatts that we
14 put out in our system, we are only getting telemetry.
15 We just want watts and vars. And what we're doing is
16 that we're posting it on a page in the transmission
17 system operators and distribution system operators'
18 system-data system and they're just taking a tally. The
19 idea is that this might be a tally that says solar or
20 wind, biomass or natural gas. So that the operator
21 knows that if tomorrow is going to be a cloudy day, I
22 might take that number and say that contribution might
23 go down. They don't really need to know, each field,
24 what it's really going at this point. What they've told
25 me is don't bother us until you have a couple hundred of

1 megawatts more. And so we've instrumented the first 100
2 megawatts and we're hoping that through things like the
3 Rule 21 Working Group we can start coming up with a
4 unified standard for what the inverter might look like
5 for the second hundred megawatts worth of units so that
6 they can accept some sort of control systems.

7 We are processing all of our sequentially. As
8 they come in, we process them and turn them back around.
9 On the feed-in tariff, we closed the program at 100
10 megawatts and from what I hear from my management we
11 won't be reopening that real soon. We're waiting for
12 the economy to recover, some of the loads to come up,
13 some of our revenues to look better before we start with
14 the second but I think the average price we were doing
15 was about 14 cents on the feed-in tariff although it
16 varies for time of day and time of year.

17 And just the last issue, as we try to go
18 higher in the penetration the voltage rise becomes an
19 issue. The European inverters that we've investigated,
20 and I got a chance to talk to Christian at the break,
21 they don't really have as many of the type of inverter
22 it sounds like as the inverter manufacturer is telling
23 us. A matter of fact, the same manufacturer told
24 utility back East that SMUD had a whole bunch of them
25 and I wasn't aware that we had any. It turned out that

1 we didn't have any. That's salesmanship. When people
2 hear about inverters they hear that they provide
3 reactive support, that's not what these inverters are
4 designed to do. If people think in terms of reactive
5 support doing the same thing that a capacitor does for
6 the system. What they actually do is exactly the
7 opposite of reactive support. They will draw vars from
8 the system to lower the line voltage so that they can
9 ship the megawatts on without raising the voltage
10 unacceptably. I've equated that to driving your car
11 with your foot on the gas and the brake at the same time
12 so that you can get the RPMs that you're looking at.
13 The other thing is, and I've made this comment at other
14 meetings, vars are relatively cheap. We buy capacitor
15 banks for a modest amount of money. So the contribution
16 of vars, yeah it can be helpful at times, but what the
17 utility from back east reported that their capacitor
18 banks were turning on and off like maniacs. They were
19 wearing out switches on the devices and they couldn't
20 guarantee any of their customers any of the voltages
21 that are typical to a distribution system when that
22 inverter-based unit was doing its thing.

23 We're presently participating with the
24 Commission and others in high penetration PV studies.
25 One of the ones with Hawaiian Electric is a great

1 example. They've got a small island that was run on a
2 couple of diesel generators. They had a hotel come in
3 and a matching solar field go in right next to the hotel
4 and then the hotel went out of business. They didn't
5 have the load, it's not about capacity for most of this,
6 we can upgrade wires pretty easily. We can't make load
7 happen where we need load to happen. They had that same
8 problem. And on days when they're maintaining one of
9 the diesel generators they have to turn the greatest
10 part of the solar off because the remaining diesel
11 generator can't swing as the clouds go by, I guess is
12 the story.

13 We're hoping that by working with those folks
14 we can avoid having those problems here first. They're
15 clearly having them first. Learn from their mistakes or
16 challenges.

17 Any way, that concludes my remarks.

18 CHAIRMAN WEISENMILLER: Thank you. You're
19 going next?

20 MS. SANDERS: Hi. I'm Heather Sanders. I'm
21 with the California Independent System Operator. We're
22 responsible for managing the reliable--am I not on?
23 Shall I restart?

24 Hi. I'm Heather Sanders. I'm with the
25 California Independent System Operator. We're

1 responsible for the reliable operation of the
2 transmission system. What I thought I would do is talk
3 a little bit about the differences that are required
4 from a system operations perspective on the European
5 grid than we have here. You've heard them mentioned.
6 It's the telemetry, the control aspects and then some of
7 the interconnection standards for power quality, low
8 voltage ride-through, etc. And what that means as far
9 as from a transmission system operator. Just to remind
10 us of the contrast. The German telemetry requirement is
11 100 kilowatts and above. In the ISO for a resource,
12 distributed or otherwise that's renewable, telemetry is
13 required at one megawatt and above. We also require
14 information from met stations to give us information
15 about wind speed, wind direction, solar irradiance, etc.
16 so we can use that to improve the forecasting and the
17 decrease forecasting error. For all other types of
18 generation, regardless of whether it participates in the
19 market, is 10 megawatts. So that's telemetry.

20 And I'm really glad that we brought up the
21 difference between telemetry and metering. Telemetry is
22 near real time. I can see what's going on. I get real
23 time information. Our SCADA systems get information
24 from generators on the ISO systems as well as timelines
25 every four seconds. That allows us to understand that

1 state of the system, it also goes into the optimization
2 on the market and what units, what resources get
3 committed to serve what's coming in real time.

4 So telemetry is a real time measurement versus
5 metering which is typically thought of after the fact
6 and used for billing. We also use that meter
7 information, that actual, to train our forecasting
8 models. So metering is important in knowing the actual
9 is important to train our forecasting models. But it's
10 different and those systems were designed for different
11 purposes so talking about the smart meters and the
12 network that was built, it was build to be a settlement
13 in billing system. Now I do believe we can leverage
14 some of that to help support our forecasting models in
15 the future but we need to work that out, how we're going
16 to do that.

17 So I just want to talk a little bit about how
18 the ISO plans the system to give some background on why
19 we would have the requirements on telemetry and control.
20 We're responsible for ensuring that there's enough
21 supply on the system to meet the demand at every
22 instant; everyone understand that. For a particularly
23 operating day, we operate a day ahead market that seeks
24 to economically commit resources based on the ISO
25 forecasted load. During real time additional energy

1 procurement is done and flexible resources are brought
2 online based on short term forecast and the actual state
3 of the system, which I mentioned. Currently most of the
4 load in California is conforming. So I'm just talking
5 about load forecasting now. I'm not talking about the
6 renewables forecasting on the transmission system, just
7 load forecasting. What confirming means is that in
8 general on aggregate load follows a pattern that can be
9 predicted. And it has a low percentage of error.
10 Currently the error across the ISO system for load
11 forecasting is very low, it's less than two percent day
12 ahead and it's less than one percent an hour ahead. And
13 that's the mean absolute percent error.

14 We do currently calculate one piece of
15 nonconforming load. That is load that is unpredictable.
16 We don't know when it's going to come and that's for the
17 pumps that are across the system. And they represent a
18 low percentage of that total load but we do forecast
19 that separately.

20 The reason for focusing on the load forecast
21 in this discussion about distributed generation is that
22 the expectation of the distributed generation that we're
23 talking about in this forum is that it won't be
24 participating in the ISO market. Therefore we won't
25 have visibility into it. So if you're going to put

1 12,000 megawatts on nonconforming load, it's going look
2 like a reduction of load to the ISO. That's going to
3 have significant impact on how we plan and procure
4 resources on the system. So that's what's really
5 driving that need for telemetry and visibility is
6 because if you don't accurately predict that you're
7 going to have to carry more reserves, more regulation,
8 more load following requirements. That's going to be a
9 significant cost because we don't want to compromise
10 reliability. We talked about that in the first panel.
11 To put that generation out there in a local place makes
12 a lot of sense just logically but then one day the sun
13 doesn't shine.

14 Over lunch I looked up—we don't have a lot of
15 solar on the system right now. There's less than 500
16 megawatts on the total system that we know about.
17 There's probably more in the distribution system that we
18 aren't even aware of.

19 But from a wind perspective there's 3,500
20 megawatts—3,598 megawatts of wind on the system. We
21 achieved an all-time peak of 2,060 at 4:10 in the
22 afternoon one day, which was quite odd. And because of
23 that, because of the forecasting of that, we had so much
24 generation on the system because you aren't expecting
25 wind to peak at 4:10 in the afternoon so we had prices—I

1 don't know that they were negative at that time but
2 prices were reflecting get off the system, get off the
3 system. So we're re-dispatching the market in the most
4 economic we can to follow what's going on in the system.
5 So it will be important for us as we go forward and
6 integrate this distributed generation to realize that to
7 control these costs we are going to need this telemetry,
8 that visibility.

9 From a control perspective, the ISO does not
10 have active control over the renewable resources except
11 that they are providing regulation. In order to curtail
12 this as an operations procedure that's done outside of
13 the market if you're in an emergency situation. So
14 that's another thing that really gets concerning. Most
15 recently we had 800 megawatts on wind just drop off the
16 system. And we have to replace all of that. So we're
17 getting to the point where we have significant amounts
18 of generation coming in from resources that we can't
19 control.

20 So the European systems—one of the things up
21 here is how can learn from the European systems. We
22 have established a renewables desk that focuses on
23 improving forecasting, looking at things coming ahead.
24 It's really difficult in California, I think more so
25 than some of the places in Europe, because we're right

1 on the coast here. We have a lot of different
2 typologies than they have there. It's hard for us to
3 see what's coming. We're doing a number of research
4 projects to improve our forecasting all the time. Our
5 renewables desk is being trained to recognize things
6 that could happen like a wind turbine cuts out or in
7 times of high wind, the blades are actually feathered so
8 that you can still get output from the wind without it
9 fully cutting out. We're also working everyday to
10 improve our forecasts. Just so give some data, you saw
11 on the previous presentation on our error in wind
12 forecasting. We have about a 14.75 percent error in
13 wind forecasting day ahead. We have about 6.75 percent
14 error in hour ahead. That's the mean absolute error,
15 that's the MAE.

16 So it's significantly challenging for us and I
17 bring this up because we have visibility into those
18 units. We have telemetry. To put this amount of
19 distributed generation onto the system without
20 visibility, our forecasting would expect to be
21 significant. So I wanted to bring this up because
22 that's what's driving those European requirements for
23 telemetry and control. I thought that would be
24 important for us to understand that we don't necessarily
25 want to arbitrarily say that it's 100 kilowatts

1 everywhere. As far as the costs go, there's the
2 components that, I believe, Bill spoke about in terms of
3 the developer putting in the measurement devices but
4 that most of the cost is in the communication back, the
5 optimization decision on what to do with that data.
6 There's costs in a number of different places and we
7 need to be very deliberate about how we handle that and
8 recognize without it that it could be fairly
9 significant. I think that's all I wanted to touch on
10 regarding to the European studies so, thank you.

11 CHAIRMAN WEISENMILLER: A couple of questions.
12 One is what is the exact status of the ISO application
13 at FERC on the ride-through requirements?

14 MS. SANDERS: Well I have--so we filed on July
15 2 on interconnection requirements. And the subsequent
16 FERC issued on August 2010. Basically what he's
17 referring to is that there were four points of that -
18 power factor design and operations criteria FERC
19 rejected our proposal there in addition to voltage
20 regulation reactive power control that was also
21 rejected, as well as revisions to generation power
22 management requirements that was also rejected. The one
23 item that was supported was revisitation to frequency in
24 low voltage ride-through requirements.

25 As far as the status goes now, we're still

1 really waiting to see how that's getting resolved. The
2 direction was to study these individually with each
3 interconnection request so that if these requirements
4 were there they were done at an individual generator
5 level. As far as the rehearing with FERC I'm not sure
6 where that stands specifically but I know that how
7 that's being handled is on an individual basis right
8 now.

9 CHAIRMAN WEISENMILLER: And similarly, in
10 providing pricing signals to the renewables, where does
11 that stand now?

12 MS. SANDERS: So we have an initiative going
13 on right now for integrating renewables on a market and
14 product review.

15 We've just held the initial straw paper to
16 suggest different approaches that may be taken to
17 support reflecting like ramping needs or fast ramping
18 needs because if you think about what's happening on the
19 system now and how we plan for this single largest
20 contingency, I'll tell you that as this increases from a
21 renewable perspective our single largest contingency
22 won't be the loss of one of the nuclear facilities. It
23 will be a loss of the bulk of wind. We need to think
24 about how we're handling that.

25 The renewable product market review is in its

1 stakeholder process. It's working through that.
2 There's a number of initiatives that are out there to
3 address that and get that. One of the components is the
4 price signals that are sent. Right now the lowest that
5 the price can go is negative \$30 dollars so you're not
6 providing a strong enough incentive to the demand side
7 resources or the reduced generation side resources as
8 you are to the supply side. We are going to adjust that
9 floor, if you will. I believe the current thinking is
10 to negative \$100 dollars a megawatt or \$200, depending
11 on where they land on that. So that should give better
12 negative price signals so that we recognize tons of over
13 generation over supply. So incenting the either demand
14 response or the generation to reduce.

15 CHAIRMAN WEISENMILLER: Obviously you're not
16 the only balancing authority in California. So the
17 question in part is what-how are the other balancing
18 authorities responding to these challenges?

19 MS. SANDERS: SMUD? SMUD how goes it?

20 [LAUGHTER].

21 MR. BROWN: That's not my side of the company.

22 [LAUGHTER]

23 MS. SANDERS: Good answer. I'm not sure. I
24 believe it's got to be more challenging for them because
25 we have a much larger system than they do. They have to

1 be very active of balancing that energy minute-to-minute
2 and second-to-second. He had referred to the fact that
3 they have up on their wall the different generation
4 mixes that they have to balance this stuff because only
5 some of the resources are flexible enough to be able to
6 respond to those frequent changes. We have a larger
7 system. So we have more resources at our disposable to
8 balance this. We also have larger problem as well. I
9 would assume it's gotta be fairly challenging for them
10 depending on how much native renewable resources are
11 intermittent nonconforming resources they have that they
12 have to forecast for but I don't know. I would have to
13 have SMUD or LA or someone IID respond to that.

14 MR. BROWN: They did generously add to the
15 staff of the people that take care of that so I suspect
16 they're managing somehow.

17 CHAIRMAN WEISENMILLER: Yeah, it's just that
18 your story reminded me that I was in the El Paso Natural
19 Gas Pipeline Control Center in about 1986 just as
20 restructuring was start and pipelines basically became
21 common carriers to others to transport gas through the
22 system. And at least, at that point, they had a
23 clipboard that would—they would write down the flows
24 they were anticipating and within a matter of years they
25 were just swamped. Absolutely swamped in terms of the

1 SCADA system, it was inadequate. Their computer
2 software was just hopeful. It took them years to dig
3 out from under the tidal wave of trying to really revamp
4 their control center to reflect what was going to happen
5 when others started scheduling gas transport in their
6 system. So hopefully you're not in that situation. The
7 company barely survived the challenges at that stage.
8 Gas obviously moves much slower than power so with
9 different time costs, conceptually, it's a much easier
10 challenge but they just got killed on the accounting
11 side.

12 COMMISSIONER PETERMAN: Just one follow up
13 question, Heather. Assuming telemetry, how suitable are
14 different reserves for dealing with contingencies of the
15 size you mentioned like the 800 megawatt drop in wind?

16 MS. SANDERS: So the tricky part of that
17 question is that we can't use our contingency reserves
18 to accommodate those drops. We have to re-dispatch the
19 entire system. Our reserves can only happen in, you
20 know, an N minus one contingency scenario. So when all
21 the wind drops off the system we have to do it with the
22 market and the load following the market and the
23 regulation that we have. As far as percentage goes—

24 COMMISSIONER PETERMAN: Can you just clarify
25 why that is for me?

1 MS. SANDERS: I'm not sure—it's because of the
2 NERC WECC requirement.

3 COMMISSIONER PETERMAN: Okay.

4 MS. SANDERS: And that's also discussed in the
5 paper, it's a different of how you can use your
6 contingency reserves so we need to look at how we're
7 providing our reserves and when you can exercise those
8 reserves because you currently cannot do it at a loss of
9 wind because you're not losing the plant necessarily or
10 the transmission links; the winds died and stopped
11 flowing.

12 COMMISSIONER PETERMAN: So it may not be
13 technically a limitation on what the reserves can do so
14 much as a technical—a requirement—a regulation
15 requirement now about what we can use them for?

16 MS. SANDERS: For reliability, yeah, a
17 reliability standard.

18 COMMISSIONER PETERMAN: Thank you.

19 MR. LENOX: Yes. I'm Carl Lenox with
20 SunPower. We're a, obviously quite large, solar modular
21 manufacturer as well as a system integrator and product
22 developer. We work globally. I deal with grid
23 integration issues as well as advanced plant control
24 functionality. And so forth I just wanted to provide
25 some comments based on the KEMA report based in part to

1 some colleagues, feedback from my colleagues our of our
2 Frankfurt and our Madrid offices as well.

3 So I'd just like to say that the KEMA report
4 is pretty helpful in providing additional insight into
5 the situation in Germany and Spain. Just for some
6 context setting, I just want to reiterate that what
7 we're talking about in Germany is that over 17 gigawatts
8 of installed capacity. But that doesn't tell the whole
9 story. There was 7,400 megawatts installed just last
10 year. It's really very concentrated. About 70 percent
11 of it is actually in the southern part of the country.
12 We're not talking about it being spread out amongst a
13 whole system. We're actually talking about it being
14 quite concentrated. In addition, as I think we heard, a
15 lot of it is actually in rural radial feeders as opposed
16 to on these networks. These are all important things to
17 keep in mind as we think about that experience.

18 One of the things that we're seeing, again, is
19 that we're seeing greater than 100 percent instantaneous
20 penetration routinely on German distribution systems. I
21 understand that there are differences in the way they do
22 relaying and things like that but that is what they're
23 dealing with.

24 I think it's really important to point out—I
25 saw a breakdown on penetration levels by distribution

1 system operators in Germany--there's 15 DSOs,
2 distribution system operators, in Germany that have PV
3 capacity on their systems that is between two and four
4 times the annual load on those circuits. They have some
5 very significant penetrations on many of those systems.

