EFFICIENCY COMMITTEE WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

In the Matter of:	)	
	)	
2008 Order Instituting	)	Docket No.
Informational Proceeding	)	08-DR-01
and Rulemaking on	)	
Load Management Standards	)	
_____	)	

CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

THURSDAY, JUNE 19, 2008

10:00 A.M.

Reported by:
John Cota
Contract Number: 150-07-001

COMMISSIONERS PRESENT

Jackalyne Pfannenstiel, Presiding Member

Arthur H. Rosenfeld, Associate Member

CPUC COMMISSIONERS PRESENT

Rachelle Chong

CEC ADVISORS PRESENT

Tim Tutt, Advisor to Commissioner Pfannenstiel

CPUC ADVISORS PRESENT

Andrew Campbell, Advisor to Commissioner Chong

CEC STAFF PRESENT

David Hungerford, PhD

Nick Fugate

Mike Gravely

Jacob Nesom

Gabriel Taylor

ALSO PRESENT

Roger Levy, Demand Response Research Center

Ron Hofmann, California Institute for Energy & Environment

Diane S. Pepetone, L'Monte Information Services, Inc., California Institute for Energy & Environment

Clay Collier, Akuacom

ALSO PRESENT

Ray Bell, Grid Net

Roland Acra, Arch Rock

Rick Boland, e-Radio USA, Inc.

Michael J. Davidson, Wessex Consult, representing the Australian Greenhouse Office

Karen Herter, PhD, Heschong Mahone Group

Mike Kuhlmann, Residential Control Systems, Inc.

Gene Goodell, Residential Control Systems, Inc.

Jim Parks, Sacramento Municipal Utility District (SMUD)

Andrew Tang, Pacific Gas and Electric Company (PG&E)

Larry Oliva, Southern California Edison (SCE)

Austen D'Lima, San Diego Gas and Electric (SDG&E)

Ken Oestreich, Cassatt Corporation

John Steinberg, Eco-Factor

Charles R. Toca, US&R Power Grid Partners

Steve Taylor, Corporate Systems Engineering

Irwin Weingarten, ICE Energy

Jackson Wang, e-Radio USA, Inc.

Tim Simon, Golden Power Manufacturing

Ed Cazalet, MegaWatt Storage Farms

I N D E X

	Page
Proceedings	1
Commissioner Opening Remarks	1
Introduction and Regulatory Context	4
A Brief History of Load Management Enabling Technologies	12
Public Interest Energy Research (PIER) Perspective	49
Technology Context	61
Regulatory Requirements	83
Afternoon Session	97
Enabling Technologies	
Commercial & Industrial	97
Residential	106
Enabling Communications	
Two-way Wide-band Continuous	132
Two-way Narrow-band "Bursty"	143
One-way Broadcast	163
PCT Demonstration	179
Panel Discussion: Utility Load Management Programs	
SMUD	194
PG&E	204
SCE	231
SDG&E	245
Public and Industry Comments	264
Commissioner Closing Remarks	307
Adjournment	307
Reporter's Certificate	308

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

2 10:05 a.m.

3 PRESIDING MEMBER PFANNENSTIEL: Good

4 morning. Welcome to the Energy Commission

5 Committee Workshop on Load Management Standards.

6 I am Jackie Pfannenstiel. I am the

7 Chair of the Energy Commission and the Presiding

8 Commissioner on the Efficiency Committee.

9 And to my left is Commissioner

10 Rosenfeld, who is the Associate Member on the

11 Efficiency Committee.

12 And to his left we are joined by

13 Rachelle Chong from the Public Utilities

14 Commission, who has been our partner in the load

15 management standards proceeding.

16 To her left is her advisor, Andy

17 Campbell, and to my right is my advisor, Tim Tutt.

18 This is, I think, the fourth of our

19 workshops on load management standards. Each one

20 has been focused on one issue that we identified

21 as being critically important for the development

22 of useful demand response in California. And this

23 one is on enabling technologies, which we sort of

24 broadly and generally define as those technologies

25 that will help with everything else going on.

1 Meters and rates and information to bring the
2 demand response to the level that we want it to be
3 and that we believe it should be.
4 It looks like a very long and busy and
5 meaty day today so I am going to be, perhaps,
6 playing a little harder with the gavel than people
7 are used to seeing here at the Energy Commission.
8 We are usually pretty informal. But we do have a
9 lot to cover. And we have a lot of material that
10 is going to be important to get in front of us on
11 the record, where we up here on the dais, and I
12 think the staff, want to make sure we cover it and
13 that we understand it and that we move along.
14 So I am going to keep people moving
15 along. I am not going to have a lot of patience
16 for, you know, product pitches. We really do want
17 to get the information out on what's out there in
18 terms of hardware and technologies but we do want
19 to keep it moving so we can get as much
20 information squeezed into our day as possible.
21 So with that warning and that welcome
22 let me turn it over to Gabe Taylor.
23 MR. G. TAYLOR: Good morning. My name
24 is Gabe Taylor. I am the project manager for this
25 proceeding.

1 Before we get started some quick
2 housekeeping. For those of you new to the
3 building there are some restrooms just across the
4 hall, right outside that exit. There are two
5 exits to this room. There is a snack bar on the
6 second floor which you can go to at a break with
7 your visitor badge, you don't need to get badged
8 in.
9 Also if there is an alarm. And you
10 won't be able to miss it, it will be very, very
11 loud. If there is a fire alarm the exits are over
12 here and the front door here and will follow --
13 please follow the employees out across the
14 streets. Catty-corner to the park across the
15 street. Thank you very much.
16 And again to echo the Chairman's
17 statement there. It is a very full day. Please
18 keep your comments on topic.
19 And I would like to remind you that we
20 welcome written comments at any time and those
21 will be included in the record for full reviews.
22 Thank you.
23 I will introduce David Hungerford,
24 Dr. David Hungerford, who is the load management
25 standards technical manager.

1 DR. HUNGERFORD: Does that mean I am
2 also the IT manager? I seem to be having trouble
3 with these these days.
4 CPUC COMMISSIONER CHONG: That's why we
5 have Gabe.
6 CPUC COMMISSIONER CHONG: And Gabe, is
7 there a plan when the ceiling tile falls?
8 (Laughter)
9 PRESIDING MEMBER PFANNENSTIEL: Run out
10 of the room.
11 DR. HUNGERFORD: Those have all been --
12 All of those have been taken down and reglued.
13 Let's just hope that the new, environmentally-
14 friendly glues hold a little better than the old
15 style. All right.
16 Many of you who have attended earlier
17 workshops have seen some of these slides but there
18 are some additional slides as well. This load
19 management standards proceeding was created to
20 assess -- The purpose of it is to assess rates,
21 tariffs and software protocols and equipment and
22 other measures that would be most effective at
23 achieving demand response. And the result will be
24 to adopt regulations and take other appropriate
25 actions to achieve a responsive electricity

1 market.

2 The purpose of this proceeding is to

3 obtain public input on potential standards. To

4 explore in some ways the potential of peak load

5 reduction and load-shifting strategies. And then

6 to coordinate with other authorities in the state

7 to make sure that these policies can be carried

8 out effectively.

9 The workshop schedule. It is the same

10 slide I have been using since the 29th of April.

11 We are moving towards the bottom of it, which is

12 good. We are at July 10 -- We are at June 19 and

13 there will be one more workshop on July 10.

14 Okay. The objectives of today's

15 workshop on enabling technologies are to

16 understand the policy implications of different

17 types of communication systems and enabling

18 technologies. There are many available and many

19 out there but there are certain policy

20 considerations that we are trying to achieve in

21 using them. And that can affect which choices we

22 as the Energy Commission choose to make.

23 To discuss the capabilities of currently

24 available near-term enabling technologies and

25 communications platforms. And to obtain public

1 input on the potential use of the Energy
2 Commission's authority to the further adoption of
3 enabling technologies.
4 Let me give you a brief policy context
5 for this, for this proceeding and for enabling
6 technologies in particular.
7 The Energy Action Plan, the current
8 Energy Action Plan, identifies a number of demand
9 response action items. Those things that are most
10 related to what we are doing here in this
11 proceeding are clearly the adoption of load
12 management standards to help build and establish a
13 demand response infrastructure.
14 To facilitate progress on dynamic rate
15 design reform for all customers.
16 And to approve programs that utilize or
17 to provide input to programs approved at the CPUC
18 that utilize advanced metering, tariff and other
19 automated demand response infrastructure.
20 There are three necessary components for
21 demand response. You clearly have to have
22 advanced metering so that, so that usage can be
23 measured on at least an hourly basis.
24 You also have to have tariffs that
25 reflect the cost of service at different times of

day. And those tariffs create the incentives to respond. And if properly designed, provide a more equitable pricing by reducing costs to customers with lower-than-average peak usage who are currently subsidizing customers with higher-than-average peak usage.

You also have to have price and event communication to the customers. Information is necessary for customers to take action and the rates provide the motivation to respond.

Enabling technology allows customers to automate that response and make the response and respond more easily and with greater volumes of load.

And certainly larger customers can use price and event communication to hook into automated systems they already have and manage their load more effectively.

The underlying logic of demand response policy is first, reliability. Voluntary price response can reduce the probability of emergency events occurring. Even day-ahead notice of an event can, theoretically if enough people respond even a small amount, reduce the probability of needing an emergency response that next day.

1 The ISO is already incorporating many of
2 these features in their markets and different
3 kinds of DR products will be -- as we talked about
4 last time -- will fit into those markets to
5 provide different kinds of reliability as well as
6 day-ahead type reductions.
7 And of course there is always the need
8 for emergency response to deal with true emergency
9 -- system generation failures, transmission
10 outages and other such, other such events.
11 But demand response can make the need to
12 respond to a supply shortage event less or even
13 eliminate it.
14 Efficiency. A long-term goal is to
15 improve the system load factor. Time of use and
16 dynamic prices improve customer awareness. The
17 evidence is quite clear from studies across the
18 country. And improve the ability of customers to
19 manage their own usage.
20 Attention to load shift strategies by
21 all customers, the evidence is clear -- large
22 customers as well as small -- reveals potential
23 for efficiency improvements that people otherwise
24 would not be aware of or would not have paid
25 attention to.

1 Another policy issue is demand response
2 can reduce costs and reduce bills. Including
3 demand side options does create downward pressure
4 on supply prices. And the ISO markets are clearly
5 reflecting an attempt to try to create a
6 possibility of doing that.
7 And reduction in the peak load growth
8 rate, which is currently growing faster than total
9 consumption, delays or eliminates the need for
10 generation and transmission investments solely to
11 meet peak load growth. There are clearly other
12 reasons to improve the transmission
13 infrastructure. But certain investments made
14 solely to meet peak load growth would be avoided
15 and that is a source of cost reductions.
16 Other major issues, energy conservation.
17 Price differentials drive changes in consumption
18 behavior and customer expectations for when and
19 how they can use power.
20 The experience of peak reduction, it is
21 clear from experiments and pilots, leads to spill-
22 over energy conservation. Probably through the
23 mechanisms I described earlier where the awareness
24 of paying attention to one's consumption in a more
25 careful ways reveals waste or reveals unnecessary

consumption.

And ultimately if we are reducing kilowatt hours we are reducing, we are reducing greenhouse gasses. And that fits, that's the place that demand response is in, in an overall AB 32 greenhouse gas reduction strategy.

There's also another potential benefit that is being explored now and that is for using dispatchable demand response to help balance renewable generation. Which could, in theory, increase the amount of renewable generation that the system can use.

Okay. The underlying principles for the future of demand response. And this is a staff perspective, it is not official Commission perspective at this point.

The first one is Commission policy and it has been for 15 years. Customer choice. Dynamic rates accompanied by adequate education can give individual customers the opportunity to choose which end uses to shift or avoid. Implicitly expressing the value they place on their specific end uses.

Economic efficiency. In theory we would prefer people to drop the lowest value load off

the system rather than the highest value load. Currently many of the demand response programs go after, because it is easier to get because the costs of getting it are less expensive, go for high-value load. On a very hot afternoon residential air conditioning is a high-value load. Industrial production is a high-value load.

We would rather first facilitate the ability to reduce low-value loads off the system. Squeeze out ways to find uses that people can do without during periods of need before we start asking people to reduce their comfort or reduce their productivity.

Small amounts of demand response from a large number of customers may well be the best way to achieve economic efficiency cost reductions and customer choice. A little bit from a large number of customers gets the same amount of demand response as a small amount from a small number of customers and costs less both to the customers and the compensation the customers would have to get to reduce that load.

And of course automation. And this is the segue to today's workshop. Automation makes response easier. Economists use the term

1 transaction costs to refer to two things. The
2 cost of taking the action. Picture a residential
3 customer having to walk over to adjust his
4 thermostat. There is a cost, there is a hassle
5 involved there. The other is the cost of paying
6 attention to making sure you know it is an event
7 day. Those costs for all customers are reduced
8 with automation.
9 And with that we will move on to our
10 next speaker, who is Roger Levy.
11 MR. LEVY: Good morning Commissioners
12 and staff. I am going to make a presentation in
13 the next few minutes and provide you with two
14 things. One, a brief history of demand response,
15 because I was asked to do that.
16 But I want to put that history into
17 context because the foundation for demand response
18 originated, and how it has evolved, actually
19 became the basic foundation for the research that
20 has been going on between the Energy Commission,
21 the PUC, what once was the Power Authority, and
22 the Demand Response Research Center, for the last
23 six years.
24 And I am also going to try to
25 demonstrate how some of that research and some of

1 the initiatives have been bearing fruit. And
2 where we stand with that research and what is left
3 to be done.
4 So what do customers want? And what I
5 wanted to start with is that the interesting
6 aspect about this whole presentation is that it
7 was based, in part, on the vision statement coming
8 out of Working Group 1 that was appropriately
9 titled, Demand Response 2008, a Vision for the
10 Future. That was done in 2002. Six years later I
11 guess this is where it starts to begin.
12 So what I wanted to lay out first is
13 that we started with these four criteria. What do
14 customers want? I want to take off from where
15 David Hungerford left off. That the basic premise
16 for all the research started with the issue of
17 customer choice. And so the best place to start
18 with customer choice is determine what they want.
19 A lot of this work came out of research
20 I am not going to go over that came out of the
21 outages in 2000 and 2001. I am going to try to
22 spend more time on some of the more substantive
23 issues.
24 Let's start with the evolution of demand
25 response. And I apologize for the busy graph.

1 Demand Response actually began in the 1930s with
2 Detroit Edison and some water heater tests, water
3 heater programs. It was meant for building load,
4 not reducing load. And they used time clocks
5 rather than any other kind of control because that
6 is all that existed back then.
7 But their goal was to build off-peak
8 load to compete with gas and other fuels and to
9 basically provide customers a separate rate for
10 water heating. Some of those separate rates, some
11 of those time clock controls, actually still
12 continue to exist in the US in other parts of the
13 Northeast.
14 But in the 1950s those water heater time
15 clock controls began to be replaced with analog
16 radio, FM-types of switches. And those analog
17 radio, FM-switches have actually continued to
18 exist through today. There are many utilities in
19 the Midwest that continue to use the same
20 technology that was first introduced in the 1950s.
21 A lot of those switches, tens of thousands of
22 them, are now in a position to be replaced by
23 those utilities.
24 The goals of those programs in the 1950s
25 also changed a little bit because then the

electric industry was very successful in building load. So the water heater time clock programs evolved into the late '50s, early '60s, to become the first peak load reduction programs.

Air conditioner load control also began to be introduced in the late 1960s, early 1970s. Arkansas Power and Light was one of the first companies that had an air conditioner load control program.

They were based on the switch capabilities, which is digital controls. The digital signals activated a control switch. So the issue of customer choice was very simple. The customer could participate or not. If they didn't like what was done their choice was to drop off the program.

And the programs basically were driven by participation payments. It was a very practical reason why it was done this way. Participation payments allowed the incentives to be kept out of the rates. Rates normally went through a different regulatory process or review process by the local boards. Keeping the payments out for programs which the utilities considered to be somewhat tentative or experimental at the time

was a very prudent choice.

But unfortunately this same structure actually continues to exist, even through many of the California utility programs to date. So based really on the format driven by analog technology introduced in the 1950s.

Starting in the late 1980s the first digital technologies were first introduced. And digital technologies provide a different format than the analog. Digital technologies provide, have the capability to provide information and information can be provided to the customer.

And the first example of that is probably the Gulf Trans Text Critical Peak Pricing Pilot, which began in 1991. It was the very first introduction on a larger scale of critical peak pricing. And it introduced the concept of what we call today the programmable communicating thermostat, in application. It introduced the first major program with customer choice. And it introduced the issue of integrating advanced metering with thermostats, rates and customer choice. And that was basically based on the first introduction of the digital, again, the digital technology.

1 Further, in 2001 Carrier came out with
2 what is considered to be the first, major, mass-
3 produced, programmable communicating thermostat.
4 That technology continues to be used today. The
5 biggest example of the change is the statewide
6 pricing pilot that took place as a joint effort by
7 the PUC, the Energy Commission and the Power
8 Authority starting in 2004. And that employed
9 basically the same technology and the same
10 approach as the Gulf Power Pilot, which was price
11 responsive, customer choice, information to
12 customers and AMI integration.
13 Today we have a number of different
14 digital technologies that are available. The
15 technology field is actually very ripe. I am
16 going to describe a little bit more about the
17 evolution of some of the research that is taking
18 place in California, as I go through this, to
19 fully illustrate where we are today. Eventually
20 I'll get these buttons right too.
21 This is the vision statement that the
22 Demand Response Research Center and the Energy
23 Commission through the PIER program have been
24 working with for the last six years. Basically
25 the fundamental pieces are demand response and

1 energy efficiency integrated from the beginning.
2 We believe that is best done through the rate.
3 That is also a customer issue because from the
4 customer's perspective it is really difficult to
5 differentiate demand from usage. A kilowatt and a
6 kilowatt hour go hand in hand.
7 The equity issue. Why shouldn't all
8 kilowatts at two p.m. on a hot summer day be
9 valued the same, regardless of what kind of end-
10 use it comes from.
11 The third point is that there is a need
12 to make demand response more cost-effective. And
13 one way to do that is to reduce the cost of demand
14 response and the cost of the equipment. And I
15 will illustrate with a very clear slide at the
16 very end of the presentation how the research is
17 leading to that point.
18 And last is that demand response and
19 demand response impacts, and the most effective
20 impacts come when you implement customer choice.
21 So today, our view back in 2002 was
22 demand response is really a pretty limited
23 resource. A very simple, sort of Consumer Reports
24 type of chart where we were comparing direct
25 control with price response.

1 And from the initial perspective it
2 looks like price response provides more customer
3 choice, more economic response.
4 The ability to integrate economic and
5 reliability.
6 The sustainability issue comes in
7 because with customer choice, if a customer
8 doesn't like a particular strategy, since they are
9 the ones that set it, they are the ones that can
10 reset it. They don't have to decide whether to
11 participate or not participate any longer.
12 And from a cost standpoint I am going to
13 illustrate how combining all these actually
14 reduces the cost of demand response.
15 This is an expansion of those same
16 characteristics. Today the demand response is
17 basically characterized as separate programs with
18 separate incentives for each program.
19 It's pushed into the market. And by
20 that I mean utilities are actively, aggressively
21 marketing demand response programs to customers.
22 It is principally focused on generation
23 and reduction in peak.
24 And it is designed traditionally for the
25 utility and not the customer. And from that

1 perspective what I mean from that is that the
2 utilities like reliability and control and so they
3 actually prefer direct control over a price
4 responsive-type of strategy.
5 The vision that we work with is that
6 demand response should be a system-wide resource,
7 an integrated resource.
8 It should be market-driven. And that
9 all customers should have access to demand
10 response.
11 There should be wholesale-retail
12 integration.
13 That demand response should be used both
14 for generation and distribution management.
15 And also, simultaneously if possible,
16 for economic and reliability, and designed for the
17 customer.
18 So all I want to point out with this
19 particular slide is that the model we have
20 actually chosen for pursing demand response is the
21 same model employed for the efficiency standards
22 that the California Energy Commission and the
23 Public Utilities Commission have been implementing
24 for the last 20-plus years. Which is, make demand
25 response available to all customers, focus on the

1 value the customer assigns to demand response.
2 To emphasize a point that David
3 Hungerford made, the customer is in the best
4 position to decide which of the lowest value
5 loads. And by giving them customer choice they
6 are in a position to make those loads available,
7 if they deem that they are cost-effective for
8 themselves.
9 That the customer should really own the
10 demand response. That one way to reduce the cost
11 of demand response and the cost of the equipment
12 is to introduce many suppliers to the market
13 rather than a few suppliers. And utility programs
14 tend to have a very limited number of suppliers.
15 That customization of the strategies and
16 the programs should be done by the customer and
17 have no limits. The customer should be able to
18 customize a program to whatever they deem is
19 appropriate for their facility.
20 The incentives should be performance-
21 based. And like energy-efficiency incentives
22 there is a need not only for performance-based
23 incentives but there may be a need at the
24 beginning or start-up effort to provide purchase
25 or other incentives to overcome initial barriers.