6 As interesting as the guidelines that were
7 discussed in the report, I thought it was very interest
8 what was not discussed in the report. And these are
9 issues that often come up or concerns that people have.
10 One of them is anti-islanding. There is an EIA study
11 back in 2002 which found that the risk of islanding,
12 this is a quote, "is virtually zero for low, medium and
13 high penetrations of PV systems." And that's in part of
14 why these high penetrations are being allowed. These
15 are not as concerning as anti-islanding as they
16 typically are here in the U.S. And I think it's
17 important to keep in mind that the 50 percent of line
18 sections screen that we have here for interconnection is
19 intended to avoid situations where PV penetration can
20 match load but I think that's questionable of whether
21 that's a real risk.

22 I think that also comes into this workload
23 question. If you have a screen that's overly
24 conservative then I think this idea of going to 100
25 percent of minimum daytime load would help would this.

1 If you have screens that are too conservative, that's
2 going to increase workload on the interconnections.
3 These things are actually related.

4 We talk about another concern people also have
5 around harmonics that often comes up and DC current
6 injection. I saw no indication in this report of any
7 substantial power quality issues.

8 Interestingly to me, variability, management
9 of variability, short duration of variability was not
10 mentioned in this report. There was no indication of
11 any substantial power quality issues such as flicker or
12 ONM issues related to variability. And, I think,
13 there's a growing body of data on PV variability which
14 is showing the short term changes of output on a single
15 system are far less of an issue than commonly assumed
16 because when you scale you get a tremendous amount
17 geographical diversity that aggregates that short term
18 variability. And that's true even of a footprint of
19 many distribution feeders.

20 I want to spend a minute talking about
21 communications and controls because that's obviously a
22 major theme of these reports and a major theme of this
23 discussion. I hate to be contrary here but in talking
24 to our folks in Germany very few, if any, PV systems in
25 Germany are capable of communicating the real time

1 output to the grid operator. That capability simply
2 does not exist. I'm not sure why that's in the report
3 but that's--real time telemetry is not happening in
4 Germany. However, the German TSLs do have situational
5 awareness and forecasting tools. These are discussed in
6 the KEMA memos. They are quite accurate, about four to
7 five percent in root mean square error on a regional
8 basis. Those are based on modeling the aggregate PV
9 output across the region so they do have telemetry on a
10 handful of small systems. There's actually private
11 forecasting firms that have this telemetry. They
12 utilize that telemetry from maybe a couple hundred
13 systems to develop regional area forecasts. And those
14 are usually actually to operate the transmission system.

15 When we talk about remote active power
16 reduction that is again for systems above 100 kilowatts
17 -- it's been required since about the middle of last
18 year, keeping in mind that everything that was installed
19 before then did not have this capability. So we're not
20 talking about that much capacity in the scheme of
21 things.

22 And I also want to point out that the
23 interface that we're talking about that performs its
24 function only costs a few hundred dollars. It's based
25 on a pretty low cost scheme and a pretty low cost

1 communications scheme on the upstream side, as far as I
2 can tell. We need to think about the capability of the
3 communications and then the cost of that communications,
4 I'll come back to that in a second.

5 I also note that my German colleagues tell me
6 that in practice, few German utilities have actually
7 implemented the required communications infrastructure
8 needed to do this curtailment.

9 The other functionality that's been discussed,
10 such as reactive power, low voltage ride-through, that's
11 only applicable to medium voltage connected systems,
12 about 100 kilowatts. Eighty percent of the systems in
13 Germany are low voltage so we're talking about the 20
14 percentage of systems that have been installed very
15 recently. So basically very few systems actually have
16 this capability today, of the 17 plus gigawatts. And
17 the reason that they're doing this is to really move
18 forward from that point, I think it's really important
19 to understand that. It's very important to move forward
20 from the point that they're out now to have these
21 functionalities in place but they've managed the system
22 up until now without them.

23 When we talk about telemetry and things like
24 this the cost that is required of that kind of utility
25 EMS integration in a manner typically done in the U.S.

1 is very high. It's probably a couple of orders of
2 magnitude beyond what we're talking about in Germany and
3 would be a major barrier. Now if we can—we certainly
4 can do monitoring. We do very high resolution
5 monitoring at reasonable cost. The question is what is
6 the communications infrastructure that's actually being
7 used to get that data or to control the systems. How
8 reliable does it need to be? Do you need to have six
9 nines, three nines, one nine? You're talking about a
10 lot of distributed systems, maybe you can handle having
11 some of those communications not get through to the end.
12 That's something that we really need to think about.

13 Let me just go back here a little bit and talk
14 about some of these functionalities, particularly around
15 LVRT and the reactive power. These are capabilities
16 that are available in the market today, they're not
17 widely used because we simply can't use them in
18 accordance for smaller systems lower than 10 megawatts.
19 We are starting to see many situations above 10
20 megawatts who are not in distributed generation kind of
21 situation where we are rolling these out and doing them.
22 The technology is there and it's really more of a codes
23 and standards issue, quite frankly. And we've even done
24 that in Hawaii. We actually installed a system in—that
25 went online in January of 2009, so a couple of years

1 ago, that had extended voltage ride-through ranges,
2 frequency ride-through ranges, telemetry back to the
3 utility. Pretty much everything that we're talking
4 about here. That can be done but it's sort of a
5 question of how you do it and whether those technologies
6 are really commercially available and what the codes and
7 standards are to use them.

8 That said, I want to bring our attention back
9 to the Black and Veatch Study that was done for Re-DEC
10 back awhile ago. I revisited that study. They had
11 found that you could get more than 17 gigawatts of
12 distributed PV in California with no more than 30
13 percent penetration on any given feeder after
14 constraining for where there was available rooftop space
15 and so forth. Based on that study we're not necessarily
16 talking about accommodating similar levels of
17 penetration as they currently have in Germany. At the
18 same time, I think, it's pretty clear that we can get
19 above 30 percent penetration. This is penetration now
20 that is peak-on-peak without significant issues in many,
21 many cases. There's always going to be corner cases,
22 there's always going to be everything's local but I
23 think on the whole, we're going to find that getting
24 above 30 percent peak penetration is not going to be a
25 really major issue.

1 I think I touched on this but I think
2 streamlined study process and more appropriate screens
3 are really something that we need. The current approach
4 is kind of a barrier to rapidly expanding PV,
5 distributed PV. And I think we all know this but really
6 the major issue here is not so much technical but cost
7 allocation and causation.

8 I just really want to point out that the
9 benefits of a utility systems upgrades are really
10 critical to many stakeholders. Not just the developer
11 who happens to show up that day and purchases a product
12 that triggers the need for an upgrade. You're going to
13 have customers who may want to grow their load. For
14 instance who may want to install or buy a plug-in
15 electric vehicle, a utility who may have a whole bunch
16 of electromechanically relays that they're then going to
17 replace and enjoy the benefits of having new equipment
18 for many, many years to come, not to mention the next
19 developer who many come along the line and install the
20 next step after that project. And really society as a
21 whole by integrating clean energy into the system.
22 There's many, many stakeholders who benefit from these
23 upgrades.

24 There's a really interesting institution in
25 Germany it's called, excuse me I'm totally going to

1 mangle this, but it's called the Clearingstelle EEG and
2 what it is is an arbitration body that was created as
3 part of the renewables procurement laws that allows
4 developers and utilities to quickly and cost effectively
5 settle disputes in arbitration when they—specifically
6 around PV systems settings and integration. It's a
7 neutral body that allows these issues to be worked out
8 in an efficient way. That's not something that we
9 really have here in the U.S.

10 We really need to consider the cost requiring
11 advanced PV functionality versus the cost of the utility
12 system upgrades. So ratcheting up requirements and
13 requiring that inverters do this, that or the other
14 thing. It may not necessarily be the least cost
15 solution, I think that we need to understand whether
16 that upgrades on the systems side that allow you to
17 accommodate much higher penetration versus having it be
18 on the server technology side, on the PV side of the
19 system, need to figure out what's the most cost
20 effective there essentially.

21 And the other thing that I just want to point
22 out is that we often talk about how PV can be a problem
23 for the grid but really with this advanced
24 functionalities, I'm very convinced that PV can really
25 be an absolute asset to the grid. You're talking about

1 putting very sophisticated power electronics and
2 embedding it ubiquitously through the power system. The
3 opportunities there are tremendous. To really unleash
4 that we need to start thinking about mechanisms to
5 compensate system owners for these grid services,
6 essentially insularly services; we've only really
7 thought about that in the past of the transmission level
8 but really we're talking about insularly services all
9 the way down the distribution. I'll just leave you with
10 that thought and thank you for giving me the
11 opportunity.

12 CHAIRMAN WEISENMILLER: Thanks. A couple of
13 questions. One of them is who does the codes and
14 standards in this area and what's the current status?

15 MR. LENOX: SO there's really two interlocking--
16 well, there's several pieces but the two main
17 interlocking issues are between IEEE 1547 which sort of
18 talks about how distributed generation needs to
19 interface with the utility system and the current
20 incarnation of that was written to assume very low
21 penetrations of DG. Those requirements have then sort
22 of gotten mirrored into UL 1741 which is essentially a
23 testing standard. If you want to get a UL listing on an
24 inverter you have to be able to meet that standard. In
25 turn, if you want to be compliant with the national

1 electric code for behind the meter system, you have to
2 have a UL listed inverter. Where this all comes into
3 play, you want to pull an electrical permit from the
4 building department you have to have a UL listing. A UL
5 listing precludes you from actually doing many of the
6 things the utilities would like you to do in terms of
7 the functionality.

8 So there's a lot of work going on to add a
9 high penetration DG section, essentially, in 1547 which
10 will allow some of this functionality which will then
11 eventually in turn roll through the UL standards and
12 then, hopefully, into the NAC. This is why we've been
13 able to do this for projects that are not--don't have to
14 have UL listed equipment. The utility has some
15 flexibility in interpreting the IEEE standards. It's
16 essentially voluntary so we have some more wriggle room
17 and we can actually rule out these functionalities.

18 CHAIRMAN WEISENMILLER: Next question, in just
19 a nutshell, compare your experience interconnecting in
20 Germany to interconnecting here.

21 MR. LENOX: Actually, I don't have any direct
22 experience with interconnecting in Europe but from what
23 I understand it's reasonably straightforward, at least
24 in Germany.

25 CHAIRMAN WEISENMILLER: Okay. We'll go on to

1 the last speaker then. Thank you.

2 MR. LENOX: Thank you.

3 MR. KORINEK: Commissioner Weisenmiller, I'm
4 Dave Korinek with KEMA. I apologize, Christian Hewicker
5 had to leave for his flight to return to Europe so I'll
6 be wrapping up comments on the panel for KEMA.

7 One thing that Christian wanted me to clarify
8 was in terms of the curtailment option, we've talked
9 quite a bit about that today and that option is
10 available in both Germany and Spain. But it is the
11 option of last resort under the law and all other
12 measures, including market measures, need to be
13 exhausted before the renewable curtailment measure can
14 be evoked. They're very wary of pulling that trigger
15 prematurely. They would pull that trigger as a last
16 resort as opposed to curtailing load, for example, in
17 order to retain balance in the system so there is a real
18 consciousness there that all other measures need to take
19 place first.

20 One thing that Christian mentioned that I
21 don't know if it was clear but that I wanted to
22 emphasize the approach in Spain is also radically
23 different from Germany in terms of the compulsory nature
24 of the interconnection. Under German law, the DSOs must
25 connect. There is no way for them to deny connection.

1 Under Spanish law, basically, the DSOs have set an
2 arbitrary cap on DG penetration of 50 percent of the
3 circuit peak demand or the distribution substation peak
4 demand or the area peak demand. In fact, where back
5 feed conditions are very common in Germany with the must
6 connect paradigm, in Spain they're much less of a
7 problem.

8 I appreciate all the comments, on behalf of
9 KEMA, I appreciate all the comments that were shared
10 around the table by fellow panelists. We're looking
11 forward to seeing all of the written comments as this is
12 still a work in progress at this point, a final report
13 will be coming at a later date, and so we're looking
14 forward to receiving all of these comments in written
15 form so that we can properly reflect them in the final
16 report.

17 Just to capture an analogy that was on one of
18 Christian's slides, we looked at the cross of the coming
19 tier of renewables in Germany and how expensive the
20 German utilities have calculated that's going to be as
21 compared to what they've been able to connect so far,
22 which has been relatively low hanging fruit. Taking a
23 step back and comparing notes on what we've heard today
24 and what we've seen, clearly there's going to be some
25 low hanging fruit in California also but our impression

1 is because of the differences in the distribution system
2 design that there's probably significant less low
3 hanging fruit available and that it's going to take more
4 capital investment to get those significant increases in
5 DG deployment. So those are our comments today.

6 CHAIRMAN WEISENMILLER: Thank you. I just had
7 one follow up which Christian referred to in passing.
8 What happened in Germany that led to the much enhanced
9 requirements on the DG side in terms of power quality
10 and all and visibility?

11 MR. KORINEK: I suspect it's simply because of
12 the magnitude of the deployment that they've seen to
13 date as you look at the percentage of their total system
14 demand and their total system resources. It's become
15 such a significant percentage that the aggregate effects
16 of the on their system is cumulative, of course, so they
17 have to manage it more tightly.

18 CHAIRMAN WEISENMILLER: Yeah. My impression
19 is that they may have had an incident too last year but
20 that's again something that you can follow up in
21 writing. Thanks.

22 MS. KOROSSEC: All right. We thank our panel
23 very much. This is a very good discussion and we'll
24 shift gears now and talk about the Energy Commission's
25 Staff Report on Renewables on State Properties.

1 Heather?

2 MR. TUTT: As you know—you may know, SMUD is
3 no longer a balancing authority. There's now a
4 balancing authority of Northern California. And I'd be
5 happy to ask the people that are responsible there if
6 they are—what they have been doing about similar issues
7 that they have raised and get back to you on that
8 questions.

9 CHAIRMAN WEISENMILLER: That'd be great.
10 Thank you.

11 MS. RAITT: Are we ready for the next
12 discussion? Great. Again, I'm Heather Raitt. Here to
13 talk about now the—we completed a staff report looking
14 at developing renewable energy on state properties for
15 this workshop and there are hardcopies at the table that
16 many of you may have already picked up. As far as I
17 know there's still some copies out there.

18 So the report actually looks at developing a
19 goal for developing renewables on state property and an
20 inventory of opportunities and we also looked at the
21 state's--actions agencies have taken to date to install
22 renewables and go over barriers and potential solutions
23 and next steps.

24 So the report actually focuses on DG but it's
25 not exclusively DG. It also includes the larger scale

1 and utility scale renewables so we're considering this
2 report as actually helping us more toward the 20,000
3 megawatt goal.

4 Initially we looked to see what the benefits
5 might be for developing renewables on state property.
6 We see potential for reducing energy costs, for creating
7 new revenue streams by leasing the rights of way on
8 vacant lots to developers, some cost savings by
9 eliminating maintenance obligations for lands leased to
10 developers and we hope to have-be a leader in spurring
11 development. The aim is to build off of existing
12 programs and to not increase net costs to the state.

13 It's a joint effort. There's eight agencies
14 that have signed a memorandum of agreement with the
15 Energy Commission as well as the Departments of General
16 Services, Corrections and Rehabilitation,
17 Transportation, Water Resources, Fish and Game and the
18 State Lands Commission, and the University of
19 California. It's open for others to join and in fact
20 the State Lands Commission and the University of
21 California joined since it was first signed in December,
22 I believe.

23 To begin, we have put forward a goal of 2,500
24 megawatts by 2020. This is developed in consideration
25 of the 33 percent mandate as well as the 20,000 megawatt

1 goal as I mentioned. It builds off of the inventory
2 that we conducted of the possibilities of development on
3 state property and we're cognizant of the loading order.
4 We're recommending that we first develop on state
5 buildings that have invested in--have made investments in
6 energy efficiency.

7 It builds off of the inventory in that for
8 state buildings we estimate potential for between 14 and
9 26 megawatts of development. We think of that as the
10 low hanging fruit. Next we developed an estimate of
11 potentially wholesale distributed generation and we saw
12 that as between 54 and 195 megawatts and finally land
13 lease for wholesale generation. This is where we get
14 into the potentially utility scale. This is really a
15 very gross estimate of technical potential so it's in
16 the range of 14,000 to 26,000 megawatts.

17 Our goal is--so we're suggesting that perhaps
18 10-20 percent of that technical potential could be
19 realized and that's how we get to the 2,500 megawatts.

20 We have several activities that are already
21 underway. The Department of General Services has
22 contracts to install 12.25 megawatts of PV. We've heard
23 a little bit about Caltrans working on getting PV along
24 the highway system. Department of Water Resources is
25 working on a demonstration program for the California

1 Aqueduct and installations along the pumping plants.
2 They've put out an RFP for a wind demonstration. CAL
3 FIRE is looking at using wood waste for producing
4 electricity. Department of Corrections has recently--
5 well they have one megawatt of ground mounted PV and
6 have vendor contracts to expend that to 23 megawatts.
7 State Lands Commission manage thousands of acres of
8 school lands that are a revenue source for the State
9 Teachers Retirement Fund and this is where there's a lot
10 of property that has a potential for development of the
11 larger scale renewables. And then University of
12 California. They have committed to installing 10
13 megawatts onsite by 2014 and they already have over six
14 megawatts of PV and they expect to have six megawatts of
15 biogas by the end of the year.

16 Then we talked about the variance of solutions
17 and I won't get into these in too much depth since we've
18 been talking about them already today. For economics,
19 the high upfront costs and transaction costs and then
20 specific to for the state expense we are running into
21 some issues around contracting as well. For integration
22 we talked about that with the intermittency. We'll hear
23 more about that this afternoon with our D&D discussion.
24 Interconnection we talked about that with the challenge
25 of a interconnection requests. And then permitting we

1 haven't talked as much as about that today. For the
2 state agencies, they have the authority to conduct their
3 own permitting for actions on state property but it
4 needs to comply with the California Environmental
5 Equality Act and be consistent with any local
6 regulations.

7 We definitely see permitting as a major
8 challenge for the larger scale projects and our
9 inventory doesn't do any screening, at this point, for
10 the really large scale projects so that would be a
11 future step.