1 And lastly, the key problems that we
2 came up with, with demand response. I have
3 highlighted rate on this issue. That problem has
4 actually been partially removed by a recent PUC
5 decision.
6 So three things that we focused on in
7 the research the last six years. David Hungerford
8 has gone over all three of these already. I am
9 going to go over one of them in particular at the
10 very bottom in a little more detail. Advanced
11 metering, dynamic rates and automation. Those we
12 felt were the three critical factors for the
13 success of demand response.
14 Thing 1, advanced metering. This is a
15 fairly self-evident answer at this point. System-
16 wide metering with communications and interval
17 recording. And the reason is because it provides
18 information, both for the customer to manage their
19 load and to educate the customer, not only for
20 demand response but for efficiency.
21 To support rates, new rates, like the
22 dynamic pricing the PUC recently ruled on.
23 And to provide the integration with the
24 system that is necessary to provide interval data
25 at a system level that can be integrated by the

1 ISO and the system dispatch.
2 The dynamic rates. Reason? To reflect
3 system costs.
4 And the other reason is, why we need
5 dynamic rates. It establishes a value function
6 for the customer.
7 It provides price signals for economic
8 response.
9 It provides reliability signals for
10 emergency response.
11 And it provides customer choice.
12 And it turns out that when you integrate
13 the dynamic rates, the metering and automation you
14 wind up getting the ability to integrate
15 reliability and economic dispatch at the same time
16 with the same customers and eliminate a lot of the
17 barriers to demand response.
18 This is some of the research. We have
19 gone over, I think in a prior proceeding, a prior
20 Commission workshop on load management standards,
21 you had a presentation from Ahmad Faruqui. He
22 went over review of the prior results from a lot
23 of the critical peak pricing and dynamic pricing
24 tests from all over the country. We were very
25 actively reviewing that material.

1 In fact Brattle, the company that Ahmad
2 represents, has been working with the Demand
3 Response Research center for the last three or
4 four years. We were very privy to that
5 information. We have been in contact with most of
6 the sites that had those prior tests. That
7 factored in to what I am going to illustrate. But
8 what I am going to focus on and illustrate is a
9 lot of the material from the California Pricing
10 Pilot.
11 So what this illustrates is customer
12 response to price. And this came out of the
13 Statewide Pricing Pilot in 2004-2005. What we saw
14 that on the left side of the graph, that while
15 time of use rates are effective in reducing demand
16 on a limited scale, critical peak pricing produces
17 a much stronger response. Not just for
18 residential but for commercial/industrial. This
19 is a small commercial/industrial representation on
20 the right side of the graph.
21 We also found that all customers respond
22 to price. All customers had the capability to
23 provide demand response. Some customers, low
24 users, are obviously going to provide a lower
25 amount of demand response, a lower kW. But the

still provide almost equivalent percentage reductions as all other groups.

So the results from the Statewide Pricing Pilot basically confirmed to us that all customers had the capability to respond, all customers had the desire to respond if presented with the right price, automation and the opportunity.

The third part, the automation part. Which I am going to focus on for the remainder of the presentation. Why automation? It enables and simplifies customer choice.

It enables price and reliability response. And what I am going to illustrate with the commercial/industrial work the Demand Response Research Center has done, is that it enables that response simultaneously with the same system, which substantially increases or could increase the value of demand response, which s currently today limited by artificial program boundaries.

Finally, automation allows demand response to be integrated with system operations.

So here is an example of what happens. It's the same chart that I presented before that came out of the Statewide Pricing Pilot. And the

1 objectives of that pilot were very deliberately
2 designed to look at these issues. This is not
3 looking backward and finding things that were
4 artificially or accidentally complementary to our
5 objectives. This was part of our objective all
6 along since 2002.
7 But what you see is that from a time of
8 use rate of response, about four percent on that
9 first year response in the Statewide Pricing
10 Pilot, that without automation and just price as a
11 difference that the demand response increased
12 substantially to between 12 and 13 percent.
13 When you add automation it doubled again
14 to about 27 to 30 percent. That in fact has been
15 the case with every single pilot that has been
16 done in the United States for the last five or six
17 years.
18 And finally, the question came up, how
19 reliable is demand response for real critical
20 days. And that's the bar on the far right, out of
21 the Statewide Pricing Pilot as well. And you can
22 see that on even the worst day of the year the
23 demand response was even bigger than on the
24 average for the rest of the year.
25 I want to illustrate with this graph,

1 illustrate the difference between the price, when
2 you combine price and automation and customer
3 choice with a conventional demand response
4 program. So you have to think back to that
5 Consumer Report chart that I put up which had the
6 little green and pink bullets on it.
7 The blue line represents -- This is data
8 out of the San Diego programmable communicating
9 thermostat pilot that the PUC ordered them to do
10 for residential customers. The blue line
11 represents the base, residential average load for
12 the group in the pilot.
13 The green dotted line represents what
14 the load looks like for those customers who were
15 on programmable communicating thermostats who were
16 on a fixed participation incentive. And what it
17 shows is, those customers reduce load about one kW
18 on average for this particular day type.
19 What the orange line shows is that in
20 year two of the San Diego pilot we took a sample
21 of customers out of that pilot and all we did was
22 change one thing. We took them off the
23 participation incentive and put them on a critical
24 peak tariff. And what the orange line shows is
25 the load for those customers more than doubled

1 from what the customers on a conventional program
2 were doing. We have also seen this same effect in
3 commercial/industrial.
4 For small commercial, small
5 commercial/industrial, same exact result. You put
6 technology in, give them automation to automate
7 their load response, and the load more than
8 doubled from roughly 6.6 percent to -- between 5
9 and 6 percent to 10 to 13 percent.
10 And I don't know what happened with this
11 graph. This changed between the time I gave it to
12 the Commission and now so I'll skip this one and
13 go to a different one.
14 I want to highlight now similar sets of
15 results with the same combination of factors,
16 which is critical peak pricing, or pricing,
17 automation and customer choice. This is results
18 from what's called the AutoDR set of pilots that
19 the Demand Response Research Center has been
20 conducting for the last five years. And this is a
21 summary of the 2007 results, which is the first
22 year of what we considered to be the first stage
23 commercialization that the PUC ordered the three
24 investor-owned utilities to do as a result of an
25 order coming out of the 2006 Emergency Orders.

1 And what it shows, what you really want
2 to look at is the very bottom, right-hand side of
3 the graph. What this graph shows is that we have
4 covered commercial, large commercial, large
5 industrial, small commercial/industrial customers.
6 And that the aggregate -- this is aggregate load
7 reductions for -- peak load reductions for these
8 customers as part of an ongoing, one-year
9 implementation.
10 And the load impacts are far in excess
11 if what anybody had ever expected. I will better
12 illustrate that with some of the other graphs. To
13 illustrate the sustainability of these impacts the
14 Demand Response Research AutoDR pilots have been
15 going on for about six years now. This is a five
16 year comparison. This comparison plots similar
17 customers over the entire five year period. And
18 what it shows is that on average the large
19 commercial/industrial customers will reduce in
20 load somewhere between 10 and 13 percent.
21 The context to put this in is that
22 nationally these same customers are not considered
23 to be very good candidates for demand response.
24 Nationally the typical response that is received
25 on demand response programs from other utilities

is somewhere in the range of four to six percent. And so this type of response, the 10 to 11, 10 to 14 percent, has been going on for six years in California when you combine the pricing, the automation and the customer choice.

In these programs the customer chooses what to do at their site. The automation is using the customer's energy management system. And for these customers, these customers were all on, except for the first two years, which was a proxy, these customers are all on PG&E's critical peak price -- critical peak rate.

This is a traditional comparison for those same customers. This is the non-industrial, this is just commercial customers. And what it shows is that -- two things. One, it shows that when you put a customer on critical peak pricing with automation that they obviously reduce their demand. But in the commercial case, they also save energy.

And in fact, some of the evidence from the work that's been done at the Demand Response Research Center is that the process the customers go through to decide how to respond to a critical peak price, how to automate their EMS system to

1 make that response, is that in several cases the
2 customers have identified tactics that they can
3 use every day and reduce their demand permanently
4 and they have. One of the customers that has done
5 that has been the IKEA store in West Sacramento.
6 So to emphasize another point that David
7 mentioned. That when you proceed with demand
8 response on a customer choice basis with the right
9 price signals and the automation, that it has
10 ancillary benefits, very clear benefits in some
11 cases for efficiency.
12 The AutoDR is not a technology. Again,
13 it's an information packet that uses digital
14 communications to communicate to customers price
15 and reliability signals. And so part of the work
16 for the Demand Response Research Center has been
17 to look at other kinds of demand response that can
18 be supported with automation and price.
19 So this is an example of results from
20 auto-demand bid programs by utilities. And for
21 the 2007 year there were 11 sites participating.
22 And the auto-bid programs basically responded with
23 about 98 percent of the load that was bid was
24 actually delivered into the system when it was
25 called. Again the average within California, if

1 you look at the monthly reports the utilities
2 file, is that the delivered versus bid generally
3 tends to be in the 20 to 40 percent range.
4 Ninety-eight percent is obviously quite high.
5 This is an example of a comparison of
6 why we believe automation and price go hand in
7 hand. This is a comparison. The red dots
8 represent customers on critical peak pricing in
9 PG&E service territory, with the AutoDR. In other
10 words, receiving a digital information packet that
11 is giving them the price and event signals. The
12 blue triangles represent a comparable group of
13 customers in PG&E service territory on critical
14 peak price without AutoDR.
15 And what you see here is a very large
16 gap. The customers without AutoDR basically had
17 no change or a minor increase in load during the
18 peak. And the customers with AutoDR reduced their
19 load, on average, over eight percent. A very
20 clear demarcation and an indication of the value
21 of this type of approach.
22 So there's several things I want to
23 point out with this graph. What this basically
24 shows is a summary of the 2007-2006 data. Excuse
25 me, the historical data from AutoDR, which shows

1 about a 13 percent reduction in peak load.
2 What this graph doesn't properly
3 highlight, though, is these same customers, once
4 they automate, have the capability not just to
5 reduce on-peak, but they also have the capability
6 to reduce, for a short duration, additional
7 reliability response.
8 And in fact, the middle column here
9 called Non-Coincident Maximum kW Reduction adds up
10 to about 1500 kilowatts of load. Which represents
11 about 21 percent reduction in system peak.
12 And so in fact these customers had the
13 capability, and some of them have done this
14 already, the capability to program their systems
15 to respond not just to a day-ahead economic
16 signal, but also to respond on a day-of basis to
17 an additional reliability signal.
18 The benefit of being on a dynamic price
19 is that if the price is properly structured, if
20 the rate is properly structured, there is no
21 baseline problem. There is no double payment,
22 there is no overpayment problem. Because the
23 customer basically just pays for the load they
24 consumer or the load they use at a given time.
25 So what we are basically trying to

1 highlight, both with the AutoDR program and with
2 the automation, which was an original design
3 objective that we had, is that with the proper
4 combination of dynamic tariffs, with automation
5 and customer choice, some of the artificial
6 boundaries in the existing demand response
7 programs can be removed.
8 By allowing the customers to respond
9 both on a day-ahead economic and a day-of
10 reliability there is no additional requirement for
11 new equipment on the customer's site. So
12 obviously, if the customer gets additional benefit
13 out of that response their cost-effectiveness goes
14 up, the utility's cost effectiveness goes up, for
15 no additional investment.
16 And the most critical piece is the
17 number on the far right, $57.62 per kw. That is
18 the one-time cost customers incurred in this four-
19 year implementation period to put in AutoDR and to
20 automate their facilities. There is a minimum
21 cost ongoing year to year to maintain that system
22 because it is part of their existing energy
23 management system.
24 The last results that are not depicted
25 on this chart is that for 2007 implementation the

following costs were observed and are a part of an analysis that the Demand Response Research Center recently completed. And that is that the average cost for a greatly expanded population of customers, which included industrial customers for the first time, was pushed up to about $71 a kW, the one-time cost.

The range of costs was $8 a kW for commercial buildings that had EMS systems, for legacy systems, up to -- The highest cost was about $118 per kW for new industrial customers. So the new industrial customers are what drove the cost from $57 to $71. But we found that with going into commercial customers with legacy EMS systems and a familiarity with their system, that the cost for going to demand response was as low as $8 a kW.

And now we come to the punch line.

PRESIDING MEMBER PFANNENSTIEL: Um.

MR. LEVY: I'm sorry. Jackie.

PRESIDING MEMBER PFANNENSTIEL: Before you go to the punchline I just want to make sure I am looking at the one-time costs for setting these things up. I am looking back to see if you showed the savings to these customers.

1 MR. LEVY: No, we did not show the bill
2 savings the customer had.
3 PRESIDING MEMBER PFANNENSTIEL: Right.
4 MR. LEVY: I can tell you what those
5 are. We didn't depict them on this graph.
6 PRESIDING MEMBER PFANNENSTIEL: The
7 question, of course, is one assumes that they are
8 saving more than their one-time cost.
9 MR. LEVY: Yes.
10 PRESIDING MEMBER PFANNENSTIEL: But what
11 is the average payback and how long does it take?
12 MR. LEVY: The average payback and the
13 actual bill savings is very much dependant on the
14 rate. The same customer load-shape change in PG&E
15 on a CPP tariff, and in Southern Cal Edison on a
16 CPP tariff, will produce a difference of about --
17 a tenfold factor difference in the bill impact.
18 For PG&E, because of their rate design,
19 the average savings to the customers for this
20 sample for this time period, was about a one
21 percent reduction in their total, annual bill.
22 ASSOCIATE MEMBER ROSENFELD: But could
23 you turn that into a payback time, Roger?
24 PRESIDING MEMBER PFANNENSTIEL: Payback?
25 MR. LEVY: I don't have a payback time

for that. What I know is from the customer standpoint, because they used their existing EMS system, the actual costs here -- you can see the costs are very small. The bills for these customers are very, very large. In most cases the payback for these customers is less than one year, even with one percent savings.

PRESIDING MEMBER PFANNENSTIEL: Because of course -- I mean, these look good to us. Although $58 a kW depends an awful lot on how many kWs you use. But the question is whether the customers will stay on this program. And they'll stay on it if they are saving money on it.

MR. LEVY: What I can tell you is that there have been no customers that have left the AutoDR facilitated program except to move to a different DR program offered with different, more beneficial incentives, by their host utility.

PRESIDING MEMBER PFANNENSTIEL: And this is for how many years, four?

MR. LEVY: This program has been operating for, now it's into it's sixth year.

PRESIDING MEMBER PFANNENSTIEL: Thanks.

MR. LEVY: One of the objectives that I mentioned at the very beginning was moving toward

automation, including price response. What I want to highlight here is that the discussion that I have just gone through is identical for residential as well as commercial/industrial. We had the same objectives for residential as well as commercial/industrial.

And I will use the commercial, programmable communicating thermostat as an example of how moving from analog to digital and moving toward many suppliers from a single supplier, or from a few suppliers, and moving to large markets, making demand response available to all customers rather than a narrow, targeted, marketed sample.

Commercially available, programmable communicating thermostats, have been available for about seven or eight years. The first one was introduced in 1980 by Honeywell but the Carrier thermostat was the first one to really make some major market share.

Honeywell, with White Rodgers, also provides commercial, programmable communicating thermostats. Those devices range in price from about $225 to $350 apiece depending on how many you buy, who you buy them from and what you intend

to use them for.

The CEC PCT evaluation that was part of this research plan used a $150 benchmark as what they thought would be the logical, wholesale price for programmable communicating thermostats, if, in fact, we could develop a standard reference design and an improved market for demand response.

That's the second block. That's the second block right here, the CEC reference design. So the cost-effectiveness analysis done two years ago assuming a $150 price point. That cost-effectiveness proved to be positive. So the CEC went ahead with the development of the reference design for the PCT based on that conclusion.

What we have today is that conventional air conditioner load control switches, which is this little item on the bottom, they generally will sell for about $75 to $100 apiece. They are in wide use by lots of utilities, including California utilities.

They are subject to a lot of factors that affect their performance. I am not going to go into many of them. Although one of the factors is that because of the nature of that device the utilities, once they install them, really have no

1 idea whether they are still working or even in
2 place. And because air conditioners have a useful
3 life of maybe 13 to 15 years, that a certain
4 percentage of air conditioners and their switches
5 wind up in a landfill somewhere every year,
6 unbeknownst to the utility.
7 What we determined from some of the
8 initial work from the reference design is that
9 that $150 price point that we originally speced
10 for the cost-effectiveness analysis two years ago
11 actually turned out to be a little too high. Ron
12 Hofmann I think will go into a little bit more
13 detail on some of this. Is that what we have
14 heard from the industry is that the price point
15 will actually be somewhere under $100 for the new
16 reference design programmable communicating
17 thermostat.
18 So as far as the objectives we have been
19 able to try to accomplish is that the PUC has
20 introduced default dynamic pricing as part of a
21 proposed decision two weeks ago. The Energy
22 Commission and the PUC have successfully
23 introduced advanced metering and two of the three
24 investor-owned utilities and one is pending.
25 The third piece has to do with

automation. The AutoDR approach, the information model. It's a digital packet. It was submitted for a national standard last month. It is in the process of being reviewed on a national level right now and it's also received a lot of interest from both Europe and from other utilities around the country.

The programmable communicating thermostat was a residential component to that research plan. And as everybody in this room knows, that is still pending and awaiting a later review to address a number of other concerns that came up as part of the public comment.

And that is the conclusion of my presentation. Any questions?

PRESIDING MEMBER PFANNENSTIEL: Further questions? Tim, did you have anything?

ADVISOR TUTT: Yes, I do have one question. Regarding AutoDR. You describe it as not a technology, as an information packet. But my question is, the information packet has to have some technology or equipment at the customer site to receive that information and actually do something with it. And that would be a demand response automation server or an energy management

1 system or something like that. Can you elaborate
2 on that?
3 And also the second question is, you
4 said there was a -- it had been submitted as a
5 national standard. where and what is the status
6 or progress or prospects for that?
7 MR. LEVY: In answer to your first
8 question, there does need to be a way at a
9 customer site to receive that information packet
10 and do something with it. For commercial/
11 industrial sites, for large commercial/industrial
12 sites, the energy management system is the
13 candidate for that. For new energy management
14 systems, most of them come factory-ready to accept
15 digital signals from outside sources.
16 So in fact the low cost of $8 per kW for
17 the commercial customers in 2007 to implement
18 AutoDR was a result of all they had to do was make
19 some software changes in their EMS system. They
20 didn't need any new equipment to receive those
21 digital packets. They received the AutoDR signal
22 as part of the standard. It's basically an
23 Internet protocol-type signal. Standard, open
24 standard. There's nothing proprietary about it.
25 And in fact it was tested both with individual

1 customers and aggregators and it worked
2 successfully with both.
3 For new commercial/industrial customers
4 that don't have EMS systems then new technology
5 will be required. Some form of control switch or
6 some other controller will be required to receive
7 that signal.
8 PCT was actually envisioned as a device
9 for doing that for small commercial/industrial.
10 And for residential the PCT was envisioned as a
11 vehicle for doing the same thing for residential.
12 To provide the first level of automation. If you
13 want to call the PCT essentially the every-man,
14 beginning, home-automation system, that's what it
15 would be.
16 The second question in terms of where
17 AutoDR is being introduced. It's been introduced
18 before BACnet, which is a building automation
19 representative group. NIST is also looking at it.
20 It's been taken before a number of other
21 regulatory bodies. I would be more than happy to
22 provide a full list of all the different
23 standards-bearing bodies that are reviewing it.
24 It is also being considered -- There is
25 discussion going on as to whether to introduce it

through IEEE as a standard. Part of the problem there is the time frame it takes to get some of these things through.

In terms of the reception. It's had a very positive reception. It had a day dedicated -- there was one day dedicated as part of the Connectivity Week conference that was held in San Jose last month. And it received extraordinarily positive comment and review from all the people who attended.

And in fact AutoDR was given one of the awards at the conference as one of the innovative advancements for demand response for that year. Does that answer your question? Thank you.

PRESIDING MEMBER PFANNENSTIEL: Andy.

CPUC ADVISOR CAMPBELL: I understand there are a number of private sector demand response providers which do provide automated demand response in different forms. I wonder if you have any sense, from a numbers standpoint, of the types of load reductions and costs that various private sector demand response providers have seen?

MR. LEVY: The Demand Response Research Center and PG&E and Southern Cal Edison and San

1 Diego worked with a number of those providers as
2 part of the 2007 roll-out. EnerNoc was one of
3 those providers. We don't have any information on
4 what costs they see from their customers for
5 implementing automation. Those are generally
6 proprietary numbers.
7 In terms of the demand response they
8 get. That's also driven in large part by the
9 contracts they sign with the utilities, of which
10 we don't have any information. We are not privy
11 to any of the contractual terms. And the demand
12 response impacts are driven pretty much by the
13 baseline standards or baseline elements of those
14 contracts.
15 What the aggregators tend to do is they
16 will balance off the loads or the demand response
17 among the group of customers to achieve the
18 baseline requirements. So they work on a group
19 average. The AutoDR work that I reported here was
20 on individual customer site bases, which would be
21 quite different. I'm sorry, I can't give you any
22 information on what the aggregator -- what their
23 costs are or what they do.
24 What I can tell you is that the
25 aggregators have all, none of them have any

1 problem with the AutoDR information packet
2 approach. But what all the aggregators generally
3 tend to do is they have a proprietary
4 communication, proprietary information packet that
5 will go from their server to the customer's
6 automation that they happen to be managing.
7 PRESIDING MEMBER PFANNENSTIEL:
8 Commissioner Chong.
9 CPUC COMMISSIONER CHONG: I have three
10 questions, I guess. The first question is, is
11 there information about AutoDR programs that are
12 being run by the publicly-owned utilities?
13 MR. LEVY: As far as we know there are
14 no publicly-owned utilities that are using AutoDR
15 at this time.
16 CPUC COMMISSIONER CHONG: My, my.
17 Communications costs. I saw in one of your early
18 slides, evolution of DR technology and programs,
19 that there's some new, promising communications
20 technologies that have finally evolved to the
21 point where they may lower some of the
22 communication costs. WiMAX, for example, RCS. Do
23 we believe that some of these new communications
24 technologies may reduce costs for these types of
25 programs?

1 MR. LEVY: I'll give you two-part, two
2 answers. One is I am going to let I think Ron
3 Hofmann in his next presentation addressed more of
4 the cost issue rom our perspective at the Center.
5 The communication cost was not a significant
6 element in pursuing this.
7 At least the AutoDR that was implemented
8 at most of the utilities in California was done
9 through the Internet. So if there was an
10 Internet-established connection at the site there
11 was no additional need for additional
12 communication expense.
13 The other technologies that were
14 mentioned in my slide, and that you mentioned, are
15 also capable of providing the same information
16 packet. And the costs are very dependant on who
17 implements it, how they implement it and the
18 number of customers that it's implemented for.
19 Some of those -- Some of those technologies will
20 have individual customer costs, some of them
21 won't.
22 CPUC COMMISSIONER CHONG: Okay. As I
23 was thinking through this AutoDR part particularly
24 I was thinking about the impact that the
25 California ISO MRTU would have on these types of

1 programs. I know that it is important to the ISO
2 that they get as much day-ahead information about
3 demand response programs as possible, for obvious
4 reasons, as opposed to day-of programs. So I am
5 wondering to what extent you might have advice to
6 us about how to proceed as MRTU gets closer.
7 MR. LEVY: There are a number of options
8 for doing that. One is that there is work going
9 on at the Lawrence Berkeley Labs with a program
10 run by Joe Eto under CERTS where they are actually
11 working directly with the ISO and with Southern
12 Cal Edison and Southern Cal Edison's air
13 conditioner load control program to provide the
14 exact information that you just referenced.
15 Where that program has provided a
16 reference of basically an access point from
17 feeders at the Southern Cal Edison sites where air
18 conditioner load control is being run to display
19 units at the Cal-ISO. Which lets the Cal-ISO view
20 pretty much in real time the status of the demand
21 response programs and what's happening in any
22 given moment in time.
23 There is another interpretation to part
24 of the question that you asked and it has to do
25 with how do you incorporate the MRTU pricing in

1 some of this. That's probably more of a rate
2 design issue. And maybe I'll call it the simple,
3 naive response would be to separate out the
4 wholesale costs that are currently embedded in the
5 retail rate and replace with the hourly MRTU cost.
6 So for customers on -- In a real-time
7 pricing example, if the wholesale cost that is
8 built into the retail rate was replaced with the
9 MRTU cost you would now have a much more, a much
10 more accurately defined, real time price that
11 would reflect both the retail and the wholesale
12 cost simultaneously.
13 For a critical peak tariff there would
14 obviously be some averaging that would be
15 necessary to make it compatible with the rate
16 form.
17 PRESIDING MEMBER PFANNENSTIEL: Any
18 other questions? Thank you, Roger.
19 MR. G. TAYLOR: Thank you, Roger. Next
20 I would like to introduce Mike Gravely. He is the
21 Energy Systems Research Office Manager in our
22 Public Interest Energy Research Program.
23 MR. GRAVELY: Good morning. What I
24 would like to do today is just give a brief
25 perspective on the research you are going to hear

about today. The enabling technologies and how it fits into the emerging technology picture that we are working on for the full system.

I think from today's workshop there are several outcomes from the research and development side that will be -- And I want to be sure that people who are attending and on-line understand there are some options in this area that they should be aware of for today's agenda.

One is we are looking for clarification and better understanding of the emerging and enabling technologies, specifically in the area of demand response and those types of areas. I will talk about much broader areas than that.

We are hopeful that future load management standards will evolve out of this and the R&E that we worked on will migrate closer to a commercial area then to a standard area.

Also there are quite a few topics that may come up today and it may be areas of interest that we are not able to cover. And I will simply make an offer to those that are participating and those that desire that I certainly represent -- for the Commission here I am more than willing to hear presentations and hear information as topics

1 come up.

2 I would prefer you provide those in

3 writing so they can help in our future references

4 of doing research and development. Use this

5 information as we develop future research plans.

6 So there may be topics that come up, there may be

7 areas that are of interest, but not necessarily

8 fitting the scope of this workshop. If that is

9 true then the scope of our work is much broader

10 than that. I would encourage you to contact my

11 office or individuals in the Commission here.

12 As we do emerging technology we are

13 looking at the full spectrum. I will take one

14 second here, Commissioner Chong, in answer to your

15 question about MRTU. Our office, and myself in

16 general as well as the working groups, are looking

17 specifically at the MRTU implementation. How it

18 affects the system, how the DR products and

19 services that are being developed will be

20 implemented and integrated into the MRTU and how

21 those services are best applied to California.

22 In addition to what you hear today there

23 are other working groups and other activities that

24 are ongoing, specifically drafting the MRTU

25 implementation of demand response. Particularly,

1 hopefully AutoDR and other types of products like
2 that, that are more conducive for that type of
3 support.
4 For those who are listening and not
5 here, we do work in transmission, distribution,
6 integration across the grid, as well as the
7 consumer or customer side of it. You will see
8 many things today in the area of communications
9 and control of those technologies that have cost-
10 cutting value. And so they can be applied not
11 only in demand response but distribution
12 automation, grid reliability, grid security, other
13 areas like that. So we do look for those types of
14 things.
15 And one of the values for us is these
16 technologies are implemented in one area. In many
17 cases there are able to be applied to other areas
18 that very low cost because the cost of
19 implementation has already been covered by the
20 first project.
21 The Commission publishes an Integrated
22 Energy Policy Report and the last one that was
23 published did point out the grid of the future
24 concept. So today you will see on this chart here
25 several areas of DR, but you will also see things

like distributed generation, storage, renewables, integration, and a whole system of a grid that communicates not one way but two ways. So again, as part of the effort we are doing today, the future emerging technology will be addressing how these things will fit into the system of the future.

A couple of quick, just some examples for you of technologies that we are working on that have the same type of impact as what we are seeing today. The transmission area, phasor research is one of the more exciting areas we have. We are getting to the point where the ISO will be able to see, and a utility will be able to see their information 30 times a second as opposed to once every four seconds. And as a result of that we are kind of creating not only technology but displays and ways to use that information across the grid.

In the area of the distribution side, distribution automation. In addition to automating demand response there's lots of other automation that will improve reliability, improve the performance and reduce the cost of the grid system of the future. So these technologies that

you see today and others are used specifically for those objectives.

You will hear a lot today about AutoDR. I want to just point out a couple of things. And one, you'll see this chart here which shows you that in addition to demand response we are getting efficiency savings and we're getting it when we really need it.

I think it is important to point out for the definition that we work with, automation of demand response means that the customer selects -- whether it's an industrial, commercial or residential customer. The customer is given automation but the customer selects which part of their load they're interested in automating for demand response. And then that is set up automatically for them so they do nothing if they want to go forward.

However, the customer always has the ability to change their mind. The customer can choose to not participate in the particular event. Or if the event is occurring and they want to change their mind they can change their mind during the event.

The technology today, we feel, allows

1 those choices. What we find is very few customers
2 choose to change their mind but most customers,
3 once they have done the selection process,
4 continue with the process they have selected.
5 The other thing we are learning from a
6 research perspective is that these customers begin
7 to know their load better than they did before.
8 So in many cases or in most cases, in addition to
9 demand response we're getting pretty good
10 efficiency improvements from these customers in
11 addition to demand response.
12 As we mentioned before, I'll mention
13 here about the work with LBNL. Once the system is
14 in place then we are able to use that system for
15 other services. And customers who desire to
16 participate, in this case we are using demand
17 response to provide the California ISO spinning
18 reserve or ancillary services. In many cases
19 these services are five to 20 minutes long. So
20 the customer who participates is paid an incentive
21 and however in most cases will not even realize
22 the event occurred. But the grid certain will
23 realize the service has occurred.
24 The technologies. Here today also we'll
25 be talking about things like smaller size radios,

1 communications systems. And the research that we
2 do is helping to check out these type of systems.
3 Their reliability, their performance. And even in
4 the area as we go into communications, research
5 into different commercial buildings and to how
6 well the reception is -- how productive the
7 reception is and how good the reception is in
8 different areas to be sure that when these signals
9 are transmitted they are received and the
10 information is sent back. So we are doing research
11 in those areas to ensure the signals have the full
12 coverage we need to get the services we need.
13 Also we mentioned cost-cutting value.
14 We also are very concerned about grid security.
15 So the work that we do in communications, the work
16 we do in load management and everything is very
17 important to us. The information flow back and
18 forth.
19 Grid security, because of these new
20 systems, we now will have the ability to know
21 quicker when something is wrong. Whether it's a
22 maintenance problem, an operational problem.
23 Whether it's a natural catastrophe or weather
24 issue or whether it's a contingency issue from a
25 terrorist. We envision in the future being able

1 to respond faster and quicker with less impact.
2 So the technologies that will be
3 demonstrated today also have a value in operating
4 the grid security in the future. And we are
5 looking at other areas of the program of how to
6 apply that.
7 The last thing I will talk about briefly
8 is energy storage. It is part of the discussion
9 for these workshops. And so I just want to bring
10 the fact, again, that if we are not able to cover
11 it all during today's agenda we certainly are
12 interested and we continue to work this area. And
13 I would encourage anybody who has topics to
14 discuss if they haven't been covered today to see
15 me or see my office.
16 This just gives you a broad perspective
17 of all the technologies we look at. Everything
18 from the residential side to commercial to large
19 grid side. We are evaluating all those for
20 California in the future and how it will support
21 the needs of California.
22 In the big picture, besides the small
23 customer or residential application, if we use
24 storage for load leveling, for ramping as the load
25 in the morning increases and decreases in the

evening, and frequency regulation services. We have done research on all these areas and will continue to do so. We think there is a huge value here but we are still researching how that works.

I think one of the discussions today is about emerging versus enabling technologies. I would say these are emerging technologies because we know what they are doing and we're learning but we're not clear. You will be seeing enabling technologies that have got to a point where they are ready for commercialization and they are much closer to that product perspective. So I think some of the areas we have now we're still assessing how we are going to use these technologies.

One of the areas we spent a lot of efforts in the -- we actually published this in previous solicitations and we have also worked together with DOE to publish public documents that have this. It's comparing the price for different technologies, their application and where they are the most effective.

But what we have been doing now is we are finding -- we are looking at barriers that will prohibit storage and other technologies from

1 going forward. And what we're learning is, for
2 example, when you look at the grid and you want
3 storage to operate as a backup. There's
4 definitions of how a generator will operate and
5 there's definitions of how loads will operate but
6 there's not really definitions of how storage will
7 operate.
8 So part of the research we're doing is
9 developing those operational envelopes so the ISO
10 can know how to control it. So when they call for
11 it how soon will they get it. When they ask for
12 it to stop how soon will it stop, so they can fit
13 it into their overall system. We are doing quite
14 a bit of work to assess the value of storage and
15 integration of renewables in California. We think
16 there is a value there. We think there is a part
17 there, we just haven't been able to assess the
18 hard numbers and we're working on that.
19 There's a strong interest in California
20 to rely heavily on renewables and get away from
21 other sources of energy and so that becomes a
22 logical perspective of using renewables 24 hours a
23 day. Storage is one of the ways of being able to
24 do that. Storing it at night when the load is
25 small. In the summer when you have excess energy

coming from solar you will be able to store it then.

So the concept is how would that work and how would that cost and what's the option. But if California decides in the future to look at more renewable energy and more use of it, this is one of the options we are researching now.

And I think the last thing we do is we are always trying to focus on key research projects. Our focus is mostly in demonstrating things that work and how they assess them. So you will see also -- and those of you who are participating have interest of showing us some of those. We do demonstration projects with the utilities, with the ISO and with other people in California to assess the value of different projects.

That has been a real quick review. A chance to catch up. I do talk fast. But I will take any questions if I can. But I think the most important thing I want to mention today is this is a piece of the work we are doing, there are other areas. We can't cover everything in one workshop. So I would encourage you to focus on what there is today. If there are questions you have, this is

my contact information. Feel free to call me anytime. Questions at all?

PRESIDING MEMBER PFANNENSTIEL: Questions for Mike? Thank you, Mike.

MR. GRAVELY: Okay.

MR. G. TAYLOR: I can always depend on Mike to talk fast and get us back on schedule.

Next up I would like to introduce Mr. Ron Hofmann.

MR. HOFMANN: Good morning, Commissioners and staff. My role today will be to spend some time to try to provide a context for the technology that you will be hearing about all afternoon. So it is important in understanding the technologies that you will see today that you have a context for it.

This afternoon you are going to be hearing from the utilities as they tell you about past, present and future technologies that they have dealt with and will be dealing with in the future. And they will talk about specific load control devices and specific type of communication.

What I will try to do is try to give you a framework this morning for trying to understand

1 where these things fit in. If it's just thrown at
2 you it becomes a bunch of things. And what I will
3 try to do is maybe give you a few little envelopes
4 and slots that you can put this in and hopefully
5 it will be helpful for you.
6 I will also spend some time reviewing at
7 a very high level the AutoDR concept and standard
8 and PCT reference design. In the afternoon you
9 will be getting two very specific presentations on
10 these topics, one from Clay Collier and one from
11 myself. We will dig deeper into some of the
12 specific issues that may be of interest to you.
13 And then finally, at the end of my talk
14 today I will just quickly go over some of the
15 things that Mike Gravely hinted at. Which is that
16 the Commission has been funding research that will
17 facilitate much greater flexibility and much lower
18 costs. And when I say that, our mantra is, ten
19 times cheaper and ten times more powerful. So not
20 just simply ten percent better. Really major
21 changes that are getting changes.
22 So you saw this when Roger showed you in
23 his talk. It's a very busy slide but I think he
24 went through it very well to give you sort of a
25 history of what's been happening. But I bring the

1 slide back up for you to focus on the bottom of
2 the slide.
3 What I need to do here this morning is
4 to make you appreciate what the value is of the
5 transition from analog to digital technology. It
6 is a major change. Most of you know about it.
7 You use digital technology every day with your
8 PCs. But I think it is important in the context
9 of what you are going to be hearing from the
10 utilities to understand where this change from
11 analog to digital technologies really helps them,
12 and helps them do the things you want them to do
13 in terms of customer service.
14 In the back of this slide deck, in the
15 backup slides, I put in two definitions for analog
16 signals and digital signals from Wikipedia. You
17 could go to other places to get these definitions.
18 But I am not going to focus on sort of the bits
19 and bytes definition of it. I am trying to give
20 you more of a feel for these differences and why
21 they're important.
22 The main difference is the element
23 called the microprocessor. Let me explain that in
24 a few minutes. Let's just hold off. But just
25 remember that that is really the critical

1 difference. It's an information processing
2 device.
3 And what it does is it does something
4 that breaks from the analog tradition in that it
5 facilitates three major things with respects to
6 your current initiatives in AMI and rates and
7 other things that facilitate demand response.
8 It facilitates customer choice.
9 Technology upgrades, so that you aren't stuck with
10 making decisions where you have stranded assets.
11 And it allows you to get to more understandable
12 standards at the regulatory level. You don't
13 actually have to know some of the details of what
14 goes on in the digital world when you are in the
15 digital world. Because there is a way to
16 understand standards better than there is now.
17 Just so we are real clear about what
18 analog kinds of controls there are, because I'm
19 sure you have heard about these. You have
20 probably heard about pneumatic controls, fluidic
21 controls, analog-electric controls, electro-
22 mechanical controls. These are all controls in
23 which some sort of an input goes into the control.
24 And without any intermediary it affects the
25 control. It is a true control signal.

1 In a digital environment it doesn't
2 quite work that way. The input come in and it
3 goes through something called a microprocessor
4 first before it actually becomes a control signal.
5 And it is at that particular step that allows
6 customer choice, it allows technology upgrades.
7 It allows for standards to appear that are quite a
8 bit more understandable than existed in the analog
9 era.
10 So I am just going to take a couple of
11 minutes here. And I apologize if you all
12 understand this very well. But I just thought
13 we'd sort of get on the same page here. I thought
14 I would use an analog of your personal computer as
15 a way of thinking about digital controls.
16 It may surprise you to know that the
17 digital platform is identical. Now a digital
18 controller, versus a digital PC, have two
19 different functions that they supply to you. One
20 is focused on what we call data processing and the
21 other one is focused on what we call real-time
22 control.
23 But from an architectural perspective,
24 they are identical. So in a PC you have a
25 monitor, a keyboard, you have a mouse. Controls

1 don't typically have those things although I have
2 actually seen some controls that do.
3 But in a control device you have sensors
4 as part of your input/output devices rather than a
5 monitor. You have a display that might be like an
6 LCD display or a keypad but you don't have a
7 keyboard.
8 But from the point of view of trying to
9 understand what do digital controls do, it isn't
10 that farfetched for you to think about it like you
11 would think about your PC. There's input devices,
12 there's output devices, and information flows
13 through the box and gets processed. And this is a
14 fundamental difference from the analog environment
15 that we were in up until the early '80s.
16 So the computational platform that we
17 have here can support almost everything that you
18 are familiar with in your PC world. And this is
19 an opportunity for regulators. Because in the PC
20 world and in other digital application worlds like
21 telecom, all sorts of standards and capabilities
22 have already been developed. And this particular
23 industry, which happens to be a little bit behind
24 those industries in terms of using these
25 technologies, don't have to reinvent any wheels.

1 So in AutoDR, in the signaling
2 capability, we used all of the existing security
3 and standard aspects of the public Internet to be
4 able to do something that is as critical as your
5 personal banking. So if you feel comfortable with
6 your personal banking in terms of the security.
7 If you feel comfortable that the processing that
8 is being done there on an input and output basis,
9 which is what I call data processing.
10 What you can do at the control level is
11 you can copy that in a very useful way so that you
12 don't have to reinvent any wheels to get the same
13 level of security. But you are now dealing with
14 temperature information, kilowatt hour
15 information. And you are now sending signals to
16 devices like thermostats to maybe set up the set
17 point.
18 This paradigm of looking at the
19 controls, digital controls of being somewhat like
20 PCs, they really come together when you think
21 about it as processing information. Hope that
22 that's helpful.
23 One of the differences about controls
24 that is very fundamental is they tend to be real-
25 time devices, whereas your PCs are not. Your PCs

1 actually can do things on their own time schedule.
2 And because they are so fast, you can't tell that
3 they are not real-time. It's a minor difference.
4 So I mentioned before that these digital
5 control devices facilitated three things.
6 Customer choice. Why? Why would I say that? Why
7 would I make that distinction between digital and
8 analog? Well I make that distinction because as
9 long as you have a digital device, by definition
10 you have a microprocessor which is run by
11 software. It's run by application software and
12 operating system software.
13 And so from a regulatory point of view,
14 or a specification point of view, one can specify
15 what the microprocessor does with the data that
16 goes in and what it has to do with the data that
17 goes out. And at that point you have a break
18 point in the operation that you never had with
19 analog controls. You have something that allows
20 you through regulations to say, this is what I
21 want this thing to do in terms of privacy, in
22 terms of customer choice, whatever. Because I
23 have this break point, this intermediary, that is
24 acting as my proxy. This is a very important
25 issue about digital controls.

1 Technology upgrades benefits from the
2 same thing. As long s you have a processor there
3 that can listen to communications it is possible
4 to make your hardware last longer. If the
5 functionality of the control is really in
6 software, which is what I implied in the last
7 slide, you now can change that functionality over
8 time as you get more experience.
9 If you had a pneumatic control, or you
10 had a fluidic control, and you all of a sudden
11 found out something was wrong, you would
12 physically have to touch the control to fix it.
13 Or potentially replace it with something that
14 actually did the analog that you wanted, the
15 analog control that you wanted.
16 That is not really the case here. The
17 case here is you have some options to upgrade the
18 technology. I think the good news is all of the
19 utilities on the AMI side have all been thinking
20 about this in very creative ways. And I am
21 looking forward to the day that AMI is deployed
22 with this kind of capability because it means we
23 are not going to get embarrassed like we were back
24 in 2001 with things that go wrong that you can't
25 fix on the fly. And here you are going to be able

1 to fix it on the fly. And the same thing is true
2 of the controls.
3 And finally, as I implied a couple of
4 slides back. Standards are more easily understood
5 at this point because you are now not having to
6 know the physics. You just need to know the what.
7 You just need to know what it is you want to do,
8 specify it in true English. And that
9 specification in true English can be translated
10 into software into the how.
11 And so now the regulatory process
12 becomes more deterministic. And you will be
13 hearing a talk after mine in which tools that were
14 developed in Silicon Valley to develop products
15 can now be used potentially to develop regulatory
16 rules. And you will hear a talk from Diane
17 Peptone about that.
18 So with that it's just sort of
19 contextual background. Let me jump into just a
20 quick, high-level view of some of the things that
21 PIER has been doing, that the Commission has been
22 doing to try to facilitate this.
23 And let me just say right off the bat,
24 just so there's no confusion, all the work that
25 PIER has been doing has not been to create

1 products. What we have been trying to do is to
2 create paradigms in which products can work
3 interoperably together. So that the customer has
4 the option to choose between vendors and
5 potentially even mix and match products between
6 vendors.
7 It's a common knowledge among all people
8 in the commercial industrial sector that once a
9 building owner signs up for an energy management
10 system today, because they are all vertically
11 integrated, proprietary systems, that they are
12 locked in for a number of years. They can't go
13 out and go to their competitor unless they want to
14 rip out the entire system. They can't go out and
15 mix and match with most systems that are in the
16 field today because they're proprietary.
17 But with digital controls regulators can
18 now act for consumers and actually say that what
19 they want is this interoperability and say what
20 features of the interoperability that they want.
21 And these things can be implemented in software
22 standards which can be easily understood. And you
23 shouldn't have to care about the hardware that's
24 underneath. You shouldn't care whether it's one
25 type of communication system or another. The

1 bottom line is, they will interoperate.
2 So with AutoDR we started off by using
3 the existing public Internet. And with the
4 residential loads, with the PCT, we characterized
5 the three categories that were available to the
6 homeowner as entry points into the home. One
7 being broadband, one being narrowband, which the
8 utilities are using from their meters, and one
9 being one-way broadcast, which is very similar to
10 your AM-FM radio but digital, not analog.
11 So in these PIER-funded initiatives what
12 we tried to do was to characterize these
13 technologies in an effort to make sure that all
14 the possible innovation that could come out of
15 these three categories of technologies would be
16 available to customers.
17 Now as you all know, ultimately some of
18 these will fade away because they are either no
19 longer supported or because there is some reason
20 why one particular technology wins over the other.
21 Well that's great. Everybody wins at that. But
22 if you eliminate some of these technologies in the
23 beginning you are not allowing for the possibility
24 of creative new ideas that are potentially much
25 lower cost than others.