12 We first looked at the potential for buildings
13 in the load centers which we divided up into seven load
14 centers. We excluded buildings that were in sensitive
15 lands or that had existing projects. We collected
16 monthly and annual meter data to help us evaluate the
17 potential. We also looked at the square footage of the
18 rooftop and the parking lot spaces and were actually
19 able to net our obstructions in North facing areas of
20 roofs. We then estimated the total PV capacity to be
21 about 16.2 megawatts. I had meant to actually say this
22 upfront that much of this capacity that we're talking
23 about is in terms of PV but we actually happen to have a
24 broader mix of technologies going forward.

25 Then the next category that we looked at was

1 state property with potential for wholesale. We looked
2 at Department of Corrections' property and Department of
3 Mental Health Facilities. For Corrections they were
4 able to do a little bit more advanced analysis excluding
5 areas that had insufficient interconnection
6 opportunities for topography or had environmental
7 sensitivity. Having applied that screen, we see
8 potential for about 50-200 megawatts of DG with
9 wholesale potential.

10 Finally, the category of looking at areas that
11 really were for wholesale. We looked at available space
12 around aqueducts, siphons, pumping plants, excess lands,
13 other state lands and highway intersections. We kind of
14 looked at parcels, we divided them up into groups of if
15 they were 200 acres or smaller. We assumed that those
16 could support a wholesale regeneration and if it was 200
17 acres or above then it would be a utility scale project.

18 Based on this very rough technical estimate,
19 we came up with about 14,000-26,000 megawatts PV
20 potential. We also looked at areas that had good wind
21 resource availability. There's about 100 parcels and
22 that those have the potential of about 1,900 megawatts.

23 As I had mentioned, there's much more work
24 needed to determine the suitability of developing these
25 parcels and that is something that we would like to do

1 going forward.

2 So next steps, we're interested in working
3 with more agencies to join the MOU. We want to continue
4 to refine the inventory. Working with the Department of
5 General Services to develop a request for proposals for
6 renewables on state buildings. We are planning to do a
7 screening environmental analysis for the properties area
8 to get a better sense of what areas would be best suited
9 for development. And then today we're hoping to get
10 more comments on the report and feed the results into
11 the renewable strategic plan portion of the Integrated
12 Energy Policy Report. That's what I had. Thank you.

13 CHAIRMAN WEISENMILLER: Thanks, Heather.

14 MS. KOROSSEC: All right. Next we'll hear from
15 KEMA about what from the European experience relates to
16 renewables on government property topic. So Karin
17 Corfee.

18 MS. CORFEE: Hi. My name is Karin Corfee, I'm
19 with KEMA. I apologize but Christian had to leave and
20 catch a flight so I'm pinch-hitting for him today.

21 So KEMA actually did three memos in
22 preparation for a consultant report on the EU experience
23 with DG. This presentation is real brief. I'm just
24 kinda going to skip to the key conclusions but this is
25 related to Memo #3 which is what the experience is with

1 renewables on public property.

2 We investigated key questions, which I'm going
3 to summarize at the end so I'm going to skip over this,
4 and I think it's really important to touch upon what's
5 really driving the market of renewables in Europe and
6 without focusing too much on this there is the EU's 20-
7 20-20 goals and so 20 percent reduction in greenhouse
8 gases, 20 percent reduction in energy consumption and
9 then 20 percent reduction in—and 20 percent share of
10 renewable energies by 2020. And these are binding
11 targets.

12 And I asked today what does that mean binding?
13 What happens if they don't meet it? And it's very
14 squishy binding targets. So that's just an FYI in case
15 you guys are curious.

16 But one of the key things is this EU Directive
17 that came out in 2009 and so there's some key things
18 that have really kind of set the groundwork in Germany
19 for renewable projects along highways so that's a key
20 thing that we found in our report.

21 This just summarizes where we have fits and
22 what some of the rules are. I'm going to skip over
23 that.

24 This EU 2009 Directive, I'm skipping all the
25 way down to the bottom bullet point here, really focuses

1 in on zero energy housing but also set the groundwork,
2 really clarified and explicitly called out renewables
3 along highways.

4 For the most part, public authorities have
5 really played the role of just facilitating renewables
6 within their communities. They're not really taking an
7 active ownership share. In Spain, there's a lot of
8 pilot programs but in Germany where we're seeing things
9 really take off now are these PV installations along the
10 interstate highways.

11 And then this is kind of interesting. In
12 Germany they actually use CO2 emission allowances to
13 fund a schools program where their target is to put PV
14 installations on 400 schools. Interesting to think
15 about for the State of California.

16 So we have some details on the installations
17 along the interstate highways, I am going to skip over
18 it but I do encourage you to, if you have questions,
19 please file written comments and we can clarify in our
20 consultant report.

21 There's some photographs of installations
22 along highways and along noise abatement walls. So the
23 2009 EU Directive actually in Germany the new renewable
24 feed-in tariff laws specifically called out noise
25 abatement walls as well as highways. So the lower

1 picture is actually a noise abatement wall and the upper
2 pictures are examples of highway installations.

3 Summary of observations. One of the key
4 questions was whether European countries placed solar DG
5 on government buildings and is it a common practice or a
6 new practice. As I said earlier, governments are
7 facilitating but they're not taking an active ownership
8 role. That is starting to change a little bit. We're
9 starting to see more public private partnerships but in
10 general the publically owned projects on public property
11 is really taken up by private investors.

12 We have seen some limited expansion of DG on
13 state property in Europe. And it's likely to occur
14 because of this recent 2009 EU Directive specifically
15 focused on the municipality's responsibility to promote
16 and to serve as a good example so they actually are now
17 specifically required to make available rooftops of
18 public buildings. We're expecting to see quite a lot of
19 activity from 2012 onward.

20 There's also economic drivers. The economic
21 drivers really come from land sales, leasing fees and
22 taxes. The municipalities do receive income from all of
23 these sources.

24 Lastly, I think that there's tremendous public
25 pressure, primarily to reach the European climate

1 reduction goals or greenhouse gas reduction goals. We
2 do see—we see a concentration of solar projects and DG
3 projects in certain areas and those tend to be the areas
4 where you see very active public support for renewables
5 in DG.

6 So another question is do renewable DG
7 projects on government remote properties go through a
8 normal or expedited permitting process? And there's
9 really no difference. So there's no different between
10 projects that are publicly owned or privately owned or
11 projects that are on public property versus private
12 property. We found no instances of expedited permitting
13 processes.

14 It is important to note that in order to get
15 feed-in tariff that the local development plans do have
16 to be adjusted to allow renewables on public property.

17 There is a more lengthy and complex,
18 typically, approval process for projects on public
19 property.

20 So how do European programs for renewables
21 address issues such as safety and some of the other
22 environmental issues? In general what we're seeing is
23 that there's not really special provisions in Austria,
24 Spain or Switzerland but in Germany they've explicitly
25 extended the feed-in tariffs for solar PV installations

1 along the highways. As a result of that, there's a
2 federal law on highways that basically—it's a federal
3 authority that has oversight on projects along the
4 highways. And then there's also been municipalities and
5 state authorities that also have oversight.

6 In terms of how projects are financed, we
7 have, for the most part, most of the projects are
8 financed by private company investors and local
9 authorities and these are usually utilities and private
10 investors. And, as I said, sometimes you see the
11 municipalities invest but it's very, very—not very
12 common. And then for fully dedicated municipal
13 projects, financing typically comes from municipal
14 budgets, local banks and other sources such as
15 subsidized regional development and energy efficiency
16 funds.

17 The private partnerships typically have access
18 to investment credits and foreign capital and so even if
19 their private or public partnerships, by virtue of them
20 being a private entity and a partner, they do have
21 access to the foreign investment credits.

22 Are there special or higher incentives or tax
23 credits? In general, installations on public
24 properties are subject to the same rules and financial
25 support. They really don't make an exception for public

1 property.

2 What are the ownership and revenue structures?

3 There's investor led projects and these are, as I said,
4 the most common. There's public, private partnerships
5 which are now starting to emerge as being more common
6 but certainly way less common than the investor led
7 projects.

8 And then we have a number of other different
9 revenue structures, cooperative projects, energy
10 contracting, public ownership and operational
11 responsibility and ownership by a municipality
12 administration.

13 And I think that's it. Thank you. Any
14 questions?

15 CHAIRMAN WEISENMILLER: Thank you. More
16 observations. I was going to note that in the first
17 round of administration, looking at his energy policy at
18 that point, one of the three elements was basically
19 using public facilities in a leadership role in dealing
20 with energy efficiencies and renewables. Obviously,
21 this program has a lot of resonance now in the new
22 ground administration.

23 I think in terms of one of the things—but
24 obviously with the budget realities we have to do a lot
25 of this work with public private partnerships. But I

1 think certainly the solar highways program, the German
2 example of theirs interest I would note that in the
3 Governor's campaign document he was specifically calling
4 for solar highways in California. I would also note
5 that certainly PG&E's experience with-back in the days
6 of their bankruptcy was solar in schools which was the
7 most popular thing PG&E had ever done in the 2000 ish
8 period in terms of focus groups, polling and everything
9 else that had remarkable public support. So again, I
10 think, in terms of encouraging all the utilities to look
11 at extending and expanding those types of programs.

12 MS. CORFEE: And I also think that the carbon
13 allowances was a pretty interesting way of financing it.
14 The other thing that-one of our key questions that I
15 kind of skipped over, Commissioner Weisenmiller and
16 Commissioner Peterman, is the waterways. I know in
17 California we have a lot of irrigation waterways and
18 there's really no similarity to the market in Germany or
19 Spain or Austria and Switzerland. So for waterways in
20 Europe they're talking about beautiful rivers and it's
21 different than irrigation in remote areas so what we
22 found were very few, if any, examples of DG projects
23 along waterways and what we found was that there was a
24 lot of public pressure against projects along water ways
25 for obvious reasons. It was hard to develop the

1 parallel there for waterways.

2 CHAIRMAN WEISENMILLER: I did notice that you
3 also mentioned the railroads were obviously a difference
4 between the role of the railroads here versus there at
5 least in some attempt to use those waterways.

6 MS. CORFEE: Yeah. The feed-in tariffs in
7 Germany specifically called out Germany railways but
8 we've seen no example of projects along railways.

9 CHAIRMAN WEISENMILLER: And I guess the other
10 thing is that interest adversely, we haven't gotten very
11 far in solar but the noise abatement walls. Are you
12 trying to do that along the freeways?

13 MS. CORFEE: What's really interesting about
14 noise abatement walls is that they're looking at it as a
15 way to fund noise abatement walls. So the solar
16 component of the project can actually provide enough
17 revenue to fund the noise abatement walls. And often
18 time that's where you see the instances of public
19 private partnerships where the public entity is funding
20 the noise abatement and the private entity is funding
21 the solar and then there's a subsidy for the two.

22 COMMISSIONER PETERMAN: Do public buildings
23 face a different rate structure than commercial or
24 residential buildings in Europe?

25 MS. CORFEE: No.

1 COMMISSIONER PETERMAN: Thanks.

2 MS. CORFEE: So there's municipal utilities and
3 sometimes they're publicly owned but it's a private
4 corporation set up to run those municipal utilities so
5 it's spate

6 CHAIRMAN WEISENMILLER: Thanks.

7 MS. KOROSSEC: Next, we'll hear from Julia
8 Donoho from Sonoma County.

9 MS. DONOHO: My name is Julia Donoho and I'm
10 from the County of Sonoma. I work in the Architecture
11 Division of General Services so I build things rather
12 than generally providing view on energy although in this
13 case I have built a fuel cell power plant and that's why
14 I'm here today.

15 A little background first about Sonoma County
16 since I'm here to talk about how do you put facilities
17 on state properties or government properties. Our
18 course has been a long one. In 2002, we had a
19 consultant evaluates our facilities for greenhouse gas
20 emissions and that consultant identified three aspects
21 to our impact on greenhouse gas and that was commute,
22 buildings and fleet. And the consultant identified some
23 projects that we could do to reduce our greenhouse gas
24 footprint.

25 Out of that we did a landfill gas project and

1 that's capturing and turning into power the landfill
2 gases. We set a course for demonstrating policy and
3 leadership in energy and environmental goals. What that
4 turned into then was a community protection plan for the
5 County of Sonoma in 2006. That, again, identified
6 commute buildings and fleet as our main source of
7 greenhouse gas and energy impact. That plan came up
8 with a plan for us to add hybrids to our fleet, electric
9 vehicles and hybrids I should say and to do a variety of
10 energy efficiency measures and to add co-gen and in that
11 case it suggested distributed generation of 1.2
12 megawatts for our load.

13 It recommended hiring an energy services
14 company which we followed through with. We hired—we did
15 an RFP, it took about a year to hire our energy services
16 company. We did an inventory grade audit that took
17 about another year. So by 2008, we were ready to go
18 with a comprehensive energy project. At the conclusion
19 of the Climate Protection Action Plan for Sonoma County
20 also the Board of Supervisors of our county made a
21 resolution to go beyond Assembly Bill 32 and greenhouse
22 gas reductions with targets of 20 percent below 2000
23 levels by 2010 and 25 percent by 1990 levels of 2015,
24 which is coming pretty quickly. We have a challenge.

25 I want to thank Heather for putting this

1 together today. This is very inspiring that ya'll are
2 doing this and the Governor of 20,000 megawatts by 2020.
3 Binding or not, the County of Sonoma will always strive
4 to meet and exceed any targets you give us.

5 So our energy services company did an
6 inventory grade audit and came up with about 170-180
7 measures of efficiency and generation that we could do.
8 We limited those by payback and other goals and came up
9 with a list of 101 measures that seemed feasible of
10 which we're trying to pursue each.

11 And then that was further limited by three
12 primary goals. One was cost neutrality, second was--
13 well, first was greenhouse gas reductions, second was
14 positive financial impact and third was infrastructure
15 renewal. So we came up with a package of 38 measures in
16 24 buildings that include energy efficiency lighting,
17 water valves, controls on each HVAC, new HVAC, new
18 boilers and a 1.4 fuel cell power plant. All together
19 in Sonoma County we now have our five to six megawatt
20 landfill methane, we have 820 kilowatts of solar for our
21 1.6 million square of buildings.

22 I would like to talk about rooftop but I'm
23 going to reserve that for a minute.

24 We have 1.4 megawatt fuel cell. Currently
25 it's utility supplied natural gas not green natural gas.

1 We have a PACE program, Sonoma County Energy
2 Independence Program Property assessed clean energy
3 where we've issued--approved \$53 million of loans for
4 distributed generation on residential and commercial
5 facilities. We have another one megawatt of biogas of
6 compost in development at our landfill and we have an
7 aggressive EB program. Also the Sonoma County Water
8 Agency has two megawatts of solar at three different
9 installations, 2.64 megawatts of hydropower. We have a
10 chicken byproduct biogas facility of 5.6 megawatts in
11 development. The water agency has a goal of carbon free
12 water by 2015. They're also looking at geothermal and
13 they have 22.4 megawatts of renewable energy in
14 development including wind turbine, wave energy they've
15 looked at at the coast and a community choice of
16 aggregation of feasibility study is in progress.

17 Also, we're eager to implement some Bloom
18 Boxes so we're trying everything that we can and we
19 think that you can too.

20 For our fuel cell, 1.4 megawatts. We chose a
21 combined heat and power plant because we placed it at
22 our central mechanical plant where our boilers and
23 chillers are. We had created the central mechanical
24 plant years ago to serve our whole campus. Our load
25 characteristics for electrical energy are 800-900

1 kilowatts nighttime energy winter kind of
2 characteristics or not continuously that much. And
3 going up as high as two-and-a-half megawatts on a summer
4 day. Our current agreement with PG&E is to have
5 uncompensated export because we kind of have a bigger
6 fuel cell than our total minimum load and that was a
7 difficult thing to negotiate but we've very grateful for
8 PG&E for that. The interconnection was a little bit
9 difficult because it had to come through at the same
10 time that they were dealing with San Bruno and the staff
11 was quite busy but they made it happen. They were
12 terrify to work with.

13 We have a net generation output meter on our
14 fuel cell but we do not have one on our 12KV system so
15 we can only at present see when we're generating zero
16 and when we exceed zero, I mean when we're not exporting
17 zero and when we exceed zero—I mean when we're not
18 exporting zero and when we exceed exporting—when we
19 start exporting we see that but we don't see our load
20 characteristics between the 800-900 and the 1.4. We do
21 have meters on all of our buildings but we don't have
22 them digitized. They're not smart meters. They could
23 be smarter. The cost to make each meter smarter is
24 about \$25,000 a building that wasn't included in our
25 energy project but if you have a campus that might be

1 something that you need to look at.

2 The reason that we ended up with 1.4 megawatts
3 was because that was what was available of the
4 manufacturer that we had already entered into
5 negotiations with had a large contract to provide 50 1.4
6 megawatts to Korea at the same time that they were going
7 to be building ours. Ours is the first article of the
8 1.4 megawatts here in California and so it's the biggest
9 one in place.

10 We would be really happy to get the feed-in
11 tariff in place even for our currently non-renewable
12 fuel cell our demand charges are quite high on days when
13 fuel cell takes down for some maintenance. It's
14 happened once or twice. It could be \$36,000 charge for
15 the month just because we go out for even a couple of
16 hours during the peak time.