1 This is a very busy slide and Clay will
2 go over this in more detail this afternoon. But
3 what I want to tell you about this slide is that
4 the AutoDR structure is not just limited to
5 commercial/industrial over 200 kW loads. It's a
6 client server architecture that could also talk to
7 radio stations that broadcast price signals. It
8 could talk to any type of device. It could talk
9 to third party people who want to send broadband
10 signals that aren't being sent by the utilities.
11 Those options are available to the
12 regulators. It's important to understand the
13 client server architecture, which has been used
14 now for about the last 20 or so years in the
15 computer industry, is still a very robust, very
16 flexible and very useful architecture that you
17 could use to make sure the price signals and other
18 information get to consumers. This kind of stuff
19 didn't exist in the '70s and early '80s.
20 Roger's point that these standards are
21 all about information flow, as shown by this
22 picture. There is nothing special about this
23 picture except that the utility generates the
24 prices from a server. People can either push or
25 pull the information from the server. And through

1 some sort of set of standards it gets to the
2 customer.
3 And you notice I said, set of standards.
4 It doesn't have to be one standard. You can
5 actually live in an environment where multiple
6 standards exist and coexist together. So you
7 don't have to pick a winner today. You just have
8 to pick the idea that you want standards so people
9 can interoperate.
10 And typically the standard that we
11 focused on is the information model. Which says,
12 we don't care how you deliver it. We just care
13 that the content of the message meets what the
14 Commissioners want. That if you want prices, and
15 you want prices in a certain way, they can be
16 delivered that way. And we built into it the
17 ability that it can be changed over time.
18 So this particular type of delivery
19 system, as you refine the system, can actually
20 change the software that delivers it and things
21 behind it will be backward compatible. These
22 kinds of systems do exist.
23 Roger Levy and I put this picture
24 together last year. The purpose of this picture
25 was not to pick winners and losers but was to make

1 everybody aware that within the home the consumer
2 market has not decided on particular communication
3 standards today. There are lots of communication
4 standards in the home. And on top of it, there
5 aren't very many automated homes. So it's sort of
6 an open market.
7 But there are a lot of players in the
8 market from the consumer electronic arena. And I
9 think the Commission should think about this in
10 terms of moving forward that the consumer
11 electronic market is very large. The vendors are
12 very large. And they should be brought into the
13 process of understanding what consumers need and
14 want.
15 That doesn't go -- That doesn't in any
16 way say that the utilities can't send in a
17 standard signal that isn't the signal that the
18 consumer electronic people pick. It can be
19 different. But it means that there has to be a
20 translator or gateway. That's not necessarily a
21 bad thing.
22 But you have to understand that having
23 multiple protocols is not a terrible -- Having 45
24 protocols, which exist today, is a terrible thing.
25 Having two or three, four, not a big deal. What

do you have to do to make sure that the broadband signals, the broadcast signals, the narrowband signals all interoperate? A common information model. That's the message.

So just as a quick reminder to everybody. One of the outcomes of the research from Lawrence Berkeley Laboratory with AutoDR is a current, proposed load management standard in Title 24 which is called Global Temperature Reset for Large Commercial/Industrial Energy Management Control Systems. And a lot of the companies already have this.

But what we found out is that if those energy management systems have this it makes the process of doing demand response a lot easier. You don't have to run around to every zone in a building and set everything up. You can do one keystroke or one little script in your software and it can make everything change accordingly, according to a customer chosen plan. A customer chosen plan.

In addition to that, as you've heard, AutoDR has now been presented through ASHRAE and through the National Institute of Standards and Technology to people across the United States for

1 comment. It is being reviewed by the IEC, which
2 is in Europe. It has some resistance from
3 proprietary positions of some companies. But in
4 general most companies see this as a leveling of
5 the playing field in which more people can play.
6 Finally there is the PCT reference
7 design, which is currently on hold in Title 24 and
8 has currently been -- is being considered by the
9 OpenHAN group as a possible standard.
10 Very quickly let me just tell you where
11 we are and where we're going with technology in
12 general. This will just take a couple of minutes.
13 But what I hope to show you here is that the
14 future is extremely bright. The ability to be
15 able to monitor demand and energy at a cost that
16 is almost zero is coming to us very soon. It will
17 be incorporated in appliances because it will be a
18 no-cost adder. And all we have to worry about is
19 to make sure that that information is available to
20 whatever device in the home is helping you manage
21 your energy. Or any device in the building that's
22 helping you manage your energy.
23 So today, today's technology pretty much
24 uses 4-bit, 8-bit, 16-bit, 32-bit microprocessors.
25 The 16- and 32-bit microprocessors are capable of

any kind of demand response application that I am aware of at the moment.

There are real-time operating systems that allow these microprocessors to handle software tasks that would meet the needs of the regulators. All of that exists. It is fairly reasonably priced. That's not a big deal.

Voltage and current sensors, which are needed to actually measure plug load and other types of energy and demand, are still a little bit too large and costly to be integrated in with the microprocessor into a package that makes them cost-effective. So today you see devices like Blue Line and other devices. It's a small market and so their price is high. But if you look inside what's there you're dealing with basically a non-integrated component design. So that's something that has to change in the future.

Batteries are getting better. You all know about the Tesla and its use of lithium ion batteries. You may only think about that for cars. But as they improve the battery technology there, guess what, it gets better for our laptops and our control devices.

There are two-way narrowband mesh-

1 network transceivers called 802.15.4 that Zigbee
2 is layered on top of, that are very low cost. And
3 they look to be very good IEEE standards. If
4 there is a negative about them, they still need
5 100 to 200 milliwatts of power, average power to
6 operate. A bit of a problem.
7 Two-way broadband WiFi point-to-point
8 communications are attaining low power status.
9 There's about four companies in Silicon Valley
10 promoting this. And they are very similar to
11 802.15.4. Don't take this as a competition in
12 terms of it's good or bad. Think about this as
13 innovation.
14 So two different, a broadband technology
15 and a narrowband technology, that are both trying
16 to achieve levels of operation that the energy
17 community, the electricity community could use in
18 the future. That's the advantage of this. It
19 needs to be facilitated.
20 Tomorrow's technology. Microprocessors
21 will include integrated radios, sensors and power
22 supplies. That's the holy grail. So instead of
23 getting individual component microprocessors,
24 memory, et cetera, it will all come on one chip
25 that's so small you probably can't see it.

1 The Commission has been working on
2 silicon two-way narrowband mesh radios that are
3 now at, today, 100 microwatts. Not 100
4 milliwatts, 100 microwatts. A big difference.
5 It looks like that. Mike showed a
6 picture of it. Don't worry what this means, I'm
7 just showing you that it's real. This is one that
8 happens to have existed in 2005 and it actually
9 used 400 microwatts. But there are actual ones
10 that use 100 microwatts today.
11 In addition to that there's a technology
12 called MEMS, micro-electro-mechanical-systems,
13 which is to etch mechanical devices onto silicon.
14 And then use the electro-mechanical properties of
15 what has been etched on the silicon to be able to
16 do things that we have only be able to do in the
17 macro scale to bring them down to the micro scale.
18 So we are actually building at UC Berkeley today
19 what are called current sensors in silicon. It
20 never happened before.
21 What does that mean to us? That means
22 that every appliance and every cord and every plug
23 load and every transformer box that you have ever
24 seen today could actually have its own monitor of
25 what energy its using and therefore self-diagnose

1 itself. And even have an included radio and talk
2 to some device in the house that tells you the
3 thing is functioning properly or not in terms of
4 its energy use.
5 There are MEMS energy scavengers, which
6 I won't go into in any great detail at this point.
7 But there are technologies that allow you to print
8 batteries right onto the PC board, print a circuit
9 board, with ink-jet printers. With ink-jet-like
10 printers. And you can print batteries and
11 capacitors.
12 These are all sort of Buck Rogers things
13 that are just around the corner. But the bottom
14 line is, is this means that power supplies for
15 sensors, which are so important to energy
16 efficiency in the future, will be able to last 25
17 to 50 years, which they don't today.
18 I don't know if you can see this or not
19 but this is what, on the micro-scale, little
20 cantilevers look like. That eventually are
21 interpreted either as sensor information or as
22 energy scavenging information.
23 So here is my summary. Technology is
24 available to day and it is getting better and less
25 expensive. And in the future you are going to be

able to ask for things like totally dis-aggregated energy loads, which you can't get today. When you get the AMI system today you are getting a facility load. But it is going to be possible in the future for just a few dollars, literally a few dollars' bill of materials cost, to be able to have a microprocessor, a radio, its power supply, sensors, energy storage, et cetera, all on some silicon that's going to cost about a couple bucks.

Regulators are going to be able to leverage that in the future. What you need to do now is to embrace the digital design. Understand it in such a way that when the future comes and these things are cheaper, faster, simpler, et cetera, not much as to get changed. Only your requirements have to be increased.

Doing it that way with the digital paradigm allows vendors and utilities to meet these functional requirements because they understand the digital paradigm very well. Thank you.

PRESIDING MEMBER PFANNENSTIEL: Thanks Ron. Questions? Maybe not. Thank you.

MR. G. TAYLOR: Next I would like to introduce Diane Pepetone.

1 MS. PEPETONE: Hello Commissioners and
2 staff and everyone else. My name is Diane
3 Pepetone and I am going to be presenting the
4 results of the PIER project: Requirements
5 Engineering for the Advance Metering
6 Infrastructure and the Home Automation Network,
7 AMI-HAN, Interface.
8 And I think I would like to spend just a
9 little bit of time on what requirements
10 engineering is because part of the research
11 project was to see if we could use requirements
12 engineering as an enabling technology for policy
13 development.
14 Requirements engineering, simply put, is
15 a discipline, meaning it is repeatable and there's
16 some rigor, for developing requirements or
17 criteria of a solution in order to either
18 implement the solution or evaluate proposed
19 solutions. And we were using it to evaluate
20 proposed solutions.
21 It's a process of analysis, modeling,
22 standardizing of information in the solution
23 space. And some examples that you may be familiar
24 with are context diagrams, system interface tables
25 and use cases. And we will be looking at some of

them as I go through the slides.

It was first used in the software industry, as Ron mentioned, in Silicon Valley to define software specifications. It has been picked up by most product development projects.

And it is very good for specifying interfaces in complex systems.

So if we look at requirements engineering and utilities we are seeing that they are now using it more and more to define their new and increasingly complex systems.

And examples are Southern California Edison developed use cases as they were trying to specify their AMI system.

And Utility AMI, which is a forum of utilities and vendors, they have a task force called the OpenHAN task force, which was looking specifically at the interface between the AMI and the HAN. And they developed use cases as well.

And as a result we took that as a starting point. This was a number of months ago and I know that they have moved on.

We just took it as, let's look at what they have developed at this point and use it to develop our own regulatory use cases. So we began

with initial use cases, looking at the interaction between the customer, their equipment and the utility AMI system.

And then we did different kinds of information modeling. We did Venn set diagrams, which are great because you stick everything in one set. Customer and their equipment. Then you stick the vendors and their equipment and services in another set. And then we put, of course, the utility, their AMI equipment and DR services.

And the point of this is to find out where is that interface where the boundaries come on the different ways that this could be implemented. And is it very clear who owns what and who is responsible for what.

We also used other kinds of modeling to look at different configurations. We used context diagrams. These are very simple. Again, anybody can draw them, including me, which is one reason why I use them. A circle and a square and a line.

And what's interesting is when we did use cases of different configurations and we did context diagrams of different configurations what was interesting to see was where the vendors had their relationship. Did they have a direct

relationship with the customer and their equipment or did they have a relationship with the utility in some way.

And we did graphical scenarios which are a little closer to reality. Or we can imagine that yes, that box looks like a house or some kind of a customer premise. And then the utility. And the little yellow thing is our meter and this represents someone reading a meter. And the arrow indicates that in this particular diagram it is going in one direction, which is the way it is for most people right now.

We were working steadily towards something called activity semantic models, which is like the next step before you actually write text in terms of policy guidelines. And basically we defined rights and obligations. And then we used these activity semantic models to actually write the text in terms of rights and obligations.

And a note here. There will be a PIER report on this published soon. If anyone is interested in being notified when it is available, and we may also be able to post this somewhere on the web, I'm not sure, but let me know.

And also there are handout slides at the

1 end that give examples of some of the diagrams
2 that I don't have in my presentation, in
3 particular use cases and semantic activity models.
4 So why did we focus on the AMI-customer
5 interface? Well as we all know, AMI is essential
6 technology for enabling customer participation in
7 DR. And it introduces a paradigm shift in the
8 relationship between the customer and the utility
9 from a simple arrangement with a customer in their
10 home and the utility on the outside, to up close
11 and personal with the utility talking to enabled
12 devices in the home. For example, programmable
13 communicating thermostats.
14 And what we were very interested in was
15 how far into the home does this go depending on
16 the different configurations. Because how this
17 interface is conceived and implemented will have a
18 big impact on how many customers participate
19 effectively in demand response.
20 So that led to considering different
21 types of customers. We looked at the customer who
22 wants the utility to handle all the details. And
23 for this particular customer the solution is
24 exactly what we found in the OpenHAN use cases.
25 The customer enrolls in a utility

program.

The utility sets up the AMI-HAN interface, which they call a utility HAN.

It's two-way communication.

The customer equipment is automatically registered with the AMI system.

And it might look something like this, where the customer has a PCT or a home area network. This utility AMI gateway is what is described in the OpenHAN use cases as belonging to the utility and it will transfer the two-way signal that was coming in through the meter into the equipment in the customer's home.

There is another group of customers who will have existing equipment and they don't want to lose their investment. And we developed something called the utility program extended option. And the only difference is explicit addition of a communications translation device if it is needed.

Because we did not want to find customers who were early adopters and had equipment using a different communication protocol being stuck and having to either buy something new or not be able to use the equipment they already

had. We did want to punish people who are already trying to get on the bandwagon early.

And so, again, the only difference is explicit addition. And it is very likely that that now exists in the OpenHAN use cases. As I said, we have not followed that from the first time when we analyzed it.

But that doesn't cover all of the customers that we could think of. We could think of customers who do not trust technology and would want something familiar.

We could think of customers who do not want the utility intruding in their home and are concerned about privacy issues.

And we could think of customers who are the do-it-yourselfers who want to pick the equipment, they want to set it up, they want to do everything themselves.

And the first option, which we saw on the previous slide, would not encourage these three different categories so we developed something called the Open Market Option, which is a one-way communication system. Meaning that the utility is still on the outside of the customer premise.

1 It is a broadcast communication and it
2 could be similar to radio, which is very familiar
3 to everyone.
4 And it allows the customer in the third
5 category who wants to define everything and do it
6 themselves to have complete control over what
7 equipment is used for their automated DR.
8 And that leads us to the rights and
9 obligations. So combining the customers that we
10 could think of and the assumption that we want to
11 get demand response from as many people as
12 possible we came up with these rights and
13 obligations.
14 So right number one is the customer has
15 a right to receive price, periodic and real-time
16 signals, and reliability signals without enrolling
17 in a utility program and without registering their
18 equipment with the utility. That doesn't mean all
19 customers have to exert that right but we felt
20 that it should be supported.
21 If it is then for every right somebody
22 must be obligated to support it or provide it.
23 And in this case the utilities then would be
24 obligated to provide a broadcast price and
25 reliability signal received by the customer

1 equipment that is neither registered with the
2 utility nor in a utility program.
3 The second right is that the customer
4 has a right to choose if and how they will program
5 their programmable communicating devices to
6 respond to price and reliability signals.
7 And the obligation here is that vendors
8 need to provide programmable communicating devices
9 that have a means of setting a device to not
10 respond, or a means of overriding the programming.
11 Right number three, customers have the
12 right to purchase, rent or otherwise select form
13 any vendor any and all devices and services used
14 in energy management or for other purposes in
15 their premises.
16 And the obligation is that utilities are
17 obligated to provide an AMI communication system
18 that uses an open communication protocol and does
19 not unduly restrict customer choice of customer
20 equipment or services that support performing DR.
21 Right four is for vendors. They have
22 the right to compete in a open market to sell HAN-
23 related systems, devices and services to all
24 utility customers.
25 And again the utilities are obligated to

not restrict customers enrolled in utility programs to equipment that only uses AMI communication protocol.

Right five: Utilities have the right offer demand response and energy management services to customers which utilize the informational and communication capabilities of their AMI system.

And customers are obligated to maintain their equipment used in utility programs in good working order and to provide any communication translation device if needed.

And finally, customers have the right to participate in utility-sponsored programs, and at the same time, use equipment not involved in the utility program that receives price and reliability signals.

So the obligation is that utilities are obligated to provide price and reliability signals through their AMI two-way signaling system and through a one-way signaling system.

And if we look at the graphical scenarios and the options and what rights they support. The Open Market Option, which is in our diagrams. We gave an example of what that one-way

broadcast could be. Which it could be RDS but that's not required. It's not that we are specifying that but it's just as an example. So the Open Market Option supports rights one,two, three and four.

The Utility Program Extended Option, which means that you are enrolled in a program, you are registering your equipment with the utility. It's two-way and there's a translation device if you need it. It supports rights two, three, four and five.

And if you had someone who didn't want to get that translation device but rather wanted to receive one-way signal from that device and they had other equipment that they wanted enrolled in the utility program, that combination supports all of the rights that we defined.

And that is the end of my presentation. Are there any questions? Yes, Commissioner.

PRESIDING MEMBER PFANNENSTIEL: Yes, Commissioner Chong.

CPUC COMMISSIONER CHONG: I'm wondering if you could explain a little further the utility program extended option.

MS. PEPETONE: Yes.

1 PRESIDING MEMBER PFANNENSTIEL: The
2 addition of the communications translation device.
3 I'm afraid I didn't quite grasp that, I'm sorry.
4 MS. PEPETONE: That's okay. So that
5 would be the middle diagram. And basically this
6 is for the person who has a device that uses a
7 different communication protocol. So they don't
8 use Zigbee, they use Z-wave or something. And it
9 can respond to a signal.
10 And so we don't want someone who already
11 did -- You know, as I said, it's probably going to
12 be an early-adoptive kind of person who already
13 has equipment and they are not using what their
14 local utility has decided to use.
15 And so with a translation device -- Now
16 the assumption is that on both sides you have, as
17 Ron described you have communication protocols
18 that are using an information model that's a
19 standard so that you can translate it.
20 So that's an assumption that we're
21 making. If someone bought something and no one
22 uses it and it is a proprietary communication then
23 that wouldn't work. This is assuming that it's a
24 standard that can be communicated -- translated,
25 sorry. Does that answer your question?

CPUC COMMISSIONER CHONG: Thank you.

PRESIDING MEMBER PFANNENSTIEL: In your rights and obligations.

MS. PEPETONE: Yes.

PRESIDING MEMBER PFANNENSTIEL: Is there sort of an assumption that utilities have the right to put a programmable communicating thermostat in homes?

MS. PEPETONE: That's a good question. Are we talking about -- Let's see, let's get it down to right five. They have the right to offer DR and energy management services to customers. We never spelled --

PRESIDING MEMBER PFANNENSTIEL: That's an offer, that's not -- That's an offer. So they offer it to the customer and the customer says, thank you, no.

MS. PEPETONE: Exactly.

PRESIDING MEMBER PFANNENSTIEL: So your assumption is that it is not anything that is required of customers.

MS. PEPETONE: Exactly.

PRESIDING MEMBER PFANNENSTIEL: It is just an assumption.

MS. PEPETONE: Exactly.

PRESIDING MEMBER PFANNENSTIEL: Okay, fine. Anything further?

Thank you very much. Great.

I see on the schedule that we are right about the time to take a lunch break and in fact the clock tells me that also. So let's break and come back at one.

(Whereupon, the lunch recess was taken.)

--oOo--

1 AFTERNOON SESSION

2 PRESIDING MEMBER PFANNENSTIEL: I think

3 we are ready to begin the afternoon session. If

4 people will take their seats.

5 Why don't we start on Section number 7

6 with Clay Collier.

7 MR. G. TAYLOR: It will just be about

8 ten seconds here, we have got to do a quick

9 update.

10 MR. COLLIER: Good afternoon

11 Commissioners, staff, guests. I am here to

12 present the Open Automated Demand Response

13 Communications Standards. I work with Ed Koch,

14 who is both the liaison to the standards effort

15 and the principal author of the standard that we

16 have been working on with Lawrence Berkeley Labs.

17 And I will provide a web address to the standard

18 at the end of this presentation and invite any

19 questions about the liaison status to other

20 organizations to Ed. I'll provide his contact.

21 So I think this morning's session did an

22 excellent job of the history, definition, benefits

23 of demand response.

24 I will address that in a very brief

25 fashion and focus on the Open-ADR concept. What

it is, where that protocol is implemented. What the implications of that protocol are and what we perceive as the benefits of it.

And then I will you where we stand in the standards efforts in terms of organizations we have reached out to and the reception we have gotten so far.

Now here is a slide showing within of spectrum of where energy optimization can occur, where automated demand response can address the spectrum. Day-ahead, slow, demand response and real-time demand response start moving towards and looking like spinning reserve DR possibilities. Which we obviously find very exciting.

This is the only slide that I am going to present that wasn't presented, in a sense, in the context of demand response this morning.

Roger did a great job of showing the history. I'll point out a couple of elements in this that are interesting because they influenced the decision to move to the standard.

Again, LBNL has been working on this since 2002.

The initial development at DRRC using XML exchange was in '03.

In '05 -- And then use of Internet relays in field trials was in '04.