17 Comments on the report. I thought it was a
18 great report, well done. For the distributed generation
19 target that the Governor has set of 20,000 megawatts, It
20 didn't really say whether there were partnership
21 potentials. So if you had a fuel cell in an urban area
22 and you offset that with a biomass or biogas or
23 something in another area that might count within that
24 target, that would be something worth looking at. I
25 would recommend that the state portfolio divest in

1 various technologies in load demand response. Load
2 demand wasn't well spelled out in the report, it could
3 be clarified if the 12,000 megawatts is primarily meant
4 to be a 9-5 thing or if it's a 24/7 desire to have that
5 as a backbone for the system or if it's meant to help
6 during peak times and how that interfaces with how the
7 utilities are providing peak loads. I'm not an expert
8 in that area, I'm more of an expert in buildings. I'd
9 like for the report to say surface area instead of
10 rooftop when it refers to buildings, certainly there's a
11 lot of skyscrapers and some of the highest load centers
12 that have curtain wall possibilities in which case
13 rooftops are not a great area compared to the floor area
14 and the demand of the building. Also, it's my
15 experience as an architect having done a lot of
16 different kinds of energy projects that PV on roof
17 doesn't really run a whole building, it doesn't really
18 successfully run pumps and motors and lights and
19 electric requirements all together. It's never a
20 complete system for a building so you need to have
21 multiple ways in high load centers for providing things.
22 Also rooftops are frowned upon in our county because of
23 facilities maintenance issues. Rooftops, speaking as an
24 architect, are three percent of construction costs. I'm
25 also an attorney, rooftops are 50 percent of lawsuits in

1 the construction industry. The damage from leaking
2 roofs, mold and deterioration of buildings is huge.
3 Adding solar on top of rooftops with different life
4 expectancies is problematic. Maintenance issues are big
5 when you put solar on rooftops. Even removing barriers.
6 Solar is great for daytime load but maintenance, I look
7 at Alameda County which is one of our models we liked
8 what they've done there, rooftop though is a huge
9 maintenance issue on top of that rooftop solar. The
10 fuel cell is just one little box in the back of the lot.
11 You can imagine the difference in terms of facility
12 difference. Also, a building's useful life is 50-100
13 years. The roof's useful life is maybe 20 and then it
14 has to be replaced. So we are on a continual program of
15 replacing roofs and that may not be the same as the
16 solar systems useful life, especially if you're trying
17 to put them all on a bunch of roofs at the same time.
18 At least you'd want to coordinate that of when you're
19 putting a new roof on.

20 Another reason why I'd like to see the report
21 reference surface of buildings rather than rooftops
22 only, not just that curtain walls are available, but
23 also the International Green Construction Code is coming
24 out in 2012 that will go beyond what CALGreen is now
25 doing for building codes and it will require higher

1 efficiencies and effect the design of buildings in their
2 form and envelope the shape of the buildings and all of
3 those things and that is an area of opportunity for
4 state owned facilities, all facilities really, it's a
5 very forward looking code and won't be as impactful here
6 in California because we have CALGreen as it will in the
7 rest of the country. Let's take advantage of what it's
8 offering or going to require and look at that a little
9 bit.

10 Also, what I'd like to say is that solar as
11 shown in the report is five to nine acres per megawatt
12 so 12,000 megawatts looks to me to be about 60-108,000
13 acres. From my estimation what you're looking to do is
14 to provide a solar farm the size of the City of
15 Sacramento and that's a huge environmental impact, even
16 if you've spread it around the State of California.
17 Fuel cells take up 1/20 of an acre, I'm not here to say
18 fuel cells are better I'm just saying they're something
19 to look at with this. So that's about 600 acres to
20 provide 12,000 megawatts over one square mile. And
21 there's no CEQA review because CARB has certified fuel
22 cells as ultra clean.

23 Finally as an architect I want to put on my
24 architect hat. Are there any other architects in the
25 room? Okay. So I have the floor and I'm going to take

1 advantage of that. I'm a member of the AIA, American
2 Institute of Architects, and Regional Urban Design
3 Director for the AIA Redwood Empire and also the Vice
4 President this year.

5 From a planning point of view, I'd like to see
6 your report add some other partners for your effort.
7 One is agriculture. The Agriculture Commission seems
8 missing here with the irrigation water and composting
9 and biogas and all those sorts of things. I think
10 that's a real opportunity for you. Also, what you're
11 looking at is that you're basically farming the Earth's
12 natural resources for energy - solar, wind, hydro,
13 fossil fuels. Whatever you're using, you're basically
14 farming it similar to growing food. Similar to if you
15 can create some sustainability between all the growing
16 of food we do here in California and the creation of
17 that energy to create a net zero that would be an
18 excellent thing to be looking at not that that effects
19 the state buildings as much but those are state
20 facilities.

21 Also, another potential partner is the
22 Strategic Growth Counsel. They're doing the planning
23 for the high-speed train and if Caltrans doesn't really
24 want solar along the highways then maybe get it into the
25 high-speed train corridor and get your bang for the buck

1 at the same time as they're building because that might
2 be easier than retrofitting.

3 Finally, I'd like to also--also, if you do
4 something along the corridor you have that great
5 opportunity to bring the biogas and the biomass to the
6 side and have fuel cells along there pumping energy into
7 a grid that's distributing back to the urban centers.
8 But there will be more urban centers along the Central
9 Valley if the Strategic Growth Counsel's report come
10 true of what happens once you put that in place.

11 I'm looking at the train because we're putting
12 a train in in Sonoma so it's a big deal how you change
13 your urban infrastructure and how you change
14 redevelopment, SB 375, all those are part of the energy
15 equation. At the same time that we're trying to catch
16 up, we need to look forward and get ahead of the game.
17 You have 10 years forward to look. What's this going to
18 look like in 2020. What will you have accomplished now
19 that we've been through this process, it's been nine
20 years since 2002 when we did our first report and we
21 have now, we can check that we did this, this, this and
22 this. And this is where we're still going so I would
23 urge you to do the same. Thank you.

24 CHAIRMAN WEISENMILLER: Great. Thanks. A
25 couple of questions. One of them is as we were marching

1 forward at least--anyways, the question in part going
2 forward is trying to figure out a way to do partnerships
3 with the local governments in this area to try to build
4 off of expertise. Obviously, you have a lot of
5 expertise in this area that we could benefit from along
6 with I'm sure other local governments. I think that may
7 be, I think we mentioned earlier, that we're trying to
8 do a working conference later in the summer and again
9 this could be a topic there. The other thing that's
10 interesting to look at is when you look at our federal
11 partners, particularly looking at military installation
12 in California, I'm going to cite particularity the Navy-
13 Marines under the ex-Chair of the Commission Jackie
14 Pfannenstiel. Who had very aggressive policies on
15 reducing their energy use by energy efficiency and also
16 by using renewables in bases in California. That again
17 sets a good leadership role for all of our.

18 I guess the last thing is one of the things
19 that the State Treasurer, the Governor's Office and I
20 have been working on is trying to deal with commercial
21 retrofit and one of the things that we've been
22 encouraging the utilities to expand the on-bill
23 financing programs. I don't know if that would be of
24 assistance or not in your operation.

25 MS. DONOHO: For on-bill financing we are

1 pursuing every kind of financing. And yes, we've looked
2 at that for certain projects that have under the 16 year
3 payback, is that the one with the—we have ARRA funds,
4 on-bill financing, all sorts of things going on. I'm
5 not the right person to talk to that matter though. In
6 terms of partnerships, we're also trying to create lots
7 of partnerships and we'd be happy to help in that area.

8 CHAIRMAN WEISENMILLER: That's good. The
9 Governor and the Treasurer have a high priority in
10 really trying to move along commercial retrofit. And so
11 are then interested in learning more about the financing
12 side such as on-bill or other ways to do that but
13 certainly trying to move forward.

14 MS. DONOHO: The interesting thing in the
15 International Green Construction Code which is not in
16 the CALGreen code that we've just adopted here in
17 California is that it will require commercial retrofit
18 projects to meet energy targets and sustainability
19 targets. Only the first TI of a core-and-shell project
20 would have to meet any of those targets in the CALGreen
21 but in IGCC, I think anything over 10,000 square feet or
22 50 for sure, will have to, even if it's a retrofit or a
23 remodel, will have to start meeting all the same targets
24 as new construction. Over, say, 20 years it will pretty
25 much hit all facilities.

1 CHAIRMAN WEISENMILLER: Okay. Thanks.

2 COMMISSIONER PETERMAN: So how where your fuel
3 cell and energy efficiency projects financed?

4 MS. DONOHO: We financed our projects through
5 incentives, grants and financing through Bank of America
6 421710 financing. We had a slightly bigger project
7 planned but we cut it back that first fall to make sure
8 it would be cost neutral the first year but then net
9 zero impact to the county budget which was kind of
10 difficult because we took out some projects that we
11 really wanted to do, some infrastructural renewal and so
12 forth. But we wanted to make sure that it files
13 smoothly and does pay back in a short time. I think our
14 estimate though was over the 25 year period, we'd pay
15 back \$40 million for a \$22 million project.

16 CHAIRMAN WEISENMILLER: Andrew, go ahead.

17 MR. MCALISTER: I just wanted to make a point
18 of clarification. This is Andrew McAlister from the
19 California Center for Sustainable Energy. Sonoma County
20 is actually doing an on-bill finance program through the
21 water utility. And SDG&E also has a fairly aggressive,
22 I think, well done on-bill finance program in their
23 utility territory. Very little discussion has been done
24 on the financing—at this point it hasn't been brought up
25 much today. Financing is really totally key for getting

1 the smaller end of the DG spectrum done and that's
2 really a big gap in the marketplace right now. We have
3 PACE, we don't have it right now but we will have
4 commercial PACE in a number of jurisdictions in the next
5 year or so. I would suggest, I really just wanted to
6 clarify what I perceived as Commissioner Weisenmiller's
7 question, but I would suggest that commercial PACE could
8 be a very good strategy in incorporating it in this
9 planning effort in the near term and not wait until
10 residential PACE gets figured out because commercial
11 PACE is basically ready to go. Thank you.

12 COMMISSIONER PETERMAN: Thank you, Andrew.

13 MS. KOROSEC: All right. Thank you, Ms.
14 Donoho. Now we're going to shift gears once again and
15 go to our last panel of the day on research development
16 and demonstration efforts and that's going to be led by
17 Linda Spiegel from the Energy Commission Staff.

18 MS. SPIEGEL: Hi. Good afternoon. In the
19 interest of time, I'm going to skip through some of
20 these slides and go through some of these quicker. I'm
21 Linda Spiegel and I'm with the Research Development and
22 Demonstration Division of the Energy Commission and in
23 particular I'm with the Energy Generation Research
24 Office. I'd like to acknowledge my college shown here
25 who put together this presentation.

1 So what we're going to do here, I'm thanking
2 the panel for taking the initiative for going ahead to
3 sit down, I'm going to provide a very brief overview of
4 PIER's efforts in distributed generation. Then we're
5 going to have a panel of five people talk about some
6 select projects that we've sponsored. And then in the
7 end if there's still some energy in the room, we'd like
8 to seek input from the attendees on the direction that
9 you think research should go in this area and if you
10 don't have a lot of energy by then, then we would still
11 appreciate it if you provided it in writing.

12 Just in case you don't know, PIER is Public
13 Interest Energy Research. We get about \$86.5 million a
14 year for research to look at--to conduct research on
15 science and technology in areas shown here, energy
16 efficiency, renewable transmission distribution,
17 climate, environment and transportation. I'm not going
18 to talk about this because you've heard about it all day
19 but I just want to mention that all of our research
20 initiatives at PIER are driven by policy and are tied to
21 policy. And now we have also the Governor's Clean
22 Energy Jobs. You've heard about the challenges already
23 today. We've listed most of them again here, these are
24 just some of them. PIER often lists its challenges as
25 their opportunity for research. In the Renewable

1 Generation Office itself, this shows some of the goals
2 of that program. In particular, they demonstrate
3 integrating renewable energy at three levels - utility,
4 community and buildings. They like to address the
5 integration barriers and provide reliable access. They
6 look at projects to increase storage and improve
7 forecasting. All of which you've heard a little bit
8 about earlier today.

9 This is an example of some of the work we do
10 in our community scale projects that's called RESCO,
11 Renewable Energy Secure Communities. We are currently
12 funding 11 projects in this area and just to summarize
13 the purpose of these projects, they have to demonstrate
14 three technologies that are indigenous or that are
15 locally available to them with the goal of meeting 100
16 percent of that particular community's energy needs.

17 Again, we have 11 different projects. You'll
18 hear from some today so I won't go into a lot of detail.
19 One example is the UC Davis West Village. The purpose
20 of this is to provide all of the energy needs for about
21 3,000 families that include homes, education and
22 recreation centers and retail uses. And you can see the
23 plan technologies here. In addition to energy
24 efficiency and demand response, they're using this array
25 of technology so it's a pretty interest project.

1 Another one is our Santa Rita jail. In this
2 particular instance, we are demonstrating integrating
3 smart grid.

4 Other research involving distributed
5 generation, involved digesters. We are looking at
6 taking organic waste and reducing the waste stream while
7 producing electricity and other products such as soil
8 amendments. We're looking at ways to reduce
9 construction operation and upfront costs of solar
10 technologies in the environmental area. We've heard a
11 lot about the problems of permitting today, we're
12 sponsoring a lot of research on that in our
13 environmental group as well as we're looking at the
14 potential of photovoltaic on landfills, closed
15 landfills. In California, there's something like 225
16 closed landfills. And there's an estimated potential of
17 about 7,000 megawatts of electricity from those so we're
18 looking at the feasibility for those. In addition,
19 we're putting together a roadmap to help understand the
20 co-benefits of air quality and using alternative fuels
21 and renewables so we have a lot of things going on in
22 this area.

23 The purpose today is to ask the panel to
24 discuss these questions, I won't go over each one
25 because it's on the agenda so in the interest of time,

1 but in addition we'd like to hear from people outside of
2 the panel, what they would like to see the R&D role take
3 in distributed generation. Where usually the biggest
4 barriers are where we can help—we can try to help solve
5 those barriers.

6 So again, if you have energy, we'd like to
7 hear it at the end of this otherwise please provide it
8 in writing. So with that, I would like to introduce our
9 panel members and have them start right away. They can
10 come up here in order that they're shown. Jan Kleissl
11 of the University of San Diego will start.

12 MR. KLEISSL: Thank you. Firstly, I'd like to
13 thank the sponsors for our research, the DOE high PV
14 penetration program and actually will have, by chance, a
15 workshop in Sacramento on June 13th on the Future of High
16 PV Penetration so may be worth checking out for some of
17 the attendees here. And then, the PIER program has been
18 sponsoring us so special thanks to (inaudible) who's in
19 the audience who has been guiding our research in the
20 California Solar Collaborative, further CPUC and Sanyo.

21 Repeating these questions here, focusing on
22 the main things that I will focus on today. One is
23 technologies and components that we are developing, we
24 are looking at utility issues with DG and distribution
25 technologies and what are further directions that we

1 need to take in order to accommodate the increased
2 amount of renewables.

3 We've talked about this before already here
4 today. So we have distribution system impacts off of
5 renewable generation so that the voltage changes
6 primarily where we may have wear and tear on all this
7 generation equipment and potentially reverse power flows
8 and then we also have transmission system impacts.
9 We're looking more into the bulk system with total
10 generation from renewables opposed to demand. There,
11 again, we begin to distinguish between two scenarios.
12 One is a low penetration scenario we've still in where
13 we have some forecast errors and these forecast errors
14 will lead to increased and reserved costs and also
15 inefficient transmission scheduling. Rather if you go
16 into very high penetration scenario, we may be looking
17 at having curtailment of renewables and need storage.
18 But we're talking much, much higher than we are right
19 now.

20 People have talked earlier about data that we
21 already have from DG systems. Actually this map shows
22 from CCSE the metered computer systems in the SDG&E
23 region. So actually we have here, in the red color,
24 metered systems so we actually have a very rich database
25 here that is collected by the CSI program to allow us to

1 analyze already what are some of the impacts from DG in
2 terms of aggregate generation and the correlation
3 between different systems.

4 And also some of our own research at UC San
5 Diego we have built up computer systems but also a high
6 frequency monitoring station that allows us to monitor
7 every second the radiance exchanges there.

8 Here are some examples of the computed from
9 the CSI database of the systems in the SDG&E territory.
10 This is 2009 data, here there were about 15 megawatts or
11 so of PV systems that were metered at that time. This
12 shows the two largest ramps that we found over the whole
13 year. This is November 29, 2009 and September 29. And
14 we see that, in generation, if we look at the aggregate
15 generation from all of the facilities, it's actually a
16 very nicely behaved curve that follows the cycle of the
17 sun. That's not too much risk here in terms of shorter
18 variability. But sometimes you do get rapid changes, so
19 on this date it was foggy in the morning then it became
20 quickly clear across SDG&E territory so resulting in a
21 strong ramp up here of 60 percent of max in 60 minutes.
22 And here it was the opposite in that it was clear in the
23 morning and then it became quickly cloudy across the
24 system and then it started on a down ramp of about 43
25 percent in 30 minutes.

1 The ramps themselves aren't really the big
2 deals here. The question is rather can we forecast
3 those ramps or not. If you can forecast them, then
4 they're much easier to deal with because we can already
5 get the generations schedule that can then take care of
6 the over generation that will occur. So that's
7 something that research still needs to do to see if
8 research can predict those ramps in the days ahead or at
9 least in the hour ahead forecasts and what conditions do
10 we have more likely these large ramps. Is it going to
11 be marine layer days, totally fog days, what types of
12 conditions are causing these large ramp features. And
13 that's still something that we're evaluating and also
14 evaluating how good the forecast models are for
15 forecasting these ramps.

16 Here's one example that's striking for
17 California. It was mentioned earlier, that in Germany
18 forecasting is a little bit more easier because cloud
19 systems are visible for thousands of miles before it
20 actually hits the country. In California we have the
21 coastal phenomenon which are much more difficult to
22 predict which are the marine layer clouds. There's an
23 example here of a satellite map versus a weather model.
24 See here the coastline and you see the satellite shows
25 the clouds to be inland versus in the American weather

1 model shows the cloud to be offshore. The error is
2 small for the meteorologist, it's a 20 mile error in
3 terms of predicting the chart front but in terms of
4 predicting the DG generation for the time period it
5 could be a dramatic error because much of the generation
6 is within that narrow band along the coast.