And then the development of the modern demand response automated server concept occurred in '05. And we collaborated with PG&E's CPP DR program to implement this architecture.

In '06 we expanded the field trial using PG&E's pilot programs. And we used the development of a CLIR box to facilitate getting into facilities that did not have a gateway out in an open Internet mechanism.

We have since that time been able to migrate away from needing to propose specific hardware and find partners that are doing EMCS and the hardware implementations in facilities. So I'll talk about that in a little bit in terms of the standard.

In '07 and '08 we have had commercialization and use of DRAS throughout the state with PG&E, So Cal Edison and San Diego Gas and Electricity (sic). And have been quite pleased with the mechanics of those implementations with those partners.

Last year we began the effort of standardization of the automated demand response

1 communications protocol. And I'll show you where
2 it fits in the overall architecture of the system
3 and what the implications of it are. We see it as
4 an enabler to the rapid expansion of this
5 technology. Okay.
6 So here is a picture similar to what Ron
7 showed this morning with an abbreviated version of
8 a link to a wireless interface. I'll talk about
9 that a little bit.
10 If we look at the place of the messaging
11 infrastructure to facilitate a utility or ISO
12 program reaching out directly to facilities, it is
13 the demand response automated server. Right? So
14 you can see the demand response automated server
15 as a messaging gateway that facilitates pricing
16 signals and confirms reliability of messages for
17 an implementation of a program.
18 If I look at the interface to facilities
19 I can have an open, messaging protocol over the
20 Internet which facilitates a partnership between
21 facilities that have their own EMCS system that
22 can incorporate an XML messaging interface, or
23 facilities that may need an external gateway to be
24 implemented.
25 We have deployed this, as I mentioned,

1 throughout the state with partners that are --
2 Again, this is so far a C&I implementation, 200 kW
3 and above. And partners, we have a variety of
4 partners that we interoperability with using this
5 open protocol to do EMCS, messaging and DR, even
6 at the aggregated load level. So some of our
7 partners for this are aggregators that have their
8 own network of customers that use this open
9 protocol.
10 The benefits of using an open protocol,
11 and the reason that we wanted to open this up, was
12 so that you can have a rapid expansion of the
13 availability of partners that could get on that
14 bus, so to speak. If you look at the open
15 protocol as an open bus, you go back to the early
16 days of the PC, to go back to Ron's analogies.
17 And you can plug and play different components.
18 Anybody doing EMCS in a facility that
19 wants to participate in a DR program can use an
20 open gateway to facilitate that. The DRAS itself
21 as a messaging infrastructure facilitates the
22 utilities' implementation of the program with an
23 easy integration. You don't, you don't have to
24 struggle through one-on-one, proprietary
25 implementations and integration.

1 One of the things that was mentioned
2 this morning in Roger's presentation was that if
3 you look at this being deployed across the
4 spectrum of all proprietary protocols, equipment
5 and implementations you risk having stranded
6 assets. If the utility changes their program some
7 of the assets that were a hard pipeline cannot be
8 modified.
9 So we believe that it is to the benefit
10 of the expansion of this technology to have an
11 open protocol. And that is why Akuacom has worked
12 closely with Lawrence Berkeley Labs to publish
13 this messaging protocol and make it usable to
14 anyone operating AutoDR.
15 Let me just go through a few of the
16 standardization benefits. I mentioned vendor
17 lock-in. You know, if you have a specific,
18 proprietary technology there's a danger that a
19 transition in a program costs you whatever
20 equipment, whatever TATI money is spent, in that
21 implementation.
22 Given an open interface it offers the
23 opportunity for innovation. You know people, and
24 I think you'll see some demonstrations later
25 today, of innovation towards the household side

and lower Kw side of technology that could benefit from an open protocol.

And ultimately that lowers technology costs because you have benefits of scale that standardization provides.

It allows DR technology specifications to be interoperable. You can have a variety of programs implemented, as we have, with multiple utilities, that can interoperate with the facilities that are hooked up.

AutoDR can be used for price or reliability.

And with an open standard that has gone through the process of achieving standardization you get security. You confirm security and reliability.

Impact of financial planning for a utility. This is a cornerstone of technology development that enables a series of programs, to a series of interface devices, that we can't yet imagine. So we see, by having the open interface standard, that it can facilitate a spectrum of implementations, we facilitate rapid expansion.

Now this is a long laundry list of the participants over the last several years that have

1 worked on standardizations of various elements of
2 demand response and EMCS systems, both from a
3 facility side and household side AMI.
4 And then there are some industry
5 initiatives we'll talk about.
6 We have embraced, whenever possible,
7 these efforts and extended outreach and
8 participated with the NIST to establish an open
9 format to promote the standard.
10 We so far, as Ron mentioned this
11 morning, see no conflict. We are getting support
12 to participate in the process.
13 And the standards process has a little
14 bit of uncertainty in terms of time frame. If you
15 take it to IEEE, for instance, you know, what is
16 the pipeline to create a committee, get buy-in of
17 the committee and proceed.
18 So far over a one year effort the
19 published standard has received good acceptance.
20 We have had the key California utilities
21 participate with comments, modifications and
22 leverage the plan.
23 So here is where the status, here is
24 where it stands right now. We have recruited
25 participation from the utilities and ISOs and have

had hands-on, written comments and interactive meetings.

There are a variety of national standards bodies including NIST, Open AMI and TC-8 that have agreed to -- NIST participated in the Connectivity Week meetings three weeks ago and helped publish a DVD of the standard that we are releasing.

Facility control vendors and organizations, both commercial partners that are doing facility implementations, participated in the demonstrations at Connectivity Week and have shared their stories of how to implement and interface to the standard.

And then end-user organizations, including aggregators and the Retail Energy Alliance, are reviewing the standard. And there are some implications there when you look at three billion square feet of retail space that could be opened up to demand response.

I included a web address at the bottom of the page here. This is where you can actually download the standard. Take a look at it. It's the LBL website for open ADR. And that will give you a view of exactly what the content of the

standard is. Any questions?

ASSOCIATE MEMBER ROSENFELD: Clay, you should probably read the invisible yellow on the website.

MR. COLLIER: Oh, thank you.

ASSOCIATE MEMBER ROSENFELD: I didn't even know it was there until you pointed out it's supposed to be there.

MR. COLLIER: Thank you. The web address is drrc.lbl.gov/openadr. Thank you.

PRESIDING MEMBER PFANNENSTIEL: Thank you. Any other questions? Thanks.

MR. COLLIER: Thanks.

MR. G. TAYLOR: Next up we have Ron Hofmann again to discuss residential enabling technologies.

MR. HOFMANN: Good afternoon, Commissioners and staff. The word PCT often gets different definitions so I thought I would put up a definition of what a programmable communicating thermostat is. And I will show you some schematic pictures as we go forward and hopefully it will become very clear as to what it is and isn't. I like to say that it's a standard programmable thermostat with a wrapper around it. And the

1 wrapper is a set of communications interfaces of
2 different types.
3 Some of the communications that were
4 planned on have to do with just interconnectivity
5 to the HVAC system. That's a form of
6 communications. But the most important ones are
7 the ones that allow communications to extend
8 beyond the PCT and out of the home. In and out of
9 the home. So a PCT is a programmable thermostat
10 with communications interfaces added.
11 PCTs have existed for a long time as
12 Roger out this morning. They are proprietary
13 PCTs, they are good technology. So don't
14 interpret what I am saying as anything negative.
15 They are high-cost because the markets are
16 relatively small. And they are proprietary, which
17 means that they have limited markets. There is no
18 large market in which they all can participate.
19 These markets have primarily been
20 utility defined and so some of the products, some
21 of the PCT products that are in the market today
22 are quite different because of their evolution
23 from particular utilities across the United
24 States.
25 So the purpose of the PIER-sponsored PCT

1 referenced design was to dramatically lower the
2 cost by creating standard interfaces and a common
3 information model independent of protocol. So we
4 were not trying to define how you would
5 communicate to the PCT in terms of what the
6 physical layer is. But we were trying to get, as
7 I mentioned this morning, to come up with a common
8 information model that allowed proprietary
9 technology to play in a bigger market.
10 I guess I should say one more thing.
11 Everything you are about to see in here applies to
12 more than just thermostats. When you see the
13 schematic I think you'll begin to understand that
14 any communicating device in the home could
15 actually follow this same idea of basic capability
16 surrounded by communication interfaces.
17 So let me just take a few minutes, a
18 couple of slides to go over some PIER PCT history.
19 In 2005 PIER held a number of workshops that were
20 facilitated by Erich Gunther having to do with
21 defining what is a reference design and what is
22 system integration.
23 Because the basic idea here was
24 different from what the Commission had dealt with
25 in years past when they dealt with energy

1 efficiency standards for refrigerators and other
2 devices. This is a device that is more than just
3 a widget. It is a widget with communications
4 capabilities. It is part of a system, by
5 definition.
6 In 2006 PIER proposed and demonstrated a
7 proof of concept PCT to show that the idea of
8 reference design and system integration do apply
9 to thermostats.
10 In 2007 as a result of a study that was
11 completed in 2006 by the University of California,
12 PIER facilitated an open industry forum to
13 establish a reference design for a PCT based on
14 this proof of concept PCT that could be proposed
15 for the Title 24 standards in 2008.
16 That particular reference design is on
17 the web. And anybody that would be interested in
18 seeing it, it's on the LBNL site. But if you just
19 e-mail me I will give you a direct link.
20 In January 2008 the Title 24 PCT rules
21 were challenged. That's the regulatory rules were
22 challenged. And the PCT reference design was
23 removed from consideration. So here is a very
24 important point. There's really two parts to the
25 PCT. They are the parts where the rules were set

1 for regulatory purposes, for Title 24. Which
2 takes advantage of the reference design. But the
3 reference design is a separate document which is
4 independent of the particular rules.
5 A particular rule in the Title 24
6 procedure was challenged but it didn't invalidate
7 the design. The technology still stands quite
8 independent and can respond to any set of
9 regulatory rules. Remember my conversation this
10 morning in that all of this is instantiated in
11 software, not in hardware.
12 In April 2008 OpenHAN agreed to, which
13 is an industry group led by the utilities, agreed
14 to consider the PCT reference design. And that i
15 underway under the facilitation of Erich Gunther.
16 And this afternoon after a few more
17 talks you will get a chance to see a couple of
18 prototypes, tested PCT prototypes. And we will
19 actually do a test using one of the communication
20 links as an example.
21 So if you remember from this morning I
22 made a distinction between what the regulators
23 want versus how industry and the utilities
24 implement it. And so when we started with the PCT
25 there were a clear set of objectives that were

presented at a number of workshops and became refined to these four bullet points?

So the idea of the PCT standard that we were looking at was a set of system integration interfaces that could be applied for anybody who lived in California, and hopefully the whole United States.

A common information model for everybody in California. what this means is that if you live in Southern California Edison's territory you don't have to buy a special PCT with their information model. And I don't think they want that either.

This allows for the hardware to be a high-volume entity. And what might distinguish various PCTs is the software and how it's used. But from a stranded hardware point of view, this sort of eliminates that and creates a large market for more vendors to participate in the thermostat market.

Number three. It needs to be able to work with any minimum AMI system. If you have the very sophisticated AMI systems the chances are the AMI system will be smart enough to work with almost any vendor's products, I think.

1 But if you say it the other way. If you
2 say that the PCT has to be something that works
3 with the minimum functional AMI system. And a
4 minimum, functional AMI system might be something
5 where there's a communication system on the
6 utility side of the meter but there isn't one into
7 the home. There is an interval meter, there is a
8 communication system back at the utility, there is
9 back off the software.
10 But a particular utility in the United
11 States or a public utility in California might not
12 choose to implement the link into the home. So we
13 said, we had to have an option for that. If
14 everybody chooses to have a link into the home,
15 that's fine. This is for working in the minimum
16 AMI case.
17 And finally, it has to be compatible
18 with all legacy HVAC systems. All air
19 conditioning systems and all heating systems.
20 Finally with this quote, what, the
21 industry will work out the how.
22 We had some -- We had some cost and
23 price targets. If you remember Roger's slide
24 early this morning, he showed that in the 2005-
25 2006 time frame the company E3 did an analysis for

1 the Commission to see what was cost-effective from
2 society's point of view. And they determined that
3 the PCT that cost $150 to the utility, that would
4 be a wholesale price, was cost-effective.
5 Based on some studies we did we realized
6 that that was a lot larger than it had to be if
7 you defined these interfaces in a open way. And
8 so we came up with some criteria based on a study
9 that we did at the University of California that
10 all of the additional bill of materials cost could
11 be less than $10. And a retail price, that's
12 typically usually twice the cost of a wholesale
13 price. A retail price could be less than $100.
14 So that was a goal that we had.
15 And remember from Roger's discussion
16 this morning, the proprietary PCTs in the
17 marketplace, because they had a limited market,
18 was more in the range of $200 to $400 wholesale.
19 Price to the utilities.
20 So how did we go about doing this?
21 There is no one way to do this. But we came up
22 with something that everybody agreed with. And
23 what we decided to do was to create conceptually
24 four interfaces. A built-in communications
25 interface, a man-machine interface, a human-

1 machine interface. An HVAC interface, an
2 expansion interface. All of which we wanted to
3 standardize.
4 As you will see later on in my slides,
5 the HVAC interface fell by the wayside because
6 even though we had a way to plug thermostats into
7 the wall in a uniform way, NEMA sent us a letter
8 that said, it's too early to do this, let's wait
9 until 2011. So we dropped that one. So we were
10 left with three interfaces to explore.
11 This is what that looks like
12 conceptually. So conceptually we have a
13 thermostat, which is the yellow. Anybody's
14 thermostat, it doesn't matter. What is inside the
15 yellow is proprietary. It's the special sauce
16 that each of the thermostat manufacturers comes to
17 market with that differentiates them from
18 everybody else. It includes the packaging and how
19 they go to market.
20 And what we did was we created standards
21 for four types of interfaces that would be
22 attached to their standard offering. And their
23 offerings could be from minimal thermostats to
24 something that played the Star Spangled Banner
25 every morning. It wouldn't matter. What people

1 would buy is what people would buy. In the yellow
2 part of this picture, whatever the market would
3 bear would be okay. But where the blue is,
4 everything would be standard so that there could
5 be interoperability.
6 We did a concept prototype in which we
7 actually tested this and we brought it to the
8 Commission. I believe it was April of 2006. And
9 we demonstrated it to Southern California Edison.
10 And it clearly worked.
11 There is a complete 192 page report on
12 all of the work done by the University of
13 California in terms of modeling, in terms of
14 prices, in terms of costs. All of this stuff was
15 published on the web as we went through so that
16 all the manufacturers could take a look at what we
17 were doing and show us the error in our ways.
18 The sum total of this 192 page report
19 which is posted on the web and I am happy to
20 direct you to if you send me an e-mail, pretty
21 well lays out a great deal of research that shows
22 that not only is this possible, but in fact all of
23 these numbers have been vetted with industry.
24 So just to give you a little summary
25 quickly. This is what we got several years ago in

terms of a bill of materials that said, an equivalent minimum, important word. Equivalent minimum programmable thermostat. Bill of materials is about $13.

And that just by quickly going out and checking with vendors, how could we create these four interfaces at minimum cost to meet the objectives of an interoperable PCT that could do price response, it could do a number of different things. In fact it could be reprogrammable so it could, in fact, do different things later in time. The total bill of materials came to about $20. It was a little bit less than $18.

Actually remember I said, NEMA said, well we don't want to do the HVAC interface right now. So actually the bill of materials is actually $2 less than this going forward because we dropped that for now.

How did we know this was true? How did we know that this was okay? Well we posted a complete spreadsheet with the bill of materials on the web. And we know from manufacturers who called us and said, yeah, can't argue with that, that looks okay.

We also did one other thing. We grabbed

1 a picture from the Sunday paper from Home Depot
2 and we looked at their ads. And you can look at
3 the arithmetic that I did there, you can do it any
4 way you want. But if you take the $12.70 base
5 price for a programmable thermostat, whether you
6 use a multiplier of three or four, which are
7 typical multipliers through all the channels to
8 retail, you get a number that's very close to the
9 numbers that they are charging for these various
10 thermostats that are in this ad. So we knew we
11 were in the ballpark. We had a way of vetting
12 this. In addition to having talked to a lot of
13 different manufacturers.
14 So the PCT reference design is posted on
15 the web. It has costs for all the elements. It
16 has a proposed scheme for security and
17 registration, which could be adopted by the
18 utilities and all users, it's all there. The
19 utilities and the vendors participated in this
20 process. The proposed RDS one-way implementation
21 of communications is in this, in this particular
22 reference design that's on the web. And the
23 expansion port, which is critical to this overall
24 design, is also there.
25 And I just want to take a moment to tell

you about these two items. The RDS is only one of the communications channels into the PCT. The PCT also supports narrowband and broadband, either through the expansion port or through eventually being on-board in the machine.

Remember the example I gave earlier this morning about external modems? Well when the PC came out all communications were external. They came in through the RS-232 port. This is the same idea here. Until we understand 100 percent what that communication channel is for the thermostats, the thermostats can at least at this time have expansion ports.

So that if a particular communication channel failed, if something went wrong and we all of a sudden found out that one particular type of communication wouldn't work, you could exchange whatever you stuck into the expansion port. You could plug in a different modem, so to speak.

That could allow you not to have to throw away the thermostat. So it was an idea that we proposed. It may never be used. Because maybe at this point the utilities have come up with a strong enough standard with Zigbee that maybe that can become the internal communication standard.

To be determined.

But the design is what I am trying to promote to you. The idea of the design is to make sure consumers don't have stranded assets and that they have minimum cost.

There will be some vendors here this afternoon who will talk a little bit about their products in the public comment period. And I think you are going to be quite surprised at what already exists out there that is starting to follow this design. And I think they and the utilities are all looking forward to something like Title 24 specifying this reference design as being acceptable. What has to be wrapped around it is acceptable regulations.

Recently there was a bill passed, SB 1491. And as far as I can tell the PCT reference design is compatible with SB 1491.

Thank you. Any other questions?

PRESIDING MEMBER PFANNENSTIEL: Questions?

ADVISOR TUTT: Yes, Ron, I just had one question. You mentioned that the possible Zigbee structure. I presume that even if that were -- ended up being part of the eventual reference

1 design that you would still include it in the
2 expansion port reference design in the PCT?
3 MR. HOFMANN: Yes. Even today the PCs
4 have expansion ports. They are called USB ports
5 today, where they were called RS-232. There is
6 still always value in having this port where
7 things are externally connected. Either
8 permanently, or for the time being while you
9 figure out whether this is the right way to go.
10 So the answer is yes.
11 I know there is one manufacturer that's
12 been thinking about multiple expansion ports. If
13 you go back to the bill of materials you'll see
14 expansion ports are very cheap. They are
15 basically the same expansion ports you have in
16 your camera, they're SDIO ports.
17 So again what we have tried to do is not
18 invent anything new. We have gone out to pick
19 technologies that already exist. So the SDIO port
20 is a standard technology.
21 The RDS one-way technology is going to
22 be in probably all cars in a few years. RDS is
23 what enables you to see what song is playing on
24 your LCD screen in your car. And there's a number
25 of cars from General Motors and Chrysler that come

1 out automatically with these things. It's a very
2 low cost technology that I believe is a good
3 transitional approach to finalizing within five or
4 so years, ten years, the two way technology that's
5 going to be built into all thermostats.
6 If it could be chosen today and
7 everybody is comfortable with it and it's proven,
8 field proven, maybe we don't have to go through
9 the step. But my experience in this area is that,
10 I doubt it. Even some of the best wireless
11 technologies that have been deployed over the last
12 30 years of the career that I had in the wireless
13 area have all hiccupped. All. Even the best.
14 The ones we look at today and say, gee, they are
15 just solid as a rock. You go back in their
16 history, you know, they had growth pains.
17 So I am trying to put belts and
18 suspenders on this and make sure that we don't get
19 embarrassed by specifying reference designs that
20 don't have some legs. This has legs.
21 PRESIDING MEMBER PFANNENSTIEL: Other
22 questions? Yes, Commissioner Chong.
23 CPUC COMMISSIONER CHONG: Thank you. I
24 want to commend you on this initiative because I
25 think this is very important for the future of the

electric industry. I particularly am very pleased to see the fact that you are achieving a statewide standard, that is very important.

And secondly, it seems to me that the fact that these all work together is a big benefit to the retail market because it will drive prices down and make it more affordable for the consumers.

The question I have is, what is the schedule for the OpenHAN review of the PCT reference design? What is your guess?

MR. HOFMANN: I think they are in process. Erich Gunther couldn't be here today because of a Smart Grid activity in Washington DC. But the last time I talked to him about a week ago he said that it had already been brought up. It was in play in the committee. I would imagine it's weeks to a month or two that they should decide on whether it can be done. If you would like I would be happy to contact him again next Monday and just find out what the status is.

CPUC COMMISSIONER CHONG: Thank you. The other question I had was you talked about NEMA asking you to pull out the HVAC interface. And I wanted to ask who NEMA was.

1 MR. HOFMANN: Does somebody want to help
2 me here? I've been calling it NEMA so long I
3 don't remember what the acronym stands for.
4 Manufacturers Association.
5 PRESIDING MEMBER PFANNENSTIEL: The
6 National Electrical Manufacturers Association.
7 MR. HOFMANN: National Electronic (sic)
8 Manufacturers Association, sorry.
9 CPUC COMMISSIONER CHONG: So when you
10 say you pulled it out, you --
11 ASSOCIATE MEMBER ROSENFELD: Delayed it.
12 CPUC COMMISSIONER CHONG: You delayed
13 it. But there's still a little place in the
14 standard for it, right?
15 MR. HOFMANN: Absolutely. What was
16 proposed was a particular connector, which is used
17 worldwide and is made essentially in the billions
18 every year, so it's a standard connector. They
19 just said, and I think it was a reasonable
20 statement, that they couldn't respond fast enough
21 through their channels of sales and installation
22 to deal with something like this, they needed more
23 time. I believe there is a letter on file from
24 them about this. It may have been sent to
25 Commissioner Rosenfeld at one point.