7 Then Carl Lenox before from SunPower talked
8 about the smoothing, the geographic smooth. In fact, we
9 have study that also. But we have a very, very small
10 area. It's about 1,200 acres but even though it's a
11 very small area, we've already seen the effects that the
12 variability issues are much less over the entire campus
13 than it would be for one single site. So this just
14 shows for one day what the irradiance was. In the
15 morning, it was overcast, brief sunny, overcast and then
16 cloudy again. You can see how we would expect from one
17 single site measurement, which is the blue line, than if
18 we had six sites we can average those six sites to see
19 what the variability is going to be for that average.
20 So we see it in some time periods in the morning, there
21 was no benefit from the diversity because all sites
22 behave the same as they'd all be cloudy or clear at the
23 same time.

24 But in other times, in the afternoon, it was
25 very intermittently cloudy but that was only at certain

1 sites it was never a cloud that covered the entire
2 system at once. So the green line shows you in the
3 afternoon down ramp compared to the single system which
4 was more noisy.

5 So that shows you how it's not immediately
6 obvious how you can characterize this geographic
7 diversion effect but what we did is we coded all the
8 different sites in our campus where we took the distance
9 between the sites for the distance means less
10 correlation and we looked at the time scale for these
11 sites, so we looked at one second fluctuations versus
12 ten minutes or one hour. And then divide this distance
13 by the time scale, basically you can exactly map out the
14 correlation would be between these different sites. So
15 high correlation means it's bad because it'll all go up
16 and down at the same time. Low correlation is good
17 because it will basically balance out each other. We
18 see how we can really model very well how the geographic
19 diversion is going to occur so for small distances we
20 see high correlation and for high distances we see a
21 small correlation.

22 So we have now developed a tool based on these
23 findings that allows us to predict for a given day how
24 much will be the effect of that geographic diversion.
25 So we're looking at two examples. One is the

1 distributed generation example that we have two sites
2 that are smaller or we have one smaller which is larger
3 and we look at the expected power output from these
4 different scenarios and so the black line shows you a
5 single panel or one sensor has a lot of fluctuations in
6 power output but if you go to the clustered site we see
7 a reduction already because even over one site we see
8 some geographic diversity and if you go this site, we
9 see even more reduction. The most sites that we put on
10 the further we space them apart and the shorter time
11 scales look like the more this diversion effect will
12 occur and we will see more output from the aggregate
13 system.

14 So this is now possible to now, basically,
15 apply this to any distribution feeder or the Cal ISO
16 grid to figure out what is the effect of geographic
17 diversity.

18 Moving on to forecasting. So forecasting as
19 you had from Germany, was very important to reduce the
20 reserve requirements and the reserve costs with the high
21 PV penetrations scenario. So all goals are to have
22 interhour forecasting that's highly accurate, up to 90
23 percent or more, to look at forecasting enabling the
24 spatially diverse network to be looked at as a firm
25 generation resource based on knowing exactly how much it

1 is going to produce.

2 Integration of energy storage is also
3 plausible if you have forecasting. And finally we want
4 to reduce the use of nonrenewable PV penetration than
5 we'll have better forecasting.

6 Our focus has been on the short term
7 forecasting, small area forecasting that we can use sky
8 cameras to track clouds. There's a camera looking down
9 at a mirror. The mirror reflects the entire sky into
10 the camera, basically a fish eye, and then we can figure
11 out where the clouds are by using image processing on a
12 computer.

13 Here's examples of cloud systems that we have
14 observed. The nice thing here versus a satellite images
15 that you can actually really see in the middle of clouds
16 which would just give you one single pixel over this
17 area and so you can now see we have cumulous clouds
18 here, lots of cumulous and cirrus clouds and the impacts
19 of these cloud systems on different PV generations in
20 areas are quite different because we have thick clouds
21 or over here we have thinner clouds that are larger so
22 they will impact the distribution generation a lot
23 differently.

24 So what do we do? Once we have the clouds in
25 the image we can basically figure out where they are

1 moving to, that gives us these cloud vectors, then we
2 can erect a frozen cloud field into the future and do
3 the forecast for where various cloud shadows will end up
4 a few minutes or tens of minutes ahead.

5 This shows an example of a movie, it doesn't
6 seem to work very well, but anyways we can see here that
7 we can project this cloud field over an area and we can
8 see how these clouds move through the area and it
9 actually correlates very well with what we found from
10 our ground measurements so we can do this in very, very
11 high fidelity over a small region.

12 From these forecasts, we found that we can do
13 actually a better percentage forecasts which is unique
14 for this technology. We also need to acknowledge that
15 with one camera we can only see a certain portion of the
16 sky, actually between 10-25 minutes the scene will be
17 out of the field of view which means that's your maximum
18 forecast view that you can use with a sky camera system.
19 If we further develop this and we imagine looking at the
20 LA warehouse rooftop potential then we can see there are
21 areas in the LA basin that these PV sites can go in on
22 rooftops-warehouse rooftops. We can imagine then
23 basically sprinkling out a few sky cameras and cover
24 these areas where we have the highest level of
25 penetration to provide high fidelity forecasts over a

1 larger region.

2 So let me finish with some directions for our
3 R&D, some expertise from our leaders in forecasting of
4 solar irradiation and solar power output so we can
5 already distinguish between different timeframes and
6 times that are important. With a day ahead forecasting,
7 that means that for tomorrow here satellites and sky
8 cameras are not of much use because there's too much
9 history that goes by between the image and the forecast
10 time so usually you use better models that you can watch
11 it on television. Here, as we noted before there are
12 special challenges here in California because of our
13 unique meteorology we have the winter frontal systems
14 that are more typical in Germany but we also have marine
15 layer clouds and fog and all of these have dramatic
16 effects on generation so we need to study more how well
17 these forecast models perform in these different
18 meteorological conditions. Then we want to develop
19 better models so we can basically use high resolution
20 rapid refresh simulations that can seek out better and
21 resolve clouds better and resolve more of these fine
22 spatial gradients that we see near the coastline where
23 the conventional models aren't just fine enough to
24 simulate those.

25 Finally, merging different techniques where

1 satellites and sky cameras can give us information that
2 model cannot have and we can mush them all together and
3 get an ultimately better forecast.

4 Now changing timescales to interday and
5 interhour forecasting means that two to three hours
6 ahead but up to eight hours ahead. And that's the
7 satellite that's usually the primary tool for doing
8 those forecasts. There again, we could evaluate how
9 good are the satellites for these forecasts and also
10 look at how can we get more accurate satellite models
11 working. For the interhour we have the Sky Imager
12 noting that the FERC NOPR will suggest that it will have
13 15 minute intervals for emissions scheduling which means
14 that interhour forecasts will become much more important
15 going forward. However, we have a limited horizon of
16 viewings so we need to integrate satellites and Sky
17 Imaging to get both the fine details but also having the
18 large view of the satellite and then ultimately looking
19 at the models to be more accurate in simulating how,
20 basically, solar irradiation goes through the clouds and
21 how it's bouncing back and forth between different
22 clouds.

23 I want to emphasize that we're doing all this
24 in collaboration with industry so we're actively working
25 with Cal ISO, Andrew Sanders working with them on solar

1 forecasting demonstrations, we're also working with
2 several companies that do forecasting commercially to
3 make sure that our research is going into the
4 marketplace.

5 I think you heard two weeks ago from Byron
6 Washon, he is also a natural collaborator with us and
7 he's keeping us real. He's telling us what's important
8 and what we should focus on in our research.

9 Here are a few more things that we can focus
10 on in terms of where are these forecasting tools going
11 to be useful. The DSOs, the control software
12 developers, that integrate the software into controlling
13 inverters, the ISOs certainly in terms of increasing its
14 ability to solar generation, also creating virtual power
15 plants, doing tech transfer and also here another link
16 for a workshop that just happened two months ago, the
17 DOE CPUC workshop where the main focus was on the high
18 PV penetration and many of these issues were discussed
19 there.

20 Also finding funding sources so we're right
21 now in front of DOE-CPUC and CEC RESCO projects looks
22 fully collaborative and also a CSI program to conduct
23 the solar resources and forecasting analyses.

24 This is my contact information. Thank you
25 very much. I'm happy to take any questions.

1 CHAIRMAN WEISENMILLER: Thanks.

2 MS. SPIEGEL: Okay. Our next speaker is
3 Roland Winston of the University of California - Merced.

4 MR. WINSTON: Commissioners, distinguished
5 audience. RD&D is very extremely important for the
6 advancement of any technology, and solar technology in
7 particular, I will illustrate this and hopefully
8 convince you of this with some examples.

9 We are the new Advanced Solar Technology
10 Institute in the UC system. The previous speaker is one
11 of our members. Our members include UC San Diego, UC
12 Berkeley, UC Davis and UC Merced.

13 Our intent and our desire and our mission is
14 to create technologies that are efficient, affordable
15 and good for California, and in fact good for the
16 planet.

17 I've already shown you who our members are and
18 we were founded by the University of California about a
19 year ago and our really-our mission is to thrive,
20 prosper and grow. And we've already grown from through
21 one campus to five in the space of just one year.

22 Our various members do wonderful things in
23 technology. You've just heard the work from UC San
24 Diego. UC Davis is involved in many technologies
25 including PV. Berkeley is especially good in

1 nanotechnology which has PV applications. UC Santa
2 Barbara is famous for the nitride devices which capture
3 the blue part of the spectrum.

4 I came to California from University of
5 Chicago. One of my first experiences was with the
6 previous Governor and then I learned what California's
7 all about. He came to visit our lab.

8 We have students is really what we do and
9 which is why I started by saying that RD&D is so
10 important. What do we do? First of all we advance
11 technology. We create the next technology, tomorrow's
12 technology which is actually useful today and which is
13 probably even more important is that we train the next
14 generation of students who will be the leaders in this
15 new emerging technology of energy.

16 I told you I'd give you some examples. One of
17 the first things that we did was develop a concentrated
18 PV system working with two entrepreneurs from Silicon
19 Valley and we used our—we're good in optics. We used
20 our knowledge in optics, their zeal to be entrepreneurs,
21 we use the very best solar cell device available which
22 is the multi junction cell and almost 40 percent
23 efficient and we came up with a rather nice design which
24 has been very, very successful. The company is located
25 in Mountain View. They're doing very well. They're

1 multinational, they have multi-megawatt projects in
2 California, as I'm sure most of you know, and we take
3 great pride in that. We started it, and one of the
4 slide shows, with a very, very small PIER grant. Did I
5 mention that here? Somewhere I mentioned that. From
6 small acorns, right? So this \$75,000 EISG grant
7 produced this. Okay? One example.

8 The example of RD&D, research, development and
9 demonstration.

10 Okay. Solar thermal. We've heard a bit about
11 solar thermal today. It's actually very important. It's
12 the most efficient of converting solar energy to energy
13 that you can use. Solar energy to heat is a far more
14 efficient process than solar energy to electricity
15 through photovoltaics. So whenever heat is your desired
16 end product you don't want to go through electricity,
17 you want to go directly to heat.

18 What we do in that regard is that we designed
19 solar collectors which produce heat of up to about one
20 degree Centigrade about four degrees Fahrenheit. No
21 moving parts so I think that those of you that are
22 familiar with solar thermal systems expect that every
23 one sort of has the flat plate collectors that don't
24 move but they're really low temperature or something
25 that's pretty high temperature, something that's 300-400

1 degrees Fahrenheit maybe higher but all of these things
2 are tracking, creaking and moving and leaking. In our
3 case, nothing moves. These are flat, totally stationary
4 collectors and we track with optics not with mechanical
5 parts.

6 The first thing we did was develop this
7 technology under the CEC auspices those were good days
8 when we could go to the CEC with an unsolicited
9 proposal, get them to listen to you and actually get
10 this funded. I would really urge the CEC to consider
11 that tradition, it's a marvelous thing to do.

12 The reason I say that is because when you have
13 solicitations—if you know ahead of time what should be
14 developed, you're really missing the important
15 development. So what you want to be able to do is be
16 open to new things and let those things go forward if
17 you can.

18 In any case, we developed this collector. So
19 its characteristics are 50 percent efficient at 200
20 Centigrade, 400 Fahrenheit. In other words, every
21 square meter, you can think of it as a 500 watt heater
22 at this high temperature which has many, many
23 applications. You can displace natural gas. You can—
24 but the application which appealed to us was solar
25 cooling. Solar cooling is a good application because

1 the need for cooling is rather well matched to the
2 availability of sunlight, rather well matched.

3 So therefore we built a 25—I should say 25
4 kilowatts thermal collector system which powers a six-
5 and-a-half ton double effect chiller. That's up and
6 running at our campus in Merced. We commissioned it a
7 week ago, I hope some of you in this room have already
8 seen it. I hope more of you will come and visit.

9 That's an example of what the value is of
10 RD&D. We develop new technology, technology that didn't
11 exist before. We do it with the help of public agencies
12 such as the CEC. Our technology seems to catch on. One
13 of the students in that picture and some fellow students
14 have started a company and now another company has also
15 started up. So two early stage companies have already
16 started up on this technology so I expect you'll be
17 seeing a lot more of that in the near future.

18 Our Executive Director Ron Durbin is in the
19 room and I hope you get to know us a little better and
20 we're very glad that you're hear and that you listened
21 to us. Thank you. Any questions?

22 CHAIRMAN WEISENMILLER: Thanks for your
23 presentation and for coming today. I would say that I
24 and Michael Picker and others visited you last year. We
25 certainly were very impressed by the operation there,

1 particularly for such a young campus, and I guess I was
2 going to ask you to say a few words about the
3 forecasting techniques developed at Merced since we just
4 heard the San Diego part.

5 MR. WINSTON: I think that they're quite
6 complimentary. The ones that we've heard from Jan are
7 very--they're very dependent, they're very tied to
8 beautiful instrumentation. I was very impressed by
9 those fish eye cameras. The one in Merced I would say
10 is more analytical. It uses very genius techniques for
11 optimizing sort of numerical procedures, sometimes
12 people call them genetic algorithms. I think they're a
13 little more analytical based. In fact, basically they
14 are a technique for trying to predict very chaotic
15 processes which is what weather is. In that respect
16 they're useful not only for solar forecasting but I
17 imagine they can be turned into wind forecasting and
18 lots of other applications.

19 CHAIRMAN WEISENMILLER: In terms of the
20 thermal applications, moving back towards what you
21 talked about, it's--California uses a lot of thermal
22 energy and sort of major projects in terms of any of
23 this oil recovery, some agricultural drying and
24 obviously in some of the refineries. The question in
25 part is what do we need to do to basically commercialize

1 some of the solar thermal applications for those types
2 of uses which are pretty significant uses of natural gas
3 or oil in California?

4 MR. WINSTON: That's a wonderful question.
5 Not a week goes by when we don't listen to and host or
6 go visit perspective users of solar technology. I've
7 visited the Bakersfield oil fields where they use steam
8 for recovery. I think that there's an enormous
9 opportunity for this technology all over the state,
10 agricultural—I'm just overwhelmed by how many things one
11 can do with this. How can the CEC help? I think pretty
12 much what you've been doing, more of what you've been
13 doing. We do talk to you, we have friends in this room
14 and I think that if I were to advise anything, I'd be
15 open to suggestions and not always have the solution all
16 worked out. In other words, when you offer
17 opportunities for research, try to be broad enough so
18 that the specific techniques aren't always laid out
19 beforehand.

20 CHAIRMAN WEISENMILLER: I was going to say,
21 back in the 80's the state reduced its soft oil
22 emissions by about 25 percent by converting the enhanced
23 oil recovery from steaming oil to natural gas so I'm
24 assuming ultimately if we want to try to reduce our
25 greenhouse gas emissions, the more we can shift that,

1 and obviously production is falling off over time, but
2 the more that we can shift that more to solar than
3 opposed to gas or some of them are now—given the
4 difficulties of doing CHP with the utilities
5 historically, some of them are shifting back more to
6 using oil and steam boilers as opposed to the more
7 efficient gas-fired cogeneration. So again, it would
8 seem like a rational use, the more we can use this sort
9 of technology into these applications could have very
10 significant benefits for the state.

11 MR. WINSTON: Absolutely, the temperate rate
12 is right. The conditions in the oil fields are really
13 ripe, I mean, they're rugged. You don't have to worry
14 about aesthetics or anything. Just put your solar
15 collector where you need them and when that well is all
16 used up, you just moved it. It's quite portable. So I
17 think it's a great application, I'd love to work on it.

18 CHAIRMAN WEISENMILLER: My impression was that
19 last year you were also looking at the advancements in
20 technology more towards electricity generation. Where
21 does that stand at this stage?

22 MR. WINSTON: Well, we do have a project with
23 the Commission on improving the DC to AC by more
24 granularity. The micro inverter, even going down to the
25 single cell level so that's our project with you.

1 Another project that is very dear to my heart is it's
2 possible to combine—so take two seconds, this actually
3 came from your predecessor. Art Rosenthal and I would
4 talk a lot and he would late at night, as you know, and
5 he would always ask me at the end "What can you do about
6 reducing the temperature of photovoltaic panels because
7 they get too hot and their performance goes down."
8 Okay, so one day I call him and I say, "Art, I've got it
9 for you. What you should do is not just try to reduce
10 it by some special selectivity but actually cool it,
11 cool the panels and use the heat." And we have a
12 proposal, and we've talked about it some, where you have
13 the combined moderate temperature, good enough for hot
14 water but out comes electricity at the same time. So
15 the idea is that you have—so the really good hot water
16 solar collectors are not flat plats. No, no, no.
17 They're vacuum tubes. That's the one that's really
18 taken over the whole world, that's the vacuum tube
19 collector. Now it turns out—those that depend on vacuum
20 and selective coating. It turns out that a thin film
21 solar material like amorphous silicon is naturally
22 selective otherwise characteristics that make
23 photovoltaic material much more photovoltaic also makes
24 it transparent to infrared so it's much more selective.
25 So what do you do? Instead of using a conventional

1 selective coating on these vacuum collectors you put in
2 an amorphous silicon and we think it's about the same
3 cost. And suddenly every solar tube has two wires
4 coming out and the user will have their hot water and
5 their electricity. We think that's a rather good
6 direction and we'd like to work on it.