ASSOCIATE MEMBER ROSENFELD: My recollection is it only asked for delay.

MR. HOFMANN: It did. In only asked for a delay. By the way, just to make you understand how important that particular interface is. If you have ever tried to change your thermostat in your house and dealt with all the different colored wires, even people who are expert at it, screw it up. So it would be nice to just have a little plug-in thing.

And that means that the wires in your wall would already be hooked up to some sort of receptacle and you would never have to worry about it. It would be easily retrofittable. But then every thermostat would come with this connector. Whatever it is, industry will figure it out. But that standard connector, like an RJ-45 plug or a DB-15 plug or something, would just plug into the wall.

And then if you wanted to change your thermostat you now can do it easily. You have eliminated the cost of somebody coming in and doing it for you. So it was an idea that I think the industry also accepts but they wanted the delay.

CPUC COMMISSIONER CHONG: But it is expected it will go forward, just 2011.

MR. HOFMANN: Well, the PCT itself is in doubt at least at this point for Title 24 so that has to be first resolved. And then the second step is, what to do about that other interface. And I don't know the status of that.

CPUC COMMISSIONER CHONG: Okay, I understand. And I'm wondering if you could tell us just a sentence or two about SB 1491. I am not familiar with that bill.

MR. HOFMANN: I wonder if I could defer to somebody else here.

PRESIDING MEMBER PFANNENSTIEL: That's the bill --

MR. HOFMANN: I'm sorry, it's not passed yet.

PRESIDING MEMBER PFANNENSTIEL: No, a bill, not a law. Correct, absolutely.

CPUC COMMISSIONER CHONG: Thank you.

PRESIDING MEMBER PFANNENSTIEL: Ron, your page of Home Depot advertisements of programmable thermostats. Non-communicating, programmable thermostats, I assume?

MR. HOFMANN: Yes.

PRESIDING MEMBER PFANNENSTIEL: Sort of trigger the question of, is there the expectation that at some near-term date the PCTs are going to be on display at Home Depot?

MR. HOFMANN: I think the answer is yes. But I think I will defer to the public comment section when I believe the company that actually makes thermostats for Home Depot could answer that directly. But I think the answer is yes. That I think that various versions of things that look like the Title 24 PCT are poised to go on the market very soon. How they are enabled, I think you have to ask Tim Simon from Golden Power. And he can explain to you what the plans are for Home Depot. I don't know them personally.

PRESIDING MEMBER PFANNENSTIEL: Okay, thanks.

ASSOCIATE MEMBER ROSENFELD: Ron, Commissioner Chong had one question about an interface, the HVAC interface. I want to try to clarify a little bit your human-machine interface. Because in fact the non-communicating thermostat already has a human-machine interface.

MR. HOFMANN: Yes.

ASSOCIATE MEMBER ROSENFELD: Although

1 looking particularly at the pictures we just
2 referred to from Home Depot, some of them look
3 pretty small and ordinary to use the program, the
4 extra complications of time of use pricing.
5 But do I gather that if you are willing
6 to go stand in front of the thermostat and try to
7 program it directly, that you would not use the
8 human-machine interface. You would use the
9 crystal display on the thermostat itself.
10 MR. HOFMANN: If you look at this slide
11 that I put back up here for the human-machine
12 interface. Notice that the added cost is only 15
13 cents.
14 ASSOCIATE MEMBER ROSENFELD: Yes, that's
15 what I'm driving at.
16 MR. HOFMANN: The implied issue was that
17 we would use whatever the manufacturers have.
18 Some manufacturers have touch screens, some
19 manufacturers have keypads and LCD displays that
20 are hard to read. All of that was expected to
21 stay.
22 The 15 cents was for two things. A
23 little LED light that told you when you were in a
24 demand responsive period. To let people know so
25 they could just quickly just glance at their

1 thermostat and see that the red light was on.
2 And also, what I call a Homer Simpson
3 button. It was an override button. So one of the
4 things that was misunderstood by the Legislature
5 when they thought that this particular device
6 might be Big Brother. You always had control in
7 the design with an override button. I think that
8 may have been misunderstood.
9 The regulations, however, said there was
10 one event under which you would not be able to use
11 the override button. But part of the 15 cents was
12 to give the user complete control in overriding
13 whatever they had programmed. So the 15 cents
14 includes a button plus a light. Everything else
15 is whatever the manufacturer offers in their line
16 of thermostats, whether it's touch screens, key
17 pads.
18 And remember, now that we have a
19 communication link we now have an energy
20 efficiency enabler in that there can be services
21 that are sold over the web where somebody could
22 plug into the expansion port a WiFi connection and
23 somebody could sell them a service to help them --
24 a third party to help them manage their energy
25 through that WiFi connection if they have a

1 router.

2 So the idea is, on the human-machine

3 interface, is that it's a no-cost extension to

4 your PC if you have communications. If you see

5 that connection.

6 ASSOCIATE MEMBER ROSENFELD: So just to

7 bring this point out. If you are willing to cope

8 with the small screen display on the thermostat,

9 all you need is the red Homer Simpson override

10 button. And you said a second thing.

11 MR. HOFMANN: A little LED light just to

12 let people know that you're in a critical period.

13 ASSOCIATE MEMBER ROSENFELD: The LED

14 light which says I am receiving information.

15 MR. HOFMANN: Yes.

16 ASSOCIATE MEMBER ROSENFELD: On the

17 other hand, these things are notoriously

18 unprogrammed by many people, like VCRs. So I

19 guess a dream of all of us is that also around

20 your house somewhere is your PC with a comfortable

21 keyboard and a screen and information from your

22 friendly utility about how much electricity you

23 used yesterday and so on.

24 Where does the PC get its information?

25 The PC, not the PCT. Where does the PC get its

information? Does it get it from the meter or from the PCT?

MR. HOFMANN: I think that's yet to be determined. I think what we have done with the PCT is allowed for all of those options. We have allowed that the manufacturers and the utilities can get together and come up with a number of options that are different for different kinds of people.

So some people who are home enthusiasts and can do it themselves might go out and buy a $30 addition to their PCT that allows them to talk to a new WiFi because they already have a router in their house. And therefore they are connected now up to their PC and they could do it themselves.

Other people say, let the utility do it for me. And that's a good option too. And through the utility link they can get the same programmability.

How those things develop I think are to be determined. What the PCT does as a standard is it enables it. So this is an enabling technology that can grow and we're copying the essential, architectural design of what was done with

1 personal computers.

2 So if you look back at that and you say,

3 this has been unbelievable -- there's been

4 hiccups, well all know that. But if we have

5 enabling technology that allows the technologists

6 to offer people things through these many ports

7 and options. I think we will eventually arrive at

8 a solution that we all like. That's the hope of

9 the PCT.

10 And again, the PCT is just a thermostat.

11 The same interfaces can work for any other device.

12 And my colleague, Dave Hungerford here, has often

13 talked about PCDs, programmable communicating

14 devices. That's a possibility when you look at it

15 from the system integration point of view.

16 ASSOCIATE MEMBER ROSENFELD: Thank you.

17 PRESIDING MEMBER PFANNENSTIEL: I just

18 need to clarify the point that you made about the

19 override button. I don't think there really was a

20 confusion about whether or not these devices had

21 an override button or whether you could use them

22 or whether they work.

23 I think it was more of the sense that

24 from the Legislature, but I think even more those

25 customers who wrote in, it was more a question of

1 just not wanting to be bothered with having to
2 deal with even an override button. But I don't
3 think people misunderstood the fact that there was
4 an override button. I think people just didn't
5 like the concept of the device to begin with. A
6 different, a different issue.
7 Further questions? Thanks, Ron.
8 MR. HOFMANN: Thank you.
9 MR. G. TAYLOR: We're just going to do a
10 quick switch, one little minor update on a slide.
11 So excuse me for that.
12 Thanks for your patience. Next up is
13 Ray Bell, the first of three speakers to talk to
14 us about different types of communications.
15 MR. BELL: Good afternoon. Thank you
16 for asking me up to talk about broadband today.
17 I'll make it brief. I was told I had 15 minutes
18 but I'll go through and at your leisure you can
19 tell me if you would like to extend that.
20 A little bit about Grid Net, briefly.
21 Grid Net is a company that builds Smart Grid
22 network management software for next generation
23 utility Smart Grids. We also build WiMAX products
24 for the Smart Grid, which is probably why I was
25 asked to talk about broadband today.

1 I'm supposed to focus just on broadband
2 technology and give you a brief kind of view over
3 that. And what this slide is meant to point out
4 is that from a broadband perspective there's
5 really two main domains in the network that are
6 probably relevant to the discussions here.
7 And that's the metropolitan access
8 network, that's the network in the city or the
9 county or the service territory. And the home
10 area network, which a lot of people have been
11 speaking about. There's other broadband in the
12 network but it has to do with the core
13 infrastructure, which is why I have it grayed out
14 in the slide.
15 If you look at, today, what's out and
16 available in the market, you have cable
17 infrastructure, a hybrid fiber coax cable
18 infrastructure which provides broadband to the
19 home. You have the telephony system, the
20 unshielded, twisted pair telephone system, which
21 provides broadband to the home.
22 And you have a variety of wireless
23 technologies on the market, a third generation
24 wireless moving the fourth generation, that also
25 provide a wireless broadband. The difference

1 there is that not only is that fixed but it's also
2 mobile, where the other two are fixed.
3 If you look at the current technology,
4 where we're at at this point in time, we have
5 third generation cellular technology. Its
6 origination was in voice and so its architecture
7 was around voice communications. Over the last
8 four to five, ten years -- probably five or ten
9 years -- it has been migrating to be able to
10 support data. And so today the technologies that
11 you have on your PDAs or phones is generally one
12 of these two technologies, either GSM or CDMA.
13 Many of you may have heard of WiMAX.
14 WiMAX is a fourth generation technology that was
15 developed in the IEEE. It is not well-deployed in
16 the United States. If you have seen the press
17 it's on a process of rolling out throughout the
18 United States but it's quite well-deployed in
19 other countries. And it's gaining fairly strong
20 momentum.
21 There is a competitive technology to
22 WiMAX which is emerging out of the third
23 generation wireless group called LTE or Long Term
24 Evolution. Currently the update on that is the
25 standard ratification is expected at the end of

1 this year and you will start to see product in
2 '09. And vendors, I believe such as Verizon, have
3 indicated a direction towards that technology.
4 Having said that, there is a lot of
5 discussion going on in the ITU, in the IEEE and
6 the 3GPP around, do we really want two competing
7 standards or should these line up on a path
8 forward as we move forward into 2010, 2012. That
9 is to be determined.
10 The other major metropolitan access
11 service network or MAN network technology that we
12 talked about was cable. Which many of you know
13 today is sponsored out of cable labs in the ITU.
14 DSL, over your telephone lines, and Ethernet,
15 which has been here for many, many years.
16 So if you look at just those metro
17 technologies. What I tried to show, just very
18 briefly, is a picture which will show on the left
19 the cable infrastructure where you have a head-
20 end, often with satellite down-link for
21 entertainment provisioning.
22 A fiber optic network, a hybrid fiber
23 coax network that goes on the telecom section,
24 generally in the utility infrastructure. And it
25 is very similar to the telephony system, which

1 also shares that same sector on the utility
2 infrastructure but for voice.
3 Cellular wireless, and in particular
4 WiMAX, is a wireless broadband technology that is
5 different than the third generation technology in
6 that it is actually wireless broadband built for
7 voice, video, data. It uses traditional router
8 and switch technology that you find in the
9 Internet for the backbone network. And there are
10 over 500 vendors today who have commercial
11 products on the market with interoperability
12 profiles. And these are companies like Motorola,
13 Cisco, Nor-Tel, Alcatel, Intel, General Electric
14 with their new product are in that space.
15 From a home perspective many of us are
16 quite aware of WiFi. It came out a few years ago.
17 It has become the predominant, local area network
18 within the home. There is a variety of WiMAX
19 releases. Recently MESH, low-power-based MESH
20 WiMAX has entered into the market as a competitor
21 to the other low-power MESH technologies. So
22 that's to be noted. That there are technologies
23 today that are looking to be in this space. As
24 Ron said, to possibly be a USB port addition to
25 the PCT. So that technology is available today.

1 Ethernet is not well established in the
2 home because when most homes were built people
3 didn't run Cat5 cable, which is what you want to
4 run your Ethernet on in the wiring premise.
5 Which led the industry to develop a
6 alternative technology, which is modeled on
7 Ethernet. It uses similar framing network
8 technology. And that's done by the Home Plug
9 Powerline Alliance.
10 And most recently that's been rolled
11 into the IEEE for a standardization process.
12 There was a competing standard with Panasonic.
13 And it was moved in, these two were moved in and
14 are being merged in the IEEE. Given Home Plug's
15 design around similarities with Ethernet it will,
16 I believe, fold into the Ethernet or the 802
17 family quite well. So this is technology to be
18 aware of.
19 Without talking about companies, we have
20 seen this technology now successfully go from a
21 meter, over the wiring, over the HVAC transformers
22 to the 24-volt PCT. So this technology is now
23 viable in terms of -- And that's a two-megabyte
24 bi-directional signal.
25 From a home perspective I think the real

1 issue, and I have been involved in discussions at
2 the Commission here and in the industry and
3 watching the Title 24 work. The kind of take-away
4 that I have is that consumers want choice. All
5 right. And the retail market needs to embrace
6 that choice.
7 And if you look at -- The purpose of
8 this slide is really to show you that when
9 consumers think of their home they don't think of
10 just their thermostat or their smart appliance.
11 They think about their television, their
12 entertainment system, their music systems. Their
13 computer and their Internet. So really the home
14 network needs to consider both aspects of this
15 environment.
16 Because if you have a control system
17 that doesn't interface with the consumer
18 electronic products you will end up having
19 multiple interfaces, multiple networks and the
20 like. So nothing other than to point out that you
21 have both wired and wireless broadband technology
22 in the home today.
23 The reason I put the meter above the
24 home area network is that I want to talk a little
25 bit about, from a broadband perspective, an option

1 from a meters perspective. From cable, the
2 problem with cable and a meter is the
3 installation. Most often the -- While a cable
4 termination may be on the side of the wall by the
5 junction box it is a very expensive installation
6 process to be able to use that technology.
7 People have discussed putting Ethernet
8 interfaces on meters to simplify that process but
9 that is a fact.
10 The same holds true for the existing
11 telephone network for DSL. Again, you could put a
12 jack in the meter but that's what was discussed
13 there.
14 We recently introduced a WiMAX smart
15 meter to the market. It's commercially available.
16 And not only does it serve as a smart meter but it
17 also serves as a broadband router to the home.
18 And so it opens up a whole lot of new
19 possibilities in demand response and utility
20 information to the customer.
21 We believe in the next year or so you
22 will see, with the technology that we know is
23 coming and in the market with the television
24 manufacturers, you will see the meter be able to
25 send hi-def, streaming audio/video signals to the

1 television as just part of the retail market.
2 And just to close on these topics. I
3 thought this slide would be a useful view. We
4 talk a lot bout standards and numbers and
5 alphabets. But what I tried to do is put this
6 into a visual that said, if you look at the IEEE
7 standards that we talk about, whether it's the
8 802.15 or 11 or 16, these standards were designed
9 for particular uses.
10 And you can see from the 15, the
11 personal area network, the original design was to
12 replace the serial cable. Bluetooth, Zigbee, are
13 implementations on that platform. You can, and
14 people have, worked to build MESH network
15 infrastructures on this technology. But that's
16 not what the IEEE originally designed it to do.
17 WiFi was, again, designed primarily for
18 broadband in the home. Or in your office location
19 wirelessly, or mobile broadband.
20 There's been a lot of people that have
21 tried to build WiFi metro infrastructures. Most
22 of them have collapsed. Which would lead you to
23 believe that you really don't want to have tens of
24 thousands of things on poles trying to build a
25 network infrastructure.

1 WiMAX. This slide is probably a little
2 dated because WiMax has now been merged into the
3 IMT, which is a telephony, a long-term, third
4 generation telephony movement. And you can see
5 WiMAX actually provides not only metro coverage
6 but coverage all the way into the home.
7 So I think that's what I have. Just to
8 talk about broadband and answer any questions that
9 you may have.
10 PRESIDING MEMBER PFANNENSTIEL: Thank
11 you. Are there questions? No?
12 CPUC COMMISSIONER CHONG: I do have one.
13 PRESIDING MEMBER PFANNENSTIEL: Yes,
14 there is one.
15 CPUC COMMISSIONER CHONG: So I'm trying
16 to understand, what will WiMAX bring us that the
17 PAN and the WiFi didn't, Ray?
18 MR. BELL: WiMAX is a metropolitan
19 access network technology. Commissioner Chong,
20 it's not what will it bring us. If you look at
21 the LAN, that technology was designed to go 150
22 meters. It wasn't designed to go kilometers.
23 From many people's perspective -- And
24 I'll talk about Intel, Intel is a major investor
25 in our company. WiFi and WiMAX are not competing

technologies, they're interoperable technologies.

In fact, what you'll see in the middle of '09 are laptops that will ship with both WiMAX and WiFi integrated so that you can have a seamless experience from outside your premise, your office or your home. And as you move in you'll reconnect to your home area network.

So it is not competitive. It's just the use of the right technology in the right place in the network I think is probably the right answer.

What it does bring you over third generation technology is that it was actually designed for voice, video and data. And so its infrastructure costs are so much lower than traditional 3G technology that it becomes a viable solution for AMI, as an example, given the monthly service charge. Which is probably far less than the utility would pay to read a meter manually today.

PRESIDING MEMBER PFANNENSTIEL: Tim.

ADVISOR TUTT: Ray, I just have one question. I've heard this term many times over the past months and I guess I'll display my ignorance in public. What does MESH mean in this?

MR. BELL: What does MESH mean? MESH is

1 a type of technology approach where you -- and
2 it's usually called ad hoc MESH. Most people
3 would refer to it that way in these solutions that
4 are on the market. Where a device will go and
5 discover locally other devices that it could
6 communicate with. And in turn that device would
7 establish communications with other neighbors.
8 And you build up this network of MESH devices,
9 devices all interconnecting. And you can then
10 move a packet across that MESH.
11 The value proposition is that itself
12 it's ad hoc and it will come up and it could go
13 away and it will reroute. And I think it's very
14 viable technology for its designed purpose.
15 PRESIDING MEMBER PFANNENSTIEL: Thank
16 you.
17 MR. G. TAYLOR: I would like to welcome
18 the second of our three presenters on
19 communication protocols, Roland Acra.
20 MR. ACRA: Good afternoon, everyone. So
21 I am here to cover the alternative method to
22 reaching, particularly devices within the premise
23 of the subscriber for a usage pattern that is
24 expected to be -- it's been called Bursty in the
25 title but in general it's expected to be telemetry

1 style interactions, meaning rather infrequent
2 corrections. And at that, each piece of
3 communication tends to be somewhat modest in the
4 amount of communication that needs to be moved.
5 I have taken in my presentation a few
6 views of the AMI network, mostly for perspective.
7 And then how this ties up with the home area
8 network, as it's been called, in the demand
9 response side of interactions.
10 And truth be told, I'll make a little
11 bit of a pitch for the open standards IP. The
12 Internet protocol-based approaches to these
13 things, which is one that we believe has quite a
14 bit of merit. But I will do my best in portraying
15 everything that is out there be it wired or
16 wireless, Internet based on not.
17 The picture that I will probably be
18 referring to quite a bit during the presentation
19 is the following. And what I have represented
20 here is on the top left part of the picture what
21 would be the utility operating center. This is
22 where presumably the intelligence of triggering
23 demand response programs or pricing signals or
24 what have you is driven by some application
25 software on a server back-end.

1 Then there is a variety of ways of
2 getting to the destination, the intended
3 destination for these messages. If we presume
4 that in this context are generally two classes of
5 destinations. One is the meter itself. You are
6 trying to get new information to the meter to put
7 it in a new pricing regime or to reset it or to
8 read it. That's one class of devices. And I
9 represent those at the bottom edge of the
10 neighborhood area network/AMI cloud. That's in
11 the middle right of the picture.
12 But then there are interactions that are
13 really intended to be conveyed all the way to a
14 device that is within the subscriber's premise.
15 And these are the things that could have an impact
16 on the actual load on the grid. So if you are
17 really trying to shed load you might want to
18 change the setting on a thermostat or turn off a
19 device all together in order to relieve the grid.
20 Homes or premises in general are going
21 to have multiple ways of getting into them. I'll
22 be talking about the AMI network in a transit role
23 towards these end devices inside the premise.
24 Knowing, however, that there will be often in the
25 subscriber premises, alternative ways of getting

1 inside of the home using something like the user's
2 broadband Internet connection, for instance, or a
3 phone line for that matter, if you want to get
4 back to the most common denominator for a way to
5 get into the premises.
6 I have picked different arrows, red and
7 green, only to illustrate the point that it is
8 unclear that we will always have the luxury of
9 having a single technology, a single communication
10 technology to cover all cases. And that's part of
11 what I'll be talking about, is doing a bit of
12 compare and contrast between what technologies are
13 available for which class of devices.
14 Alphabet soup. I'll be covering some of
15 these terms. Some of them refer to link
16 communication technologies, some of them refer to
17 protocols. I'll do my best. I have first a big
18 table that I am going to walk through.
19 I've put four, although there are dozens
20 of others. And these are -- In my mind those are
21 perhaps the most well-known out there. And on
22 purpose I have picked two columns, which are the
23 first from the left, that are wireless, low-power
24 wireless based using the 802.15.4 low-power
25 protocol, which Ray referred to earlier as the

1 PAN, the personal area network technology.
2 And I have picked a couple that were
3 wired, and particularly wired in a powerline
4 communication sense. Again somewhat arbitrary,
5 Home Plug and Echelon. I am not going to go
6 through every cell in that table, obviously, other
7 than to say that there's quite a few things that
8 one has to look at.
9 And some of them are not a choice. Some
10 of them are such that in one residence there is
11 good quality wiring for power line communication
12 transport that can be reliable, in other cases you
13 don't have that luxury. Either because the
14 distances are too long or sometimes the device
15 itself, like a thermostat, simply doesn't sit on
16 the 110 volt or 220 volt AC line, it sits on a 24
17 volt line that comes from the heater, from the
18 furnace.
19 So that is why I will be dwelling quite
20 a bit in the presentation on the notion of
21 layering and the ability to have abstractions that
22 can be implemented end to end without requiring to
23 be tied to any one physical layer of technology.
24 That's what we believe is the good approach for
25 investment protection, especially for long-cycle

1 investments.

2 You asked about MESH and what that

3 meant. The MESH does apply in these contexts of

4 home area networks and premise area networks.

5 Largely because often the single hop MESH is best

6 contrasted with single hop. Single hop is where

7 you have to have every device that is being given

8 connectivity have direct line of sight

9 communication to an access point or a hub of some

10 sort. This is how we use WiFi typically. If I

11 don't have good enough reach to the access point,

12 that's it, my laptop or my PDA is not going to be

13 able to communicate.

14 Contrast this within MESH. Nodes in the

15 network that are meant to be themselves

16 communication end-points, like a laptop, can also

17 help relay the data to other friendly nodes

18 nearby. And that's the notion of MESH. Each node

19 is a router in addition to being an end point of

20 communication. Okay.

21 And that's a very good technique to

22 extend the reach of a particular radio technology.

23 It is also used in powerline communication, by the

24 way. Sometimes there's a particular number of

25 meters that a good powerline can traverse. And if

you have longer ranges than you have to relay and reboost that message. So very much that concept.

I do want to perhaps here dwell on the fact that about halfway down I have network and transport. I want to call people's attention to the fact that in that category of low-power radio communication people have sometimes used the word Zigbee interchangeably for designating the standard IEEE 802.15.4 radio. Which is a low-power that lends itself to being meshed radio, with also a suite of things above that radio, a network and transport layer, and in addition even standard ways of describing a device. How does a thermostat present itself to a remote device to interact with it? How does a meter present itself? How does a load control module present itself?

For purposes of this presentation I will use 802.15.4 to designate the radio because now there are alternative stack technologies, the most prominent of which is TCPIP. That is available in the same efficiencies and low power and low footprint and low cost as Zigbee is. And so we need to start distinguishing whether we refer to the basic radio, which is common to both, versus

1 different networking technologies that we layer on
2 top.
3 Any questions on the slides? I wasn't
4 able to do an exhaustive job of covering it. Keep
5 going.
6 Here are some considerations. And I've
7 got two pages of those, of what to think about in
8 making these determinations of what's the proper
9 communication technology.
10 Number one, what kind of a medium is the
11 dwelling? As far as, again, good quality wiring,
12 yes or no. Good radio frequency propagation, yes
13 or no. To all of the home, to part of the home.
14 To the part of the home that I care about in
15 particular where the thermostat might be or where
16 the meter might be.
17 And there's a variety of choices there.
18 There's no one size fits all I guess is the short
19 answer to that bullet but it needs to be looked at
20 on a case by case basis. It is also unclear that
21 what works for a single-family, detached home is
22 the same thing that works well in a dense, urban
23 setting where you have apartments up a high-rise.
24 The same questions should be asked for
25 the individual device. So the home could be

1 wonderful in power line communication sense except
2 the thermostat is not sitting on the power line.
3 So we need a different way to reach that
4 thermostat because, again, it doesn't sit on the
5 alternative current wiring of the home.
6 The bandwidth of the application that we
7 are thinking of. So again here by definition of
8 how I scope the presentation is for relatively
9 modest bandwidth applications. By that I mean a
10 typical transaction is anywhere between a few
11 bytes to perhaps a few hundred bytes. I would say
12 on the outer side, when maybe you want to
13 reprogram completely all the software that manages
14 a meter or a thermostat you could be perhaps
15 several tens of kilobytes.
16 But nothing like the megabits and tens
17 of megabits, et cetera, that we think of when we
18 think WiMAX or WiFi or these big things that we
19 want to have on our PC to push a lot of data
20 through. Big web pages or big e-mails with
21 PowerPoint attachments and video and so forth.
22 Then there is the question at the bottom
23 here of, how do I get into these in-home devices?
24 Do I want to count on the AMI network as the one
25 and only path to reach a subscriber's device? No

1 matter how good, bad, big bandwidth, low
2 bandwidth, et cetera, is that AMI. Or do I want
3 to also take advantage of alternative paths inside
4 the home, either broadband, DSL, cable or dial-up
5 modem lines, et cetera.
6 In general, all of the public networking
7 technologies tend to be IP based. So if you have
8 any of the -- be it dial-up modems, DSL, cable, et
9 cetera, your home is, as far as your PC, your
10 printer and everything else, is home IP. So there
11 is a case here to be made for adding other devices
12 to that IP network.
13 Continuing the decision, criteria if you
14 will. As I said, in some cases there are link
15 layer technologies for which there is more than
16 one upper layer networking technologies. 802.15.4
17 is probably the one that is the most prominent
18 these days. And there's the, as it's called,
19 6LOWPAN, which is how to put IP version 6 over
20 15.4 as an alternative to Zigbee. Or to
21 proprietary approaches of people who have done
22 single vendor ways of driving data over that
23 radio.
24 Things like home Plug, WiFi, et cetera,
25 tend to be by definition TCP IP based because they

1 were built initially for computing, which is IP-
2 based, and then extending them to other devices
3 prolongs the IP paradigm.
4 A key question that I am going to talk
5 about a little bit here, which is, does the
6 transaction between the utility central system and
7 the intended target device benefit from being an
8 end-to-end transaction and not mediated by any
9 device in the middle? Or does it want to be one
10 of a care-of, kind of thing, where the utility
11 computer talks to some intermediate gateway, which
12 then in turn has to translate it into some other
13 communication technology towards that end device.
14 Because the utility computing
15 environment is based on IP, because most of the
16 wide area networks are based on IP. AMI networks,
17 yes and no. Some of them are IP-based, some of
18 them are not. The benefit of going end to end,
19 and I want to maybe impress on that point, is if
20 you take into consideration security, and you want
21 to have an authenticated, non-repudiated and
22 perhaps encrypted communication between the
23 utility and the user's thermostat.
24 Doing this end to end leaves the whole
25 patchwork of intermediary networks out of the

1 picture. They don't have to know what encryption
2 I am using. They don't have to know how strong it
3 is. And only the user's thermostat has to have
4 the secret and the utility computer has to have
5 the secret, end of story. The meter doesn't even
6 need to be in the way if it doesn't add value to
7 that secure transaction.
8 As opposed to if you're going from an IP
9 paradigm on the wide area side and then splicing
10 that with a non-IP paradigm in the home area
11 network. Now that device in the middle is having
12 to do some translation and it has to be taking
13 things from one format and converting them to
14 another format. Which, you know, has its own
15 issues of complexity and loss of information and
16 perhaps keeping more pieces secure. So the
17 network plays a more active and intrusive role the
18 less of an end to end transaction approach that
19 you take.
20 That brings also the question of, if
21 there was such a thing as an intermediary, care of
22 point of delivery that from the utility
23 standpoint, what is that. Is it the pole top
24 radio access point that's concentrating the meters
25 in the AMI network. Is it the meter itself. Is

it a new device known as a home gateway or energy services portal that lives inside the user's home or is it the device itself.

Or is it the communication sub-module that, you know. The famous SDIO communication module in the device. Let the user go procure his or her thermostat at their favorite retail store. And then you own the communication piece of that and you know that it's compatible with the rest of your network.

And then who owns the installation. So especially if this is a shared network. If we go with a home network that has not just the devices of concern to the utility but other devices that the user wants for their comfort or their home automation. Where does the sovereignty of one end and the other begin. So these are things to think about.

Why have I sort of taken an unequal among equals role towards IP. It's for the following reason. It's a little bit of a history lesson for why the Internet architecture has done so well. And I have taken a postal abstraction because I think it applies quite well to how this thing works.

1 The IP network works in a way in which
2 the addressing and identification and routing
3 towards all of the points that need to communicate
4 is agnostic to how things are being transported.
5 In fact, it can marry up many of those, radio,
6 wire, fiber, cable, et cetera. And it is also not
7 intrusive to what applications are riding on top.
8 And these are very much properties that
9 we, in the postal system that we use today we take
10 for granted. In that there is an abstraction
11 called the zip code, the street address, et
12 cetera. Which doesn't presume whether the mail is
13 being delivered by bicycle or truck or airplane.
14 Or all of the above actually at different legs in
15 the journey. When I send a letter to somebody all
16 I want to know is, what's their address. I don't
17 want to get into the path of how the postal system
18 is delivering it for every leg of the way.
19 Ditto whether I want to do a reliable
20 transmission, an acknowledged delivery or an ad
21 hoc, best effort thing, is left to each individual
22 application. It shouldn't be the network that
23 decides, any one size fits all.
24 And that's another beauty of IP is that
25 you have very robust and flow controlled and

1 reliable communications like TCP. And you have
2 ones that are a lot more ad hoc like UDP. Very
3 much like using certified mail with acknowledged
4 receipt and signature of the recipient or, hey,
5 send it and most of the time it gets there. And
6 I'm happy paying only the 34 cents that it takes
7 to get it there. I think it's more.
8 Do I want, with IP, to do end to end or
9 do I want to use proxies? The beauty is IP allows
10 you to do both. You can do end to end because it
11 very much is about global reachability. But at
12 the same time if for security reasons or care-of
13 reasons you'd rather have a firewall or a network
14 address translation -- we all have those at home
15 behind our DSL or cable connections and that
16 provides a level of isolation between what we do
17 within the premise and what is visible to the
18 public network.
19 Perhaps the strongest, single strongest
20 point of IP is that it has co-opted every single,
21 new communication technology that has been out
22 there. We have gone from low-speed serial cables
23 to fiber optics to coax, DSL, Ethernet, WiFi,
24 cellular, all of those. And now 802.15.4, the
25 low-power radio. All of those you can run IP

1 over. And not only that, you can build a network
2 that mixes and matches these as the economics or
3 the distances or what's available out there tend
4 to make judicious.
5 And as I mentioned it leaves the
6 application to do what the applications want to do
7 between the two end systems, using the network as
8 a transport. In that sense the network is very
9 much non-intrusive. You don't want the postman to
10 open the letter and to see if you wrote it in
11 English or French or Spanish. You just want the
12 network to deliver it. And then you decide in
13 what language you write it, whether you do A4 or
14 eight and a half by eleven and a quarter. Your
15 formatting, et cetera, is all yours. It should be
16 application by application. You don't want the
17 network to impose anything on you. That's how you
18 get the maximum flexibility and that's why it has
19 been so resilient and been around for two to three
20 decades.
21 This is in a picture how it works.
22 You've got to picture that the Internet protocol
23 in the middle is what provides the common
24 addressing, the common routing and reachability.
25 Individual devices can take advantage of any of

the plethora of boxes at the bottom. They could be, again, on radio, on Ethernet, on fiber, cable, et cetera.

And then think of it as a narrow waist where when you get to the top it starts getting wide again. And that you run any application that you please. And the only two people bound by the application are the two end points of communication. It is only the thermostat and the utility computer that have to agree on what format they need to run, how secure they want it to be and how reliable they want it to be. The network underneath ought not to impose any such consideration.

This is a pictorial view of what I mean by end-to-end versus slice. So if I picture the right hand side of the picture being the private subscriber network, like the home for example, and any of these wireless devices being say a thermostat or a load control module. And on the left hand side is the wide area with a central utility computing device.

What I have been talking about is whether from the computer to the user device we have an unmediated transaction. The network

1 underneath is just there to reliably get it
2 through. But I can pick my own security, I can
3 pick my own formats, I can pick anything I like.
4 and IP allows you to do that.
5 Or you can have a boundary device which
6 the utility wants to consider as its care-of point
7 of delivery and then have somehow this be conveyed
8 back into the intended end device in some way that
9 the user chooses or that the utility suggests to
10 the user. You can still do that with RP.
11 But if the right hand side of the
12 picture is not RP based you have to do that
13 because now you are really converting between two
14 incompatible addressing formats, two incompatible
15 networking technologies, two incompatible
16 transport mechanisms.
17 It requires you to think about whether
18 you want the thing router device at the bottom of
19 this picture, which is basically a packet flipper
20 that gets things back and forth, just like our
21 WiFi routers are and our DSL routers are, or
22 something more intrusive, which now has to get in
23 the middle of the transaction and translate it and
24 keep it the same on both ends.
25 These are a lot of words that said, that

1 tried to summarize why IP has done so well. And
2 why somebody particularly who has a mind of
3 several decades worth of investment protection
4 wants to consider something that has withstood
5 several decades worth of innovation and espousing
6 what's out there.
7 That is why my recommendation is to
8 really seriously think about using IP, especially
9 now that it has been enabled and reduced to be
10 very efficient on very low cost, very low resource
11 devices, of the kind we want to see in customer
12 premises. Again, like in-home displays,
13 thermostats, control modules and so forth.
14 PRESIDING MEMBER PFANNENSTIEL: Thank
15 you, very interesting. Questions? Yes.
16 CPUC COMMISSIONER CHONG: Okay, that was
17 a pretty deep dive. I just want to say that for
18 the record.
19 (Laughter)
20 PRESIDING MEMBER PFANNENSTIEL: Come on
21 Rachelle, you're our standard bearer.
22 CPUC COMMISSIONER CHONG: Well I'm from
23 telecom, this was a deep dive. Okay.
24 So there's movement towards the next
25 generation of the Internet, the operating system.

1 Will that impact any of these types of decisions
2 that you are talking about?
3 MR. ACRA: Yes. I presume you are
4 referring to IP Version 6?
5 CPUC COMMISSIONER CHONG: Yes.
6 MR. ACRA: Yes, very much. In fact, it
7 turned out that the way IP got standardized over
8 802.15.4 is to pick IP Version 6. So from day one
9 if the vendors go with what is known as the
10 6LOWPAN, which is IP Version 6 over the low power
11 area networks, is picked, they are ready for IPV6.
12 The way they are getting deployed today
13 is what is actually running on the devices in the
14 MESH, the thermostats and the meters, et cetera,
15 is IPV6. And typically at the router at the edge
16 of that cloud, if you will, has the ability to
17 translate that to IP Version 4, the current
18 Internet protocol. Because that's what 99.8
19 percent of the world is still running.
20 But the day the upstream networks and
21 the utility computing infrastructures do get
22 upgraded to IPV6 then you turn off that
23 translation and it just flows through IPV6 into
24 it. And the reasons for that, by the way, just
25 maybe for incidentally, is that you have a lot

more addresses. You have a lot more address space with IPV6 and they auto-configure themselves much better that way.

PRESIDING MEMBER PFANNENSTIEL: Thank you.

MR. ACRA: Thank you.

MR. G. TAYLOR: Next up I would like to welcome Rick Boland.

MR. BOLAND: Good afternoon, Commissioners, staff and participants. I am here today to speak in very general terms about one-way communications and using it for the potential for demand response.

My remarks are going to cover four types of communication technologies that are currently available in the marketplace with long histories. FLEX paging, FM RDS, which we have heard about today. SMS cellular technology and satellite radio.

The characteristics of one-way communications in this context are messaging abilities with no message return confirmation. So in the previous speaker's postal example, this is regular mail without return receipt. These technologies are widely used today, as I mentioned

1 earlier, for both audio and data content delivery.
2 And they are done in different ways.
3 They are mature. When I say plug-in and
4 turn-on technologies, that means you buy a device,
5 whether it's a cell phone or it's a radio, a
6 satellite radio or a regular radio or a pager.
7 They typically plug in and are enabled and work
8 right away. They don't have to have any sort of
9 installation associated with it.
10 One of the beauties about one-way
11 communication is that it's a point to multi-point,
12 a broadcast sort of approach that has wide area
13 coverages. It does not, in these cases, require a
14 meter, a home network, Internet connection. This
15 is just a wireless technology. Again, back to the
16 broadcast description. And they are presented
17 today as low-cost alternatives to two-way systems
18 that might be deployed in either demand response
19 or AMI applications.
20 Starting with FLEX paging. FLEX paging
21 has been around for a long time. It's a one-way
22 communication from a paging provider to a receiver
23 or a device. The messages are transmitted by
24 either a transmitter or a satellite or a
25 combination of a network. And the receiver might

be a pager that we always think of on our belt or in our pocket or a purse. Or a paging module inside of a thermostat or another device for utility applications.

A characteristic about FLEX paging that is good is it's very addressable and it allows building penetration. Even in a building like the Energy Commission that has some difficulty with penetration.

One thing that is a negative about paging is a trend that with the advent of the cell phone paging is now being relegated to sort of niche markets. Whether it be emergency response, whether it be medical response. And we are still using it in the utility business as well for demand response.

Another characteristic of paging that has some attributes that are somewhat negative in that in rural areas there are limited availability for the signals. So if you look at a statewide map of California, for example, you would see the population centers are heavily covered with paging. But once you get into more remote areas then there's a lack of signal.

This also is based on proprietary

1 protocols that have been developed some years ago
2 by Motorola. And the last point I want to make on
3 paging is that it is an inexpensive solution from
4 a bill of material perspective. Somewhere in the
5 $5 to $10 range, depending on how it's configured.
6 The next communications technology is FM
7 RDS. And FM being FM radio broadcast. So this
8 technology emits from an FM radio station. And it
9 is one-way again. Sent from the radio station to
10 an RDS receiver. And an RDS-enabled receiver
11 would be something like a car radio that has a
12 song title and artist name as you're driving.
13 It's a mobile application.
14 Another application would be, for
15 example you're going to see next some RDS-enabled
16 thermostats being demonstrated.
17 The technology has been around since
18 generally the mid-80s or so. It's a open, global
19 standard. It's widely adopted by the automotive
20 industry for things like song title and artist and
21 other information on the radio. But it also now
22 is moving to include navigation systems, the
23 ability to show real-time traffic as an overlay to
24 a navigation map in your car.
25 It also has good building penetration.

1 And unlike paging it has remote area coverage. So
2 if you think of a radio station. For example here
3 in Sacramento there are currently two radio
4 stations that have been equipped to send RDS
5 signals for Title 24 testing purposes to a PCT.
6 If you think of the wide footprint of
7 the entire market, those radio stations will cover
8 the entire market. And the best probably
9 comparison is, when you drive your car you will
10 drive in and out of reception areas for various
11 markets but it has complete market coverage,
12 depending on the configuration of the radio
13 station.
14 Another characteristic that is good
15 about RDS is the messages can be delivered
16 securely and minimal latency. One thing you are
17 going to see in a few moments is Karen Herter will
18 be executing a command for a demand response, for
19 a messaging event, and it will show up near
20 instantaneously on this thermostat that's equipped
21 with an RDS chip.
22 Redundancy during power outages we think
23 is an important characteristic as well. And when
24 I say that, that means that radio stations
25 typically have a backup power system. They are

either a diesel generator or battery packs or however they do it. Radio stations typically tend to stay on the air, even if there was an electrical grid problem. And that would allow with the battery backup in a thermostat, the ability to receive a message during a power outage.

As I mentioned earlier, this is a pretty ubiquitous technology in terms of the auto business. The statistic that we like to use, that it's ion at least over 20 million vehicles that are on the road or have been retired from service.

However, one feature is there's limited utility use cases. Currently right now the company I'm involved with, we have a pilot programs and testing programs in California, Ontario and soon we are going to Texas with this. So there are limited use cases and installations.

Price-wise the bill of material cost for the RDS chip set module is less than $5 in quantities.

The next technology I would like to just speak briefly about is SMS and cellular telephone technology. And this is a one-way or a two-way delivery of messages using cellular telephone

1 networks and related infrastructure. It comes in
2 both an analog and a digital flavor based on an
3 open, global standard. And it typically requires
4 a subscription agreement.
5 (Whereupon, CPUC Commissioner Chong
6 exited the meeting room.)
7 MR. BOLAND: And the best way to think
8 of this sort of technology is something like an
9 On-Star or emergency assist program that might
10 come in your vehicle when you purchase it new.
11 There are companies like On-Star and another
12 company called ATX that use this technology to
13 send robust data to a vehicle, primarily a vehicle
14 for automotive telematic applications.
15 It has good signal coverages, has
16 addressability. What it is not known for is its
17 use in the utility industry.
18 Then the last technology I would like to
19 cover is satellite radio. When I say satellite
20 radio it's a digital one-way communication from a
21 satellite or a repeater to a receiver. And there
22 are right now two companies in the United States,
23 SIRIUS and XM. There will soon be one company in
24 the United States that will be the satellite radio
25 provider. It's an FCC -- All of these

technologies are FCC licensed as well as satellite radio.

Satellite radio, you might be surprised, delivers both audio and data. It, in fact, can deliver data that updates traffic information onto a navigation screen as well.

It's a subscription-based service.

It has a national footprint, a wide, national footprint.

It has addressability down to the individual unit.

But it doesn't have good building penetration. So we couldn't receive a signal off of XM or SIRIUS inside this building today. It does rely upon some repeaters but it is typically a line of sight sort of application. So if you are driving in a city and you have some shadowing off of a building. Or if you even drive under an underpass on a road, your XM or your SIRIUS service may cut out for a split second.

These are based on proprietary technologies. And right now they are not currently used in any research we found that people are using over-the-air satellite radio for utility applications.