7 CHAIRMAN WEISENMILLER: Thank you. Carla?

8 COMMISSIONER PETERMAN: Thank you.

9 CHAIRMAN WEISENMILLER: Thanks again.

10 MS. SPIEGEL: Okay. Our next speaker is James
11 Zoellick from Humboldt State University.

12 MR. ZOELICK: Good afternoon, everybody. I'm
13 from the Schatz Energy Research Center at Humboldt State
14 and I'd like to, first of all, thank the Commissioners
15 for allowing me to participate today. It's a pleasure
16 to be here.

17 Okay. Great. Thank you. So I'm going to
18 talk today about some work we're doing up in Humboldt
19 County, some renewable energy planning work and we're
20 basically looking at large scale development of local
21 renewable resources in Humboldt County. The things that
22 I want to focus on are talking about how the work we're
23 doing in Humboldt County can be used as a case study for
24 local energy planning in other California communities
25 and also talk about the analysis and modeling tools that

1 we've developed to do the work that we've been doing and
2 how that might also be transferred to other communities.

3 So first of all, I believe, Linda was talking
4 earlier about the PIER Renewables Program RESCO project.
5 The project that I'm talking about today is funded under
6 the PIER Renewables RESCO Program and just to quickly
7 cover what is RESCO. It's Renewable Energy Secure
8 Community, a community that has achieved local energy
9 security through the development of their local
10 renewable energy resources as well as high levels of
11 energy efficiency and there's a lot of additional
12 benefits that come with that. Potentially more stable
13 energy prices, more stable supply of energy, local jobs
14 and economic stimulus, I'll talk about that a bit, as
15 well as meeting climate protection goals and I'll also
16 talk about that quite a bit, and certainly other
17 environmental benefits as well.

18 So our project is funded by the CEC PIER
19 renewables programs, there's some matching funds from a
20 local headwaters fund, Pacific Gas and Electric, our
21 local owned investor utility is one of our project
22 partners and also contributes some in-kind cost share.
23 The project team on this project is led by the Redwood
24 Coast Energy Authority and Matthew Marshall, the
25 Executive Direct of RCEA is here with me today. They

1 are a local joint power authority, they're made up of—
2 their Board is made up of elected officials from all of
3 the local municipalities and then RCEA is partnered with
4 the Schatz Energy Research Center. We're the lead
5 researcher on this project and the, as I said, Pacific
6 Gas & Electric is providing some data and technical
7 assistance.

8 The goals of our Humboldt RESCO project are to
9 create a strategic plan, to meet 70-100 percent of our
10 electric demand and a significant fraction of heating
11 and transportation energy needs with our local renewable
12 resources. Humboldt County is a very resource rich area
13 with regard to local renewable resources and the 75-100
14 percent goal is ambitious. I know there's some other
15 California communities with similar goals. One thing,
16 just to put in context, for Humboldt is a large part of
17 our electricity generation is currently provided by
18 three local biomass power plants and those plants meet,
19 it depends on the year, but roughly from a third to a
20 half of our local energy needs. We're a long way toward
21 the goal of 75 percent already. Our strategy has been
22 to develop a real bold long-term vision with these
23 aggressive goals but also to identify real-term next
24 steps so that we can actually start to implement things
25 in the near term and build our way toward the long-term

1 vision.

2 And our focus has also been on maximizing
3 benefits to our local community. I'll talk more about
4 that. Really we've put a lot of focus on engaging our
5 local stakeholders in our community and a very strong
6 effort on broad participation from many stakeholder
7 groups including business, finance, labor, economic
8 development as well as environmental groups and energy
9 and renewable energy advocates. And we feel like it's
10 really critical that we have that broad buy-in to really
11 move this forward.

12 We think that the project that we've put
13 together and the team that we've put together is really
14 a successful combination. As I've said, the Redwood
15 Coast Energy Authority is a joint powers authority.
16 Their very well politically connected, obviously, if
17 they're elected from all of our municipalities are
18 represented on their Board as elected officials.
19 They're really a public face in our community. They
20 were established back in 2003. They provide energy
21 planning, energy outreach and education and energy
22 implementation services to the County. They are a
23 partner with PG&E in the Energy Watch Program and
24 providing energy efficiency services. And then they are
25 teamed with myself and my colleagues at the Schatz

1 Energy Research Center. We bring a real strong
2 technical leadership to the table. We feel like we've
3 got pretty unbiased research, we are basically there to
4 represent our community. We think that that combination
5 is a real successful one and I think maybe other
6 California communities may look at as well. Certainly,
7 the JPA model that the RCEA has put together could be
8 done anywhere and I think that there's a lot of
9 communities that also have universities, colleges,
10 community colleges as well that they can really engage
11 in these kinds of joint venture ships.

12 The team that we've put together, we've
13 accomplished putting together an energy element for our
14 county general plan update. Also, coming out of that
15 was the identification of a need for an action plan for
16 energy and really the RESCO work that we've been funded
17 to do is the first step in that long-term action plan.
18 Then there's also climate action planning happening
19 through a number of municipalities. And obviously those
20 things all tie together.

21 Most of the rest of what I'm going to focus on
22 is a couple of the tools and models that we've put
23 together to do the analysis work. Our focus has been to
24 look at the ability of Humboldt County to utilize our
25 local renewable resources to meet our local energy

1 demands. And also to look at a broad diversity of
2 supply and demand site options and to look at what are
3 the optimal mixes of different supply and demand side
4 resources. The way that we've sort of defined optimal,
5 from a number of different standpoints, but we're
6 looking at things such as overall cost of energy
7 services, greenhouse gas reductions and job creation and
8 local economic stimulus.

9 This is a kind of a busy schematic, I'll try
10 to go through it rather quickly. This is our schematic
11 of our energy planning optimization model. The key
12 inputs here are really energy demand and installed
13 capacities of various supply technologies. On the
14 demand side, we're looking at electricity, heat and also
15 a need for transportation energy. We're also
16 considering, there's a couple of arrows there that
17 somehow got shifted out of place—they should drop down a
18 couple of boxes, but we're looking at fuel switching
19 measures in the heating and transportation sectors so
20 converting from natural gas or propane to electric heat
21 pumps and from fossil fuels in the transportation sector
22 to electric vehicles. And we're looking at doing that
23 because we do have a large supply of renewable resources
24 up there and if we developed them at a large scale we're
25 going to need to either improve our transmission

1 capacity as a County or basically develop local demand.
2 And we're looking at both of those things.

3 On the supply side, we're looking at an array
4 of different renewable resources locally as well as
5 power from the new PG&E Natural Gas Power Plant that was
6 just repowered and is very well suited to follow
7 intermittent renewable. It's 10 16-megawatt combustible
8 engine generators. And then balance support, look at
9 import/export electricity storage is something that
10 we've been considering as well, as well as load shifting
11 on the demand side.

12 So we've run this model, it's essentially a
13 single node energy balanced model, sort of a dispatch
14 model if you will. We make sure that each hour of the
15 day, we're meeting the demand with the available supply,
16 depending on the mix that we've come up with. We do
17 this over a year's period and then in post-processing,
18 we look at the overall cost of energy for the resource
19 mix that we've come up with, job creation impacts and
20 other local economic stimulus impacts as well as
21 greenhouse gas implications. And so we're basically
22 then able to wrap an optimization algorithm around this
23 and we're able to reiterate and key-in optimal mixes
24 based on some of those criteria. Here's an example, and
25 again it's bit of a busy slide but I'll talk you through

1 each of the sections of this. On the right hand side is
2 an optimality curve. So what we've done here is
3 establish a business as usual case so the access, the
4 horizontal access, is cost and percent of business as
5 usual starting at 100 percent. And on the vertical
6 access is carbon emissions and percent of business as
7 usual. And so, for instance, where the red circled dot
8 is there, we've allowed the overall cost of energy
9 services to go up by about five percent and then run the
10 model through a whole bunch of different potential
11 resource and demand mixes and look for the lowest carbon
12 emissions at that five percent cost increase and so off
13 to the left-hand side you can see the supply and demand
14 side measures that were arrived at. On the supply side,
15 on the top there, there's capacity so it's not energy
16 provided but just the capacity available. So the
17 natural gas plan is the existing plant, it's 160
18 megawatts. That's about 60 megawatts of new wind power
19 that does not currently exist. Biomass is shown there
20 at about 120. We've got about 60 megawatts currently so
21 that's doubling our current biomass capacity. We're
22 quadrupling hydro from about 10 to 40 megawatts. And
23 then the import/export capacity shown there is the
24 existing transmission line in and out of the county. On
25 the demand side, we're basically maximizing our

1 efficiency resources and then that's showing heating and
2 transportation, penetration of heat pumps and electric
3 vehicles in those two sectors at about 35-40 percent.
4 And on the bottom we end up with, in this scenario,
5 about 20 percent of our energy provided by natural gas,
6 about 10 percent by wind, about 50 percent by biomass,
7 about 15 from local small run of the river hydro and
8 then the final 5 percent from efficiency gains.

9 In addition, so we do have sort of a
10 simplified version in that optimization model of jobs
11 and economic impacts. We have a more rigorous analysis
12 of jobs and economic impacts and this is basically a
13 standard economic input/output analysis that we've done.
14 It utilizes the inplant multipliers and we've developed
15 models for biomass, wind, small hydro, distributed PV,
16 the natural gas engine generator power plant we've got
17 and energy efficiency. And we've done this—we've
18 utilized where available NREL's Jobs and Economic
19 Development Impact or JEDI models. Those are available
20 or at least when we needed them within a few months
21 back. They had one for wind that was completed,
22 distributed PV was completed and they had a natural gas
23 one that we had to modify somewhat, biomass and small
24 hydro they were working on but those weren't done so we
25 basically reverse engineered and developed our own

1 biomass and small hydro models and then energy
2 efficiency, as far as we know, there's nobody that has a
3 sort of JEDI type model for energy efficiency so we
4 developed an energy efficiency model. All of these were
5 customized for Humboldt County so the economic
6 input/output parameters are customized for Humboldt
7 County and we think they've given us a pretty accurate
8 estimate of the potential job impacts.

9 This is a sample so that the optimization
10 scenario that I showed you a couple of slides back with
11 the red circled dot, this is that same scenario. This
12 is showing the net jobs impact for the community based
13 on that scenario. So you can see both construction
14 phase and operation phase, job development across the
15 different resources. I think what jumps out is both
16 biomass and hydro as being big job generators.
17 Certainly in the operations phase of over the lifetime
18 of the facility, biomass is the big one in terms of
19 jobs. I think this is going to hold true for any rural
20 county, rural community, with lot of biomass.
21 Basically, the fuel source is local, the labor force and
22 the equipment and basally everything that is needed to
23 harvest this as an energy resource is available locally.
24 I suppose for us if we're putting in wind turbines we're
25 not going to be building those turbines locally but—so

1 biomass really generates a lot of local jobs. And here,
2 this was about, net creation of about 400 construction
3 and about 130 operators based jobs.

4 Just wrapping things up here, so some key
5 lessons that we learned so far in the analysis work
6 we've done is that we think we can meet a large fraction
7 of our energy needs using local renewables and in the
8 process, substantially reduce our greenhouse gas
9 emissions. One thing that we found actually is
10 maximizing the percentage of local renewables is not
11 necessarily the most cost effective or cost efficient
12 way of going about reducing greenhouse gas emissions so
13 I think it's important for us to think about what our
14 goals really are that we're trying to achieve and maybe
15 sometimes if we have a percent renewables goal, there
16 might be a point where we might want to relax that if we
17 feel that there is something else we can do that might
18 actually get us the results that we're really looking
19 for. In this case it might be climate change impacts.

20 We think that we, from what we're looking at,
21 that we can do this as a modest cost increase and in the
22 process also create a lot of local jobs and local
23 economic stimulus so potentially a net benefit to the
24 local economy. We came up with a lot of possible
25 resources and technology options. As I said, we have a

1 pretty broad mix of resources up there. I think that
2 there are some optimal mixes but likely some sort of
3 diverse mix would make the most sense. In any case, it
4 looks like that biomass, wind and run of the river hydro
5 will likely play a big role. Electric vehicles, the
6 adoption of electric vehicles and heat pumps, we think
7 is really critical to doing this cost effectively and to
8 lowering our greenhouse gas emissions. Certainly energy
9 efficiency is the key place to start. And distributed
10 generation, and I think most of the projects that we're
11 conceiving and looking at up there, I think can be
12 considered distributed generation. Most of the probably
13 below 20 megawatts. But in terms of at the customer
14 site, behind the meter types of distributed generation,
15 we think that they can play a smaller but important role
16 and one thing that I think that we see, and I've
17 certainly heard this today, that there is a tremendous
18 amount of interest and support in our communities for
19 distributed generation. And I think if, for no other
20 reason, there are technical reasons why it makes sense.
21 It's not always the most cost effective but I think
22 there's a lot of public support for it and I think,
23 certainly for us in our local communities, building
24 support for this renewable energy and energy planning
25 vision, including distributed generation in that mix is

1 important in terms of engaging our local community.

2 Finally, just some thoughts on opportunities

3 for further research. In terms of the modeling work

4 that we've done, we feel that we could put this out and

5 adapt it for use in other communities as well. We've

6 actually already been approached by the City of San

7 Francisco's Department of Environment who's interest in

8 perhaps utilizing the optimization model that we've put

9 together. It's going to take some work to—it's been a

10 very customized thing to date so it's going to take some

11 work to adapt it for them but it's certainly possible.

12 Ultimately, we'd like to put together a friendly user

13 interface on it so that it could be more easily

14 accessible for other communities. And then there's

15 certainly—it needs more peer review and there are areas

16 where I think it can be improved or expanded, one of

17 them in regards to the discussion today about

18 distributed generation and we do not look right now at

19 combined heat and power opportunities, and that's

20 something that we certainly could add. And then, as I

21 said, to start with I think that some of the lessons

22 that we're learning in Humboldt may have value to other

23 communities just as a case study. We're a pretty

24 isolated community up there and so reaching a large

25 percent of renewables on the Humboldt grid is something

1 that we can do pretty quickly given that we're already
2 at a large portion with biomass and it's sort of a place
3 where some of these issues with stability on the grid
4 could be done in the area that we're in in a pretty
5 controlled environment because we're so isolated.

6 We have done some work with PG&E and we're
7 looking at doing some just very preliminary power flow
8 studies, interconnection studies for some of these
9 portfolios that we're looking at in terms of a number of
10 local renewable projects. And certainly that's an
11 aspect that I think we certainly haven't gotten much of
12 an estimate of cost from them yet. They're going to try
13 and come up with a first order estimate for us. That's
14 something that's certainly going to add to the cost of
15 what we're looking at.

16 And then finally biomass, as I said, is really
17 a key for our community. I think one of the places that
18 we can certainly expand the utilization of biomass as a
19 resource is in fuel reduction materials. Most of the
20 waste from the current temperate product industry, the
21 mill waste is utilized and has been utilized for years.
22 It's very low hanging fruit. It's available there at
23 the mill once they mill the lumber but the fuel
24 reduction efforts, in terms of reducing fire hazard, and
25 there's a great push to do this by the California

1 Department of Forestry and others but it's expensive to
2 go out there and reduce the fuel hazard and then they
3 end up with piles of slash that sometimes they can't
4 burn. So figuring out ways to make that economically
5 viable as a fuel is, I think, an important thing. And
6 one option that we're looking at in Humboldt and we're
7 partnered with a start-up down in the Bay Area right now
8 is a process called torrefaction. It basically
9 densifies the resource, essentially turns it into a very
10 high energy charcoal type material. It's very stable.
11 It's hydrophobic and it may be a way to more cost
12 effectively getting that diffused resource to energy
13 plants, be it distributed generation or larger central
14 scale generation.

15 That's what I have for you today and I'm happy
16 to take any questions.

17 CHAIRMAN WEISENMILLER: I have just a couple.
18 One of them is in terms of your model structure, is it a
19 linear program model, power flow production cost. What
20 kind of program is it?

21 MR. Zoellick: Well, it's -

22 CHAIRMAN WEISENMILLER: Combinations?

23 MR. Zoellick: Yeah. It's an hourly model.
24 On the supply side, we have hourly wind data, hourly
25 wave data so we're actually modeling the stochastic

1 nature of the resources. And on the demand side, I
2 think we have five or six year's worth of data from
3 PG&E, 15 minute interval data so also some stochastic
4 simulation on the demand side of things. And then, the
5 cost part of it is basically based on lifecycle costs
6 and data from the CEC on production costs of different
7 renewables. Basically, there's an energy balance on an
8 hourly basis and the optimization routine is an
9 evolutionary optimization algorithm that basically that
10 tries to zero in on the optimal solution.

11 CHAIRMAN WEISENMILLER: Other suggestion was
12 that in talking with PG&E of potential joint efforts,
13 I'm sure they'd be happy to catch up with you on it.

14 MR. ZOELLICK: And David is on our
15 Professional Advisory Committee and has really been the
16 key person with PG&E that we've been working with. He's
17 helped us get a lot done in terms of if we need
18 information or data or technical assistance, so he's
19 been a great help. We'd loved to continue to work and
20 partner with them.

21 I think one of the things about-for
22 communities to be able to do this stuff is communities
23 being able to have some choice of where their energy
24 comes from and it's great to do the planning but if you
25 don't have the ability to make some choices then it's

1 not really all that useful. Certainly, there's some
2 communalities looking at community choice aggregation
3 and that's been something that people have talked about
4 in our area as well. Our feeling is that that's not
5 necessarily for every community. We're also interested
6 in exploring other avenues of partnership with the
7 investor owned utility. Even ideas such as a green
8 tariff where local business, local ratepayers could
9 purchase renewables and even renewables from local
10 projects where they see the value of developing these
11 local resources and being able to purchase that energy
12 without having to establish a community choice
13 aggregator. We're certainly interested in looking at
14 any sorts of options that the utility commission and
15 other would be willing to look at with us.

16 CHAIRMAN WEISENMILLER: Well that's great.
17 Certainly David is the one to work with at PG&E. That's
18 good that you two are working hand in glove on this.

19 MR. ZOELLICK: Thank you.

20 COMMISSIONER PETERMAN: And I had a similar
21 questions about the model because I was trying to
22 understand how you incorporate the electric vehicles
23 demand in here and thinking in particular how do you
24 think about vehicle supply versus solely on the supply
25 side?

1 MR. ZOELICK: Right. Well so the electric
2 vehicle model was based on, I believe, some EPRI. In
3 terms of penetration rates and what may be possible, I
4 think some of the work done by EPRI but also there was
5 as study in Oregon for--was it eTec and we actually felt
6 that the work done up in Oregon was, in terms of our
7 northern and rural nature, that that work was quite a
8 bit more applicable. We basically drew on that
9 information. One of the people on our Professional
10 Advisory Committee was at Davis in their Institute for
11 Transportation Studies, he's helped us out with that
12 electric vehicle piece of it. We also utilized the
13 information, in terms of the vehicles themselves, their
14 efficiency, the charging characteristics and basically
15 tried to put together our best estimate of what that
16 would look like. At this point, we do have the ability
17 to do some demand response. It's a bit crude at this
18 point so we don't really have full smart grid price
19 responsive type of interaction at this point.

20 COMMISSIONER PETERMAN: And also did want to
21 mention that at the business meeting last week, we
22 approved funding for a sustainability study of biomass
23 collection to be done by the U.S. Forest Service. I
24 think that'd be a nice compliment for the work you all
25 are doing in Humboldt.

1 MR. ZOELLICK: Okay, great. That's something
2 that we should look at. Just one other thing, I know
3 there was a comment, I believe it was when the woman
4 from Sonoma was speaking. You talked about looking for
5 ways to kind of connect communities. I know we've
6 participated in the RESCO symposium over at Davis the
7 last couple of years but by all means if there's a venue
8 for us to come together with other communities, learn
9 about what they're doing and share what we're doing, we
10 would be very interested in doing that.

11 CHAIRMAN WEISENMILLER: That would be good.
12 As Picker indicated earlier, I guess it was more or less
13 in the first panel by our first speaker, certainly we've
14 been talking to the Governor's Office about trying to
15 have an event where local communities, more later in the
16 summer whether that's July or August, working with the
17 Governor's Office and the UC on that.

18 MR. ZOELLICK: Okay, great. Thanks very
19 much.

20 MS. SPIEGEL: Our fourth speaker today is
21 William Torre from San Diego Gas and Electric Company.

22 MR. TORRE: I'm Bill Torre. Hi. I spoke
23 earlier today. I'm representing SDG&E. I'm Chief
24 Engineer and Manager of R&D activities in the electric
25 transmission distribution engineering at San Diego Gas

1 and Electric Company. We've been conducting R&D to
2 accommodate DG for the last few years. I will be
3 talking about DG integration and some concerns we have
4 about achieving the 12,000 megawatt DG goal and some of
5 the R&D and demonstration projects related to mitigating
6 the impacts on the T&D system caused by high penetration
7 of DG.

8 In our system, the DG is connected to our
9 distribution system of 12 KV and consists of mainly of
10 rooftop solar photovoltaics. This slide summarizes some
11 of the concerns we have regarding DG and I've already
12 talked about some of these previously in--when we talked
13 about European utilities.

14 On another slide later in this presentation I
15 will list a more complete list of the issues related to
16 high concentration of DG. Under operational concerns I
17 would like to emphasize the issue of ensuring resource
18 adequacy and ability to monitor DG output. This will be
19 important if DG is going to become a significant portion
20 of our resource mix. Also, the impact of DG is highly
21 locational dependent. Installations in rural areas with
22 weak distribution lines tend to have more voltage
23 regulation and power quality problems due to DG. We
24 have a number of concerns regarding the planning of
25 electric distribution facilities accommodating higher

1 levels of DG. Volt VAR planning and ensuring adequate
2 planning to meet the existing CVR and ANSI standards is
3 a concern. A short list of mitigation measures is also
4 provided here to address voltage regulation concerns and
5 monitoring of DG. Developing and requiring smart grid
6 inverters to ensure future DG may address both of these
7 concerns.

8 In this last I'm talking about the technical
9 studies that we have done related to DG. We have
10 completed a couple of internal studies looking at steady
11 state impact of high levels of PV. Listed here are
12 technical studies that are being conducted simulating
13 high levels of PV on SDG&E's distribution system. One
14 by EPRI, one by Quantum Technologies and another one
15 we're doing jointly with UCSD and EDSA as one of the
16 contractors which is funded by DOE.

17 SDG&E is also conducting some demonstration
18 projects. Our RD&D demonstration projects to test
19 technologies to accommodate high levels of DG. Our
20 microgrid project in Borrego Springs, which is funded by
21 DOE and CEC, will demonstrate the feasibility of
22 automated balancing of load and generation at a local
23 level. We'll also be investigating an automatic volt
24 VAR control. Another project that we have ongoing is
25 that we will be testing a new type of solid state

1 dynamic voltage support on the existing distribution
2 circuit that is experiencing voltage problems due to a
3 high level of DG. In fact, I'll show you a few of those
4 graphs in a few minutes on the voltage how that's being
5 affected by the high level of DG.

6 Another project we have is we also will be
7 testing energy storage equipment as a way to smooth
8 intermittency of PV on distribution circuits. We have
9 three separate projects investigating energy storage.
10 Each testing a different technology. And we are also
11 looking at other energy storage technologies.

12 This slide shows some of the planned projects
13 that we have going forward. In addition to
14 demonstration projects we're also looking forward at
15 incorporating higher levels of DG to meet the 33 percent
16 renewable target. In our general rate case, we've
17 provided for several projects that will help mitigate
18 intermittency, voltage regulation impact and provide
19 more observability for system operations on the status
20 of DG operation.

21 This map shows the existing PV that's
22 installed in our service territory. We have 12,798
23 locations of photovoltaics. Roughly 80 percent of this
24 is in the coastal region. This represents about 99
25 megawatts of PV generation to reach the 12,000 megawatt

1 goal would require us to increase this 99 megawatts to
2 about 1,000 megawatts. That's a significant increase.
3 This map shows our locations are quite diverse and at
4 present time, there's no control over location.

5 Additional impacts--this slide has a more
6 detailed list of additional impacts. A lot of these
7 have been discussed today, earlier during the first or
8 second session on European impacts. This slide shows
9 more impacts and how they're caused by high level DGs.
10 These included impacts on our voltage and associated
11 voltage regulation equipment, our protection of relaying
12 and accommodating reverse power flow at short circuit
13 levels. The impact of intermittency in the ability to
14 accurately forecast DG in the resource mix, the impact
15 on energy efficiency and increased system losses,
16 possible upgrades required of distribution circuits to
17 prevent thermal overloads and potential power quality
18 problems and changing work practices to accommodate
19 higher levels of DG.

20 This slide shows a daily and actual data taken
21 from one of our circuits that has a large two megawatt
22 PV plant at the end of the 12KV circuit. This
23 particular graph shows the daily cycling. The top graph
24 shows the daily cycling of voltage.

25 One thing that I wanted to say is that the

1 impact of intermittency is a serious concern. It's kind
2 of like not understanding cancer until you start looking
3 closer, under the microscope and then you realize that
4 it can kill you. The following two slides show you
5 successive closer shots as we kind of hone in at looking
6 at one particular voltage graph. The top graph shows a
7 succession of 21 days of voltage cycling on a
8 distribution circuit. If you take one of those
9 snapshots and blow it up to a 12 hour timeframe and you
10 can see there's quite a bit of variation within that
11 timeframe.

12 By the way, when you look at the timeframe
13 here, this also happens to be in the timeframe of the
14 reaction of our LTCs, load tap changer voltage
15 regulators and capacitors. So during this timeframe,
16 you're having capacitors switch on and off, load tap
17 changers go up and down and voltage regulators
18 constantly adjusting. And you can imagine that this is
19 kind of like driving your car and slamming on the brakes
20 every so often. You can imagine how much wear and tear
21 that would be on your equipment.

22 Now, if you take just that one 12 hour period
23 and you take a short period, like a 5 minute period
24 within that, you can see that there's quite a bit of
25 variation right within that 5 minute period. In fact,

1 during a steady state period there shown on the left
2 there, it's actually outside of our CVR limits which are
3 required in our ANSI limits. We've worked really hard
4 to meet this CVR goals to maintain system efficiency.
5 This is actual data from PV that's connected to our
6 distribution circuit, which is driving us out of that
7 range.

8 Some regulatory concerns, we believe that
9 there's a need for some changes in the regulatory
10 statutes and some of the industry standards in order to
11 accommodate future penetration of DG on our electric
12 system. Rule 21 and W-DAT need to be revised. Some of
13 these changes include adoption of new thresholds for
14 allowing PV connection considering off peak periods
15 instead of just on peak periods which is used at
16 present.

17 PV output generally peaks before our peak load
18 requiring low voltage ride-through, which is also
19 important, and frequency group control. I think I
20 mentioned these earlier. And control of monitoring
21 capability similar to the European requirements today.
22 Rule 2 will also need to be modified to include changes
23 to harmonics and voltage requirements. One of the
24 things that I did notice in the European standards is
25 the harmonics requirements are much tighter than ours

1 here.

2 Regulation needs to be considered in how the
3 cost for T&D upgrades for higher levels of DG should be
4 paid for. This is a cost causation issue. And also
5 modification of industry standards are in the process
6 and need to be completed to adopt the use of small
7 inverters for PV that will have advance control and
8 communication capability. Earlier IEEE 1547 and UL 1747
9 was mentioned. And also we need to modify W-DAT to
10 accept smart inverters.

11 In summary, increasing the level of PV
12 penetration with present regulation requirements will
13 have a significant cost to accommodate them on the
14 electric transmission distribution system. SDG&E is
15 proactively conducting R&D to include technical studies
16 and demonstration projects to evaluate ways to mitigate
17 the impact of high levels of DG. The potential impact
18 is real. We have measured the impact on our system. We
19 believe the changes are required in regulatory and
20 industry standards to accommodate the increased levels
21 of DG. Also, I'd like to say in closing that the DG,
22 the closer it is to the substation the less there is in
23 the cost impact. Thank you.

24 CHAIRMAN WEISENMILLER: Thanks, Bill. In the
25 interest of time, I'll just ask one question. You heard

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1 Heather's earlier discussion on the ISO tariff treatment
2 at FERC, obviously that's sort of an ISO issue, a
3 national issue of depending on whether the DG is on--
4 which side of the wall it's on between FERC, ISO
5 regulated PUC regulated. What can we do on the federal
6 side with FERC on that sort of tariff provision?

7 MR. TORRE: FERC is generally--has jurisdiction
8 on the transmissions here in California and most of the
9 distributed generation here is on the distribution
10 system which is out of FERC jurisdiction.

11 CHAIRMAN WEISENMILLER: That's true. As you
12 know there's a real hodge podge between which
13 transmission systems are deeded over to FERC regulation
14 when we went through 1890 so certainly it's hard to
15 generalize say from SDG&E to Edison to PG&E what
16 circuits are where.

17 MR. TORRE: Well our distribution system is
18 12KV. Whereas with Edison, theirs is 69KV system, since
19 it's radial, is considered part of distribution system.
20 There's a difference there. Seems like the appropriate
21 place to have that change in regulation is in the Rule
22 21 which is under CPUC jurisdiction and that would be
23 the place to make the changes, I think, and W-DAT as
24 well.

25 CHAIRMAN WEISENMILLER: Okay. Thank you.

1 MR. TORRE: Anybody else?

2 CHAIRMAN WEISENMILLER: Thank you.

3 MS. SPIEGEL: Our first speaker on this panel
4 is Peter Evans with New Power Technologies.

5 MR. EVANS: Thank you all for staying. I' try
6 to make this interesting.

7 CHAIRMAN WEISENMILLER: I was going to say,
8 you do get the last word, right? In the public comment.

9 MR. EVANS: Actually what I'm going to talk
10 about is sort of interesting. It's an example of some
11 foresight in the Energy Commission, specifically in
12 PIER, now quite a number of years ago that saw ahead and
13 saw the need for some tools that I think are just now
14 coming into their own.

15 At the time we were asking was DG good or bad
16 for the power delivery network. It's basically a
17 religious question. So how you felt about the answer to
18 that question depended on your point of view. So we've
19 changed the topic a little bit for the purpose of this
20 session today where we're not even talking about the
21 power of the delivery network. We're just saying DG.
22 So it really is still and we've heard it, heard it and
23 heard it over and over today is that it's still all
24 about the grid.

25 What we've tried to do with the guidance and

1 support of PIER back in the early days in the work that
2 I'm going to talk about is to reframe the question.
3 Specifically, how does a particular DG project effect
4 the grid? This is one project. How does one project
5 effect the grid? And if you know that, you know
6 everything that you need to know about all of the
7 projects.

8 Where can DG projects interconnect without the
9 need for costly upgrades? How many times have you heard
10 that today? That actually wasn't one of the original
11 questions but I put it in anyway because it's timely.

12 And then which DG projects improve good
13 performance? So this has to do with, I think, somebody
14 in one of the earlier panels used the term something
15 like micrositing or it's knowing what happens with one
16 project and one location and if you know that you know
17 everything that you need to know.

18 And then the last thing, and as policymakers
19 we should care about this, can we rigorously value a DG
20 project's direct benefit. It might improve reliability
21 but actually does this particular project, actually
22 improves reliability this amount. And if you know, then
23 you can design incentives that fairly exchange value
24 among the participants.

25 So let's talk about the grid a little bit.

1 This is a real system, it's actually part of the
2 Southern California Edison System, about 1,000 square
3 miles and serves about 280,000 customers. When you
4 think about this as a system this is pretty much what
5 you see.

6 And there's distributed generation in this
7 system. If we go to 12,000 megawatts, there'd be a lot
8 more. Here's the thing. These projects aren't floating
9 out there. There's a whole infrastructure underneath
10 that we really have to understand at a very granular
11 detailed level, still part of the whole system, but down
12 to the individual line segments, individual pieces of
13 equipment, individual devices, individual connection
14 points in order to understand the impacts of these
15 projects on this grid.

16 Every DG project and every location has a
17 unique impact. And so that's the vexing problem, that's
18 the reason why interconnection studies take forever to
19 do and that's why there's big backlogs and that's why we
20 talk about all these concerns. That's because each one
21 of these things is unique.

22 So the technology that we developed with PIER
23 support, since 2002, is this energynet power system
24 simulation. This is an area wide simulation of an
25 integrated transmission and distribution network. It's

1 basically all the white stuff that you saw in the prior
2 slide.

3 This is a single model and a single simulation
4 that determines the power flow through every line
5 segment and the voltage at every position in the system.
6 The model is produced and upgraded by software directly
7 from routinely maintained legacy utility data. So this
8 is armies of people pouring over drawings. It's a stack
9 of CDs that go into the computer and out comes the
10 model.

11 The legacy field sensory data is fully
12 integrated so people who talked about situational
13 awareness. If you have all the field data integrated
14 into the model and a single simulation running, you
15 actually know exactly what's happening in the system
16 under any set of conditions, in any location, at any
17 time. And the single simulation results are validated
18 with field measurements. So this was all demonstrated
19 through a series of PIER grants beginning in 2003 and
20 finishing up, actually the most recent one noted here
21 was completed in 2009.

22 But with this tool we can assess grid
23 conditions at any point in the network, under any
24 operating scenario and we can view direct impact of any
25 change at any point in the network. If you want to add

1 a project, what's the change. If you want to change the
2 (indiscernible) what's the change.

3 DG has a number of impacts, I'm going to go
4 through this quickly because we've heard that about this
5 pretty much all day, but I think it is important to be
6 sort of disciplined about really what are the direct
7 impacts of these projects for two reasons. One is you
8 want to be sure that you've considered them all. And
9 we've heard a lot about voltage which when Rule 21 was
10 first framed, people didn't really talk much about
11 voltage. A lot of project evaluation goes on without
12 direct consideration of voltage. You guys are
13 experiencing it. So it's important to look at all of
14 the categories, all of the impact categories not just
15 the ones that happen to be named in Rule 21 or the FERC
16 SGIP Fast Track. And with the ability we have to look
17 within an individual circuit—people say location
18 matters. Well location really matters. This is kind of
19 a look inside a circuit the way we look at them because
20 we have the granular of every individual line segment
21 and every individual point of every individual circuit
22 in a system. So you might do this hundreds or thoughts,
23 or PG&E might do this 3,000 times and this is a
24 particular path. So within each circuit you have
25 multiple paths because they're like trees.

1 These are individual potential points of
2 interconnection running out from the substation and what
3 this shows is, people talked about strength today, so
4 this is a measure of strength or weakness. There's also
5 thermal ratings of the individual lines segments, those
6 are the blue ones here. And then there's the circuit
7 minimum load. This is the load that you would like to
8 not exceed if you were to avoid reverse flow.

9 So the question is how much PV or where can we
10 put a PV or DG project on here? Well, if we limit it to
11 minimum load you're going to hear around six megawatts
12 but any point on the system. And then we'd like to
13 avoid the weak areas. In this case we used a measure of
14 weakness that's reactance over resistance, it's a ratio
15 of the--there's a bunch of different ways to measure this
16 thing, but if you have the insight of the whole, of
17 every line segment you can calculate these things.

18 So this is going to eliminate some of these
19 points of interconnection. And then, these last few
20 parts of interconnection here, because the thermal
21 irradiance of the conductor is smaller, than those
22 projects would be limited as well. So pretty quickly,
23 we can determine at these points, we can interconnect
24 projects of up to a certain size, each point is a little
25 bit different potentially and it's likely to have a

1 minimum impact. Both in terms of voltage and in terms
2 of overloads. And that's just a quick look.

3 Suppose I want to put a parking lot project in
4 this shopping center, this is one of those circuits that
5 is modeled within the system, and wants to be
6 interconnected at that particular location. It's a
7 mouse click to find all of the characteristics of that
8 location, including the controls in the substation,
9 whether it has a load tap changer, whether it's three
10 face or grounded and what the XOVVR is at that location,
11 how weak or strong that particular location is.

12 And then with a second mouse click, I can drop
13 a simulation of that individual project into a power
14 flow, resolve it and determine what the voltage impact
15 is. We heard some numbers today like 1,2,3 or 4 percent
16 change in voltage at the project location is considered
17 okay. Here we can actually tell what it would be for a
18 given project. So the evaluation of the project takes
19 about as long as I just described.

20 Sub circuit detail levels are important. You
21 can't just look at a circuit. You have to look at the
22 location on a circuit. These types of analytics can
23 help us to identify low impact sites throughout our
24 entire system. We just completed a project for CEC
25 where we looked at this particular power system and

1 identified 83,000 potential locations to interconnect
2 large scale PV projects and we identified within that
3 group 34,000 locations that met all of a pretty rich set
4 of criteria. And we did actual simulations of about 535
5 individual projects at every one of these circuits.
6 That was a large project in terms of the actual issues
7 we evaluated but it's comparable to the backlog of a
8 best run utility and they're looking at their W-DAT
9 backlogs.

10 So of course we have a look at the voltage
11 conditions, and this is going through time, hour six,
12 hour eight for this particular system on a particular
13 day. And we also, using some fancy analytics, can
14 determine locations where there's particular types of
15 resource deficiencies. And we can use those—that
16 information to determine, in this particular case, it's
17 pretty hard to read but these are individual projects—or
18 individual circuits in this system. There's 246
19 circuits in this system and there's a group here that
20 have an unusual vulnerability to random outages. So
21 they're basically less reliable.

22 So we can use these types of assessments to go
23 through and determine where DG projects can yield
24 specific types of operational benefits. And we can come
25 up with a portfolio of projects that will maximize grid

1 performance and we've done that in these studies.

2 And then I would argue that—we have projects
3 that have low impact, we also have projects that yield
4 specific benefits. So now the question is what are
5 these benefits worth? I didn't come up with this list
6 but I really like it, it's a list of benefit categories
7 and in fact, I would argue if that your rule is a
8 benefit to be real has to be quantifiable and priceable,
9 that this is a complete list and any given change to a
10 system will have an impact on one or more of these
11 areas.

12 So for example, we went through this system
13 that I just showed you and identified 24 circuits where
14 DG projects, individual DG projects, would yield certain
15 types of benefits. You can see here that most of these
16 benefits relate to reliability improvement. The reason
17 why reliability improvement is such a big deal is
18 because most of the reliability pain in this particular
19 system has to do with the ability or the inability to
20 shift load after a contingency. DG projects on a
21 particular circuit may open up a capacity for it to take
22 load following a fall where otherwise it didn't exist.
23 And now that sister circuit is more reliable.

24 These are all the benefits that these
25 particular projects yielded in all of these categories.

1 We can do a direct comparison, those projects are
2 actually aggregated in this stack, with controls,
3 resetting the controls for this system, network
4 topology, the addition of three capacitors and you can
5 see these are the value in a single year's value, adding
6 up all of these benefits.

7 And then this is a comparison of those
8 projects with a set of projects that were actually
9 planned by the utility. And you can see that some of
10 the utility projects didn't yield much in terms of
11 benefits and others yielded a lot. What's interesting
12 to me actually in looking at these is that the colors
13 are different. What that tells me is that the DG
14 projects and system expansion projects both yield value
15 but it's different value. It's not one of the other,
16 they're complimentary. There's some things here like
17 load relief that are very difficult to get from a DG
18 project but if you put in a new substation it provides
19 that.

20 A detailed system simulation like this can
21 reveal the direct grid benefits of a particular DG
22 project. It can also compare dissimilar projects along
23 a common set of values and actually that could be
24 applied to any grid investment, it's not just DG.

25 I think this is a great story, of course I

1 have to, this is my project but I think it's a great
2 story of PIER folks having the foresight years ago to
3 invest in something that actually took a long time to
4 develop and was quite difficult but now we can talk
5 about it. So that's a great story for PIER. There's
6 certainly opportunities to extend this type of thing.
7 Any tools that help to understand and manage the
8 interplay between grid and DG or any attempt to
9 understand that interplay requires tools that provide
10 better grid visibility. That's what this tool does and
11 there's certainly opportunity to develop other tools
12 that provide that. All of these challenges that we
13 talked about today would be easier to address with
14 greater visibility into the specifics of the impacts.

15 And then the second thing that I didn't really
16 talk too much about but I think, personally, is really
17 important and the PG&E guys said it. They said their
18 system is reproducing itself about one percent per year.
19 So the legacy stuff that is out there is going to be out
20 there a long time and I think anything that anybody
21 invests in has to work with the legacy data, the legacy
22 systems and it has to be easy to adopt because there's
23 risks involve that may not work and you have to play
24 well with what's out there already.

25 And then I think it's not really R&D I guess

1 but I still think it's important. The DG proponents and
2 the utility customers realize that most of the benefits
3 of DG but utilities bear most of the risk. That set of
4 incentives or misaligned incentives as a policy matter
5 should be addressed and maybe there's research that goes
6 to better understand that. But I think that this is
7 actually a relatively big barrier. We can talk about
8 all the things that could be done but in the end if the
9 incentives are cross wised between the participants then
10 it won't happen.

11 In terms of tools such as the one I just
12 described, if you have rigorous measures of the direct
13 benefits of a particular thing, you know for sure this
14 particular thing will yield these kinds of benefits and
15 it's worth this kind of money, then you have a basis for
16 rational cost sharing and incentives that allow you to
17 exchange value among different participants.

18 So that's all I had.

19 CHAIRMAN WEISENMILLER: Thanks. One thing
20 that would be interesting, from my perspective, to talk
21 about is you mentioned that the utilities bear most of
22 the risk. I guess that's a good questions to define
23 exactly what risks do you see for the utilities from DG?

24
25 MR. EVANS: I guess that's a good question. I

1 should have been more specific when I said this. This
2 set of benefits, the benefits that I listed, were
3 economic benefits. And some economics benefits accrue,
4 for example, accrue service quality as an economic
5 benefit to some types of customers and they realize that
6 benefit and they keep it. But if there's an economic
7 benefit to the utility in terms of cost reduction, that
8 ultimately turns into lower rates. At least for an
9 investor-owned utility, it ultimately shows up as lower
10 rates. So if the utility adopts something, like a
11 distributed generation project, or some new method like
12 this method and it turns out not to work and it ends up
13 reducing reliability or resulting in unexpected costs,
14 then the utility is at some risk and it could be real or
15 it could be perceived but there is some risk if that
16 occurs. When I say the risk it is a little bit
17 intangible, I suppose, it could be a disallowance.
18 There isn't really the financial benefit to adopting new
19 practices or taking on new technologies or doing things
20 different ways. The financial upside accrues to the
21 other participants, it really doesn't accrue to the
22 utilities.

23 CHAIRMAN WEISENMILLER: But again to push you
24 on that, in California we have decouplings, so to the
25 extent that DG reduces sales. And presumably they're

1 indifferent on that and obviously utilities profit
2 mostly through rate based additions but that typically
3 these may or may not displace utility rate base or they
4 may add to it but just thinking about it, it's hard for
5 me to generalize and say that this is really going to
6 chop out utility rate based additions. Certainly
7 reliability and safety, again, are two of the key things
8 for regulation and utilities so it would seem like there
9 would be risk questions to become does this affect
10 reliability or does it affect safety? Or do you at some
11 point raise rates so much that you have some sort of
12 rate revolt to be a potential risk that a utility might
13 be concerned about?

14 MR. EVANS: Yeah, I guess--well, I don't want
15 to go off on too long of a tangent this late in the day
16 but I think it's a great set of questions. I think that
17 it's a good topic. Part of the way that I think about
18 it, and I'm an ex-PG&E person so I'm pretty sympathetic
19 to the perspective of a utility, is first of all
20 reliability is pretty good and safety is pretty good.
21 I'm not sure there's a lot of money out there for
22 utilities, at last in California, to achieve dramatic
23 improvements in those things. It's really more downside
24 exposures than the upside of opportunity. And then the
25 other thing is when we talk about things like new

1 technologies and leveraging legacy systems, in some ways
2 what that's doing is that you may miss out on an
3 opportunity to expand rate based because you're
4 repurposing existing assets or you're getting new value
5 from existing assets by using soft expenditures like
6 software which don't really add that much to rate based.
7 A utility might say, "Sure that sounds great but if I
8 can just replace everything then I can add that to rate
9 based." I'm not sure that the utilities would actually
10 say that but it's easy to see how there's a financial
11 argument that says they should.

12 CHAIRMAN WEISENMILLER: It's late but
13 certainly in terms of written comments, anyone who wants
14 to dig into that more, I'd be interested—I was going to
15 ask Bill the proverbial question, I don't know how much—
16 do you have a similar model on your system? I don't
17 think you've had much of a chance to vet this model in
18 advance.

19 MR. TORRE: Of course we have load flow
20 programs, we do have some linear programming at circuit
21 analysis, we don't have this particular model that he's
22 talking about. But it sounds interesting. We are
23 developing, like I mentioned earlier, a mapping system
24 for mapping available capacity in locations so I would
25 be interested in this to learn more about it.

1 CHAIRMAN WEISENMILLER: I tend to think as we
2 move forward on DG that, again, a bunch of modeling
3 tools that we've talked about like forecasting the
4 weather but anyway we need to have the sort of model
5 development and communication among the different
6 parties to get to the best and to develop the types of
7 models that we're going to need eventually.

8 MR. TORRE: I agree.

9 COMMISSIONER PETERMAN: I just agree with that
10 as well in particularly being able to model some of the
11 environmental characteristics that we mentioned earlier
12 that would be useful for an environmental screen. I
13 don't have any follow-up questions but yes, that was
14 interesting. Thank you.

15 CHAIRMAN WEISENMILLER: Thanks again. And I
16 guess now we're at the public comment phase.

17 MS. SPIEGEL: I would like to thank this panel
18 for the very interesting summary of your research.

19 CHAIRMAN WEISENMILLER: So would we.

20 COMMISSIONER PETERMAN: And actually, I feel
21 more optimistic after this panel because we've spent
22 this morning thinking about a lot of the challenges and
23 it seems that we have researchers who are already
24 working on it. So, well done.

25 MS. KOROSSEC: All right. I have three public

1 comment cards here. I'm not sure if people have held on
2 to the bitter end here. The first is Cecelia
3 (indiscernible). No? We've got one who's bailed on us.
4 Next is Danielle Osborn Mills from CEERT.

5 MS. OSBORN MILLS: Good afternoon,
6 Commissioners. I'm Danielle Osborn Mills with the
7 Center for Energy Efficiency and Renewable Technologies.
8 I would like to thank you for getting these panels
9 together today and the entire workshop, it's been really
10 great to hear different agency perspectives and ideas on
11 how to work toward the 12,000 megawatt goal as well as
12 to hear from different stakeholders.

13 I just have a couple of quick points. Today's
14 conversation first has been heavily focused on solar PV
15 and that's great, I understand why it's obviously sort
16 of developed more than the other technologies but I do
17 want to emphasize the importance of a diverse set of
18 technologies on the grid for the variety of benefits
19 that they can contribute both to customers and to the
20 grid itself. Each technology has its own value, its own
21 environmental benefits, has a different profile and
22 different applications because of that. So we just want
23 to emphasize consideration of fuel cell technology,
24 solar heating and cooling and things like that, micro
25 turbines.

1 We also believe that planning for achievement
2 of the 12,000 megawatt localized generation goal should
3 focus on sort of the transition to a cleaner grid and
4 also the displacement as Bernadette mentioned. In the
5 long-term we're looking forward to other workshops on
6 transmission planning and some of the more technical
7 issues.

8 We also see additional value in customer side
9 installations and I want to, again, echo Ms. Del
10 Chiaro's statements on that. I think that heaving half
11 of the 12,000 megawatts come from customer side would be
12 a great goal, especially when you consider that a lot of
13 that is already online.

14 I'll save the additional comments for the end
15 but we're looking forward to future workshops and happy
16 to see the progress that you've made so far. Thanks.

17 MS. KOROSSEC: Last card I have is for Ray
18 Pingle from the Sierra Club.

19 MR. PINGLE: Hi. My name is Ray Pingle from
20 the Sierra Club of California. Again, thank you very
21 much for this excellent workshop today. We greatly
22 appreciate and support Governor Brown's Clean Energy
23 Plan and particularly the 12,000 megawatts for
24 distributed generation as supported by renewable power
25 payments also known as feed-in tariffs. And I just

1 wanted to bring up feed-in tariffs because we really
2 haven't had that much discussion of that today. I think
3 that probably most of the people in this room have read
4 all kinds of studies and documentation that has proven
5 that the single most cost effective and effective in
6 bringing up large values of renewable energy quickly is
7 a best practices, cost based feed-in tariff program.
8 NREL states that 75 percent of solar and 45 percent of
9 wind has been financed by feed-in tariff programs. We
10 believe that the existing feed-in tariff programs in the
11 state are too modest in size and have pricing mechanisms
12 that are suboptimal in their effectiveness. The
13 existing AB 1969 program, for example, is a very modest
14 program today with 500 megawatts. And even with the SB
15 32, once that ruling is achieved we'll be only 750
16 megawatts. Through the Ram program, which we think is a
17 step in the right direction, but it's only a step. It
18 still has--the good news is that it has a 20 megawatt
19 project size. But it's still a modest program in size
20 with 1,000 megawatts. And we recognize that the PUC
21 does have the discretion to expand the duration and size
22 of that program so if that authority is exercised, that
23 would be a good thing.

24 It has a bidding mechanism opposed to a cost
25 based feed-in tariff mechanism. In deference to the

1 administrative law judge that issues that ruling at that
2 time, that was probably the best he could do given the
3 understanding at that time of FERC limitations, but now
4 with the recent FERC orders in the last six months, they
5 have clarified the latitude that states have to create
6 categories of different types of energy and then have
7 competitive pricing within each category. This
8 effectively allows the state to establish multi-tiered
9 pricing structures which is very close to a best
10 practices feed-in tariff program.

11 We would just really request that the CEC,
12 working with the PUC, the Governor's Office,
13 legislation, all of those appropriate work towards a
14 vehicle—either using a vehicle—a legislative vehicle or
15 a regulatory process to put in place a best practices,
16 cost based, feed-in tariff program of sufficient project
17 size up to 12,000 megawatts. We think all of these
18 other discussions, in terms of meeting the
19 interconnection challenges, the technical challenges,
20 all of these things are great. They're required. We
21 need to make progress on them. But we still won't
22 realize that goal if there's not a financing mechanism
23 in place.

24 And then finally, of course, one of the
25 biggest objections traditionally to feed-in tariffs is

1 that they'll pay too high of a price, there will be a
2 ratepayer impact. The good news, of course, is the
3 dramatic cost in solar prices today and even if a new
4 feed-in tariff program process were to started today to
5 be put in place it would probably be two years before
6 the first contract was signed under that program. By
7 that time the prices will be even lower, probably close
8 to grid parity. We really believe that a feed-in tariff
9 program could offer, for a lower price for the energy,
10 than would be required through the Ram program.

11 And then a couple other problems with the Ram
12 program is it still produces winners and losers. Some
13 people win the bids, others don't. And that's a waste
14 of resources to society and preparing those. And also,
15 it effectively excludes smaller generators. We've got
16 to have a feed-in tariff program to allow smaller
17 generators, particularly, we've had a lot of discussion
18 and presentations on EJ communities, RESCO communities,
19 they're to some extent excluded under the currently
20 programs.

21 So anyway, I'd like to encourage you to work
22 with the agencies and the government to try and get a
23 good feed-in tariff program in place. Thank you.

24 CHAIRMAN WEISENMILLER: Thank you. I was
25 going to say obviously this Commission has looked into

1 the feed-in tariff and been a very strong supporter
2 which we can trace back to my colleague John Geesman
3 when he was here and the 2005 IEPR and certainly the
4 last IEPR produced the KEMA study, so we've taken a very
5 strong position. Obviously, one of my intentions in my
6 IEPR is not to reopen or not to go through that whole
7 record again but certainly to take comments on it. I
8 would note that one of the--this whole renewable market,
9 the developers are much more international in character
10 and you have like an AES whether to go here or China or
11 Europe, where to put or limit their PV cells or wind
12 stuff and at the same time, the Chinese government
13 realizing instead of buying (indiscernible) they're
14 rather buy infrastructure here and invest in
15 infrastructure. What the foreign countries tend to say
16 is that the attraction of going to Europe for the feed-
17 in tariff is it's much easier to monetize things than
18 here where we use the tax equity approach. And somehow
19 they have to find an entity here that has the appetite
20 for using those tax benefits as a way to monetizing the
21 assets. So it's a much more complicated for a Chinese
22 or a Spanish company coming into the U.S. than a feed-in
23 tariff would be in terms of monetizing the value of
24 those investments.

25 MR. PINGLE: Thank you.

1 MS. KOROSSEC: All right. I have one last
2 question on the WebEx. Anthony, you had a question
3 earlier. Your line is open if you'd like to ask it.
4 All right, I think Anthony has left the building.

5 All right. Is there anyone else in the room
6 that would like to make any comment? All right, if not,
7 I think we are done for the day. Commissioner, thank
8 you.

9 CHAIRMAN WEISENMILLER: Again, I'd like to
10 thank everyone for their participation, particularly the
11 last panel and certainly would thank those that are on
12 the lines for following us as long as they did. Anyway,
13 there will be more events. We're looking at an event in
14 June that's going to deal more with some of the DG on
15 the distribution issues again.

16 Yes, would you repeat the comment due date for
17 people? And for those of you who have not had a chance
18 to comment, certainly written comments would be
19 appreciated.

20 MS. KOROSSEC: Comment due date, I believe, is
21 May 31. I'm sorry I don't have my notes in front of me
22 so—

23 CHAIRMAN WEISENMILLER: No, no. Earlier is
24 better.

25 MS. KOROSSEC: The date is in the notice, it's

1 probably the 23rd. It's the 23rd. Pardon me that was an
2 error.

3 CHAIRMAN WEISENMILLER: We think that it's the
4 23rd.

5 MS. KOROSSEC: Yes, we just looked at the
6 notice. It is the 23rd.

7 CHAIRMAN WEISENMILLER: Thanks. We're
8 adjourned.

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10 [Meeting is adjourned at 5:52 p.m.]

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