1 And that concludes my remarks for today.
2 PRESIDING MEMBER PFANNENSTIEL: Thanks
3 very much. Comments, questions? Art.
4 ASSOCIATE MEMBER ROSENFELD: You talked
5 about emergency signals. Virtually that you could
6 send out warning signals of various sorts. In the
7 context of PCTs.
8 MR. BOLAND: Yes.
9 ASSOCIATE MEMBER ROSENFELD: With their
10 display, limited display capabilities and so on.
11 Can you give me an example of what will be an
12 important emergency signal or emergency warning or
13 idea.
14 MR. BOLAND: Sure. I would actually
15 like to expand upon that for just a little bit.
16 In the case of an emergency, it could be a severe
17 weather emergency. In a place where you may have
18 hurricanes or tornadoes, you could send a message
19 to be received by a PCT that would say, take
20 appropriate cover. There is the ability to send a
21 freeform message on the PCTs that you will see
22 here today. So that's one example.
23 The second example that is contemplated
24 is more community oriented. So it could be
25 anything from an Amber Alert to the high school

1 football score from Friday night. Or, you know,
2 snow emergencies and parking restrictions. So
3 there's a lot of variability on how you can
4 structure messages, both from the emergency side
5 and from the community side.
6 ASSOCIATE MEMBER ROSENFELD: So does
7 that suggest that on our specs for the PCT there
8 should be an extra ability to flash a red light,
9 which calls your attention to a signal on the
10 display panel?
11 MR. BOLAND: I am not going to define
12 the spec but that would be useful, certainly.
13 Because these units have the ability to display a
14 scrolling text, freeform text message. So there
15 should be a method to direct the consumer to the
16 device to say, you have either an emergency event
17 or a message that might be an emergency event. An
18 emergency energy event or an emergency
19 notification of an event that might be, for
20 example, weather-related.
21 ASSOCIATE MEMBER ROSENFELD: Could I ask
22 Ron Hofmann who is sitting over there. When you
23 talked about your human interface, Ron, you
24 suggested a red button and a light which said, I
25 am getting a signal. Has there been any

1 discussion of an extra light which says, emergency
2 message for you?
3 MR. HOFMANN: I believe that Erich
4 Gunther proposed at one point that you could use
5 the red light on full-time for one kind of a
6 signal and flashing for others. And one of the
7 applications that he talked about was, if it was
8 flashing and the message was on there the flashing
9 might come from the utility and say, even though
10 you don't have power we know you're out. There's
11 somebody coming within the next hour, your power
12 will be restored. So if it was a flashing light
13 it might mean one thing. If it was one full-time
14 it might mean something else.
15 There's also the possibility that once
16 you have the flashing light on there you can have
17 different kinds of messages on the existing
18 display, which tell you what kind of a message it
19 is. So there's a number of options that are all
20 software driven. Does that help?
21 ASSOCIATE MEMBER ROSENFELD: Okay.
22 Thank you, yes.
23 ADVISOR TUTT: I had a couple of
24 questions related to the RDS. You mentioned that
25 it delivers secure messages. What is the security

that involved there? No one else can send a radio signal on that band or what?

MR. BOLAND: It's the ability to encrypt the message content.

ADVISOR TUTT: Okay. And then I had the question about relevancy. Here in Sacramento I may be listening to an FM radio station but I live in PG&E service territory. So if a signal is sent out by that radio station how do I -- how does my thermostat or something else in the home know where I live so that I get the right message?

MR. BOLAND: The software architecture, and this is not going to be an advertisement for our company, but we developed software architecture to transmit and receive messages. And we have the ability to determine if you are in a PG&E service area or a SMUD service area, for example.

ADVISOR TUTT: That almost sounds two-way.

ASSOCIATE MEMBER ROSENFELD: Yes, that sounds too good to be true. Can you say a few more words about that. Here I was thinking I understood what was going on and I am now confused.

1 MR. HOFMANN: The published standard has
2 a four level addressing system. The very first
3 level identifies which utility the signal is
4 coming from. And so if you are in a particular
5 area and you have a registered thermostat with
6 PG&E it will only listen to PG&E messages, no
7 matter what radio station it's coming from. It
8 will probably be listening -- It will probably
9 self-tune itself to the strongest message.
10 But the addressing actually has five
11 layers but the four layers are in the back. I
12 understand there is a fifth layer that was
13 proposed to have the actual zip code of the
14 individual. But when you register the device you
15 will be registering it as part of Southern
16 California Edison or whatever. You personally.
17 You don't have to have the utility do that.
18 ASSOCIATE MEMBER ROSENFELD: So I guess
19 I understand it. This is one-way-plus. That is,
20 at the very first stage when you register it, it's
21 two-way via a telephone or via something so that
22 the thermostat is told you're a PG&E thermostat or
23 you're a SMUD thermostat.
24 MR. HOFMANN: Several registration
25 methods were proposed. Some of them being that

1 you call your utility and they tell you what to do
2 to your PCT to register for their territory.
3 Other people have proposed methods where there
4 could be a code on your bill. And that code is
5 punched into the keypad and that does all of that.
6 They have been calling it the credit card
7 verification or registration technique. But none
8 of them have been picked yet by the utilities. So
9 I don't know which one they are going to choose.
10 ASSOCIATE MEMBER ROSENFELD: But that's
11 the partial two-way, to add to Tim's comment.
12 It's a one-way 99.9 percent of the time but it's
13 two-way at the inception for what's necessary.
14 MR. HOFMANN: The two-way goes back to
15 the telephone.
16 ASSOCIATE MEMBER ROSENFELD: Yes, thank
17 you.
18 MR. BOLAND: If I could add onto that,
19 Ron's comments. In the case here where we have a
20 PCT being demonstrated with a live, over-the-air
21 signal from an FM station in Sacramento in a few
22 moments. That is not interrupting the current
23 SMUD pilot program that is ongoing. It is
24 receiving messages only designated for the group
25 of messages that -- or group of thermostats that

1 would be applicable to those messages.
2 ASSOCIATE MEMBER ROSENFELD: Great.
3 MR. BOLAND: So the pilot program is not
4 going to be disturbed as we sit here and make this
5 thermostat work. Because of the ability to add
6 groups and segment messages by those groups.
7 ADVISOR TUTT: I have one follow-up
8 question. Again, living in PG&E service territory
9 I bought a thermostat. It seems like most of the
10 highest signal, higher power radio stations might
11 be SMUD area. How would my thermostat self-tune
12 to the right radio station? It would have to be a
13 registration process.
14 MR. BOLAND: Well, the receiver
15 technology itself embedded in the module will scan
16 the dial looking for data. Title 24 data. The
17 architecture that would be proposed for the
18 statewide network, of course, would have no holes
19 in coverage for the majority of the state. So no
20 matter where you are you can plug it in. It would
21 find the messages for your area.
22 MR. DAVIDSON: Mike Davidson from --
23 PRESIDING MEMBER PFANNENSTIEL: I'm
24 sorry. If you are going to ask questions you need
25 to go to the microphone. There's one right in

1 front of you. And we are not really opening for
2 the audience questions but go ahead at this time.
3 MR. DAVIDSON: If anybody is interested
4 after this event I've got some --
5 THE REPORTER: I need you to identify
6 yourself for the record.
7 MR. DAVIDSON: Mike Davidson from Wessex
8 Consult representing the Australian Greenhouse
9 Office. I can provide information on trials of
10 RDS technology undertaken in Australia
11 successfully.
12 PRESIDING MEMBER PFANNENSTIEL: Thank
13 you. Thank you.
14 MR. BOLAND: Thank you.
15 MR. G. TAYLOR: As has been alluded to a
16 number of times, we now have a demonstration of an
17 actual functioning PCT. I would like to welcome a
18 small team of people including Karen Herter.
19 I just want to make a quick announcement
20 while they are setting up. All of the
21 presentations that you have seen today will be
22 available on our website, probably by COB or
23 definitely by COB tomorrow.
24 In addition I encourage everyone who is
25 here who might have something to say, we will --

we have about two hours before the end of the day here. So if you do have something to say please make it brief but we definitely want to hear in entirety what you have to say. So please submit it in writing to the record. The deadline for comments on this workshop is next Thursday, about a week from now, as published in our notice. But in addition we will accept comments past that period on the proceeding as a whole.

DR. HERTER: Hi, my name is Karen Herter and I work for the Heschong Mahone Group in Fair Oaks, California. I was asked to do a technology evaluation of the RDS technology and also the PCT technology by the Demand Response Research Center, which is, of course, funded by the Energy Commission and PIER program.

So what I am going to do is first I'll give you the results of my study and then I'll go straight into the demonstration.

The first step in the study that I did was to look at the RDS technology itself. And so I worked with Rick Boland, who just spoke, and e-Radio. They set up station KXJZ, which is 90.9 FM, with the technology that's required to send an RDS signal.

1 The first step was to take an RDS
2 monitoring system and drive around, essentially
3 Sacramento. We stopped at 40 different buildings,
4 some residential, some small commercial, it was a
5 mix. And we tuned our monitoring system to the 17
6 different radio stations that are already
7 broadcasting RDS in Sacramento. KXJZ is just one
8 of those stations.
9 And we recorded the number of correct
10 packets. There's error correction in the sending
11 of the RDS signal. And we only recorded those
12 that came with -- the full packets that came in.
13 And then we did a probability analysis of that
14 data collection to determine what the probability
15 of receiving a signal at any of those 40 sites
16 would be.
17 So the results showed that we received a
18 95 percent probability of reception at all sites
19 in one of two cases. The first, if we sent the
20 signal over KXJZ and repeated it 55 times, which
21 would take about four minutes, then there's a 95
22 percent probability that all 40 sites would have
23 received the signal.
24 Alternatively, we could have repeated
25 the signal just five times, which takes about 20

seconds, on two different stations. And 90.9 and 100.5 FM were, both of those, set up to send RDS signals. At this point only 90.9 FM is set up. There's one more station. Is it 89.5?

MR. BOLAND: No, 88.9.

DR. HERTER: That's 88.9 that is in the works. Are there any questions on that?

The second part of the study was to work with the local technology, a local thermostat vendor, Residential Control Systems. They are about three miles from where I am so that was very handy. They are one of the only manufacturers that are currently working on programmable, communicating thermostats. We'll hear from a couple. We have also mentioned Tim Simon and Golden Power.

And so we worked with them for a couple of months on getting their thermostat to incorporate the RDS receiver and to use the protocols over the e-Radio system to receive and respond to a demand response signal.

We only tested the basic functionality. We didn't test, go through all of the steps of the Title 24 specifications, mainly because it's still up in the air. For example, the addressability

1 couldn't be tested until we know what the specs
2 are on that.
3 So all we tested were the ability to
4 send a signal, to receive the signal by the
5 thermostat, and for it to respond accordingly.
6 For both a price signal and for what we are
7 calling a temperature change signal, since it is
8 not clear whether it will be an emergency/non-
9 overridable, or a emergency/overridable signal at
10 this point.
11 At the end of the study we determined
12 that the thermostats that RCS has produced do
13 respond in the way we would expect them to respond
14 and with any luck they will respond in the way we
15 expect them to respond right now.
16 One more note. We do, as was mentioned
17 earlier, I have a pilot with SMUD. Thank you SMUD
18 for being here and for working with me. We have
19 about 80 of these currently in the field in small
20 commercial businesses. We have successfully
21 tested two events. Not real events but one
22 message event and one test event at this point.
23 Both successful. And as soon as we get another
24 good hot day we'll have the real, the real deal.
25 But this is just a one-summer study.

We'll be testing price events and temperature change events. We gave the customers a choice between the two. At this point about two-thirds have chosen the pricing program, about one-third have chosen the temperature change program. And we'll have results of that, it's a behavioral study, at the end of this year.

For more information on the technology evaluation which has been completed or for the pilot you can look on the DRRC website, which is not, unfortunately, listed here. But the PIER final project report for this technology evaluation is listed here. Or you can always contact me and I would be more than happy to give you that information.

And with that, this is Mike Kuhlmann and team to give us a demonstration on how the PCT works.

MR. KUHLMANN: A little bit of a setup for what you are going to see here. We have a couple of -- we lost some of our commissioners, I see. Are they coming back?

ASSOCIATE MEMBER ROSENFELD: She'll be right back.

MR. KUHLMANN: All right. Good, Art.

This, as Karen said, is an actual, live trial that's going on in Sacramento courtesy of SMUD. We are using an interface to that through a web interface. This was provided by e-Radio, to talk to the actual radio transmission center and issue, initiate and issue live events across the RDS network.

So the background screen you are seeing there is the event controller on the live radio system. We have superimposed on top here a video display of our thermostat screen. This thermostat screen has a graphical display on it so we are able to do a lot of, represent a lot of information. Right now we have got it set to a Cool mode. We set it at 68 degrees and you can see the fan is running over there, which is hooked to the actual thermostat.

So we are going to initiate an event here. A critical peak event. And I can show you before we do that real quick, by going to the menu, where we have set up the utility interface on here. And for that critical peak or Tier 4 offset we have got a four degree offset. We have got a four degree offset set on the thermostat.

All right. So now let's go ahead and

initiate an event. Again, through this web interface. And you'll see a series of screens come up that represent and tell the user what's going on. What's happened. If there's an event in progress, okay. So we just got a notice. That came in live over the air. The thermostat has responded that an event is scheduled.

So if they walk by their thermostat and saw the flashing red screen they would know that something is going to happen. And then can see when it's going to happen on here. There is going to be a Tier 4 event, a critical peak event, occur at 2:59 p.m. It is going to start and it is going to stop at three.

ASSOCIATE MEMBER ROSENFELD: So it's going to last one minute?

MR. KUHLMANN: It's going to last one minute.

DR. HERTER: Unless you hit a button.

MR. KUHLMANN: We can override this. But I want to let this event go through completely first and then we'll go through a couple of -- So the event just occurred. It shut off the fan, which is representing the thermostat at this point. So we have done that through a

1 transmission through the local FM radio station,
2 over the air, received by the thermostat.
3 It altered its program to say -- let me
4 see. If I go in here I should be able to see.
5 The thermostat has been set up to 72 degrees,
6 which is an offset, the four degree offset that we
7 had programmed into it.
8 It will continue in this mode letting
9 you know that it is in an override until the event
10 terminates. At which time it will tell you that.
11 Which should be here shortly. We can only do
12 these in one minute intervals so bear with us
13 here.
14 ASSOCIATE MEMBER ROSENFELD: I think we
15 can afford another 15 seconds.
16 MR. KUHLMANN: All right, very good,
17 very good. All right. So we should be timing out
18 here any second now and the event will terminate.
19 MR. GOODELL: So these two heating
20 contractors go into an Energy Commission meeting.
21 (Laughter)
22 MR. KUHLMANN: He's our straight man.
23 We do have the ability to -- there we
24 go, all right. So the event terminated. We've
25 got a notice from SMUD that comes in that says,

1 normal operations resume. The thermostat kicks
2 back on, thank you for your help. So you know
3 exactly what happened. The information has been
4 conveyed to you on the event status.
5 DR. HERTER: And I want to stress here
6 that the four degree offset was programmed by the
7 customer because this is a pricing program. Now
8 in the event that the customer doesn't want
9 anything to happen, today is Granny's birthday,
10 we're having a party, so we are just going to ride
11 through the prices. We don't want to respond.
12 Then you would go in and set the Tier 4, which is
13 the critical offset, to zero.
14 Our next demo is going to show how when
15 we send the signal this time the thermostat will
16 not respond.
17 MR. KUHLMANN: We've set it to zero.
18 ADVISOR TUTT: Suppose the customer has
19 forgotten to do that and Granny is there and is
20 roasting. Or at least the thermostat is flashing.
21 (Laughter)
22 ADVISOR TUTT: What can they do then at
23 that --
24 MR. KUHLMANN: We have a set of slides
25 for that as well.

ASSOCIATE MEMBER ROSENFELD: Thank you for asking that question, Tim.

DR. HERTER: You can, you can just hit the up or down button, whatever you like, and change the temperature to whatever you like at any point that you like.

MR. GOODELL: It doesn't lock the system out. It's still back to you. You still control the system. You would walk by the system in the hall. There --

THE REPORTER: Please identify yourself for the record.

MR. GOODELL: I'm sorry, I'm sorry.

THE REPORTER: Thank you.

MR. GOODELL: Okay. Gene Goodell, RCS.

The notification would be active in the hall. The light would be flashing, the thermostat would be interactive. And then they could at that point say, whoa, we've got a party, I forgot to change out the setback. I can change that right here real-time and not affect the system.

MR. KUHLMANN: What you just saw him do there, the Group ID. That was what Rick was talking about earlier. That's how we identify what group of the thermostats -- Karen is running

1 a live test as a Group 1 right now in Sacramento.
2 We have a special channel set aside for us for
3 Group 50 for testing and for prototyping and for
4 demoing like this.
5 But each thermostat can have its group
6 ID set in it. Which allows you then to be a part
7 of certain groups, certain utilities to identify
8 what group you're in.
9 Okay, so we have got another event
10 scheduled now. Again we're on a one minute
11 interval. So this event will trigger -- This time
12 the fan won't go off. And then we'll quickly
13 demonstrate -- Okay, the event is in progress now.
14 You saw no change in the operation. There is no
15 change in the set point. So essentially the
16 thermostat, because you've set it to be a zero
17 response, has ignored the event, essentially.
18 DR. HERTER: Even though there is no
19 offset in this case the notification still comes
20 through. Because keep in mind that the customer
21 can still respond to the signal in other ways.
22 Since it is a price signal the customer might want
23 to take other measures other than just affecting
24 their AC. They might want to, whatever, turn off
25 lights, the television, not use the microwave, not

do the dishes right now, do them later. And so the thermostat is a way of -- in this case it's just a notification method, which is also very useful for a pricing program.

ADVISOR TUTT: Can the customer stop it from flashing?

DR. HERTER: Yes, you can just push a button. Push a button, would you. There you go.

MR. KUHLMANN: All right. Now we're going to do an event where we are going to override that event. Let the customer override it dynamically on the screen.

So we programmed back in the four degree offset, which will cause it to go into an event. But we are going to allow him to walk up to it and override it.

Okay. So I have attempted to override the set point. It gives me a message that says, lowering the set point will override this event. Are you sure you want to do this?

If I answer yes then it will override the event, we'll be done with it. Or no, it will go back into that screen that was indicating the event was in progress. So I essentially terminated the event at that point.

A couple of other things we would like to show you real quick about this. Let's send a message. So as Rick indicated also, the RDS network is capable of sending text messages, pre-canned messages. It can be used as a general purpose messaging device for customer information. We are going to send a message here that -- the public safety message, okay.

So here is an indication where for some reason there was a public safety alert that needed to be sent out. The thermostat can be used to send that over the network as well. So that message came again from the RDS network, to here, to be displayed on the customer's screen.

ASSOCIATE MEMBER ROSENFELD: How come it's not red to get my attention?

MR. KUHLMANN: It's programmable, Art, programmable. So if you'd like it to be red we can do that.

MR. GOODELL: Or pink or chartreuse.

MR. KUHLMANN: And I think that's the concept that Ron is trying to get across is the fact that the technology is neutral. The devices are capable of doing and carrying out any kind of a strategy that you'd like. Which gives us the

ability then to alter that as we go down the road to find out how to make it more useful or more beneficial, or get the response we want from the consumer.

This type of a display can also show you other things. I'll show you a couple of screens. We can actually monitor the HVAC usage right on this device. Show things like pricing information. Usage information. History of month's use, week's use. The point being that the device becomes more than just a thermostat control, it becomes an energy manager for the house as well. So we look to merge those technologies back together again.

That's all we've got. Any questions?

ASSOCIATE MEMBER ROSENFELD: Yes, I have a question. This is about ready to go on the market once we decide a few more protocols?

MR. KUHLMANN: Yes, we're ready. In fact, this stat is being used, it's being sold today, both directly from our company. It has been on the market for several years. The interface to the RDS radio is a module. It's a little radio module that we plug into it. So like the PCT concept we can add different kinds of

modules to this thing to support RDS, Zigbee, Z-Wave, WiFi. Whatever protocol becomes the required protocol for your application. It's available today.

This is being sold, as I mentioned. Some of you are familiar with the GE Eco-Imagination home program. This thermostat is being sold into that program along with the touch screen to show usage data in the homes. There are roughly five communities that are under construction, another five will be started by the end of this year. Representing about 20,000 homes will have this technology in them.

PRESIDING MEMBER PFANNENSTIEL: Great. Thank you. Very interesting demo. A great little device.

ASSOCIATE MEMBER ROSENFELD: Remember the flashing red screen. That's more attention-getting than Ron Hofmann's flashing little light.

(Laughter)

PRESIDING MEMBER PFANNENSTIEL: Thanks, thank you all. Thanks, Karen.

MR. G. TAYLOR: Next up we are going to have -- Let's see. SMUD I think rightly goes next after the SMUD demonstration of technology to

1 discuss their energy management technologies and
2 programs. And then we are going to have the three
3 IOUs come up and each give us a brief overview of
4 their current energy management and load
5 management programs. I think we are going to do
6 this one as a panel discussion, if the four of you
7 would like to come up to the table.
8 PRESIDING MEMBER PFANNENSTIEL: And I'd
9 suggest, as people are coming up and getting
10 started, that we are running a bit late. So I
11 would ask that the utility panel try to be
12 efficient in your time so we have time following
13 this for some public comment and input to us. So
14 come on up.
15 MR. G. TAYLOR: Have a seat at the
16 table. The microphones are live.
17 MR. PARKS: Good afternoon. I'm Jim
18 Parks with the Sacramento Municipal Utility
19 District. I have been asked to talk about SMUD's
20 load management programs and enabling
21 technologies. I've got to tell you, I think our
22 existing load management programs are nice but I
23 would rather talk about the direction that we want
24 to go.
25 We basically have three load management

1 programs right now. One is our air conditioner
2 load management program. It has between 110 to
3 200 megawatts depending on the temperature. It
4 has been a successful program but the technology
5 is over 20 years old.
6 In addition to that we don't really know
7 how many devices have been tampered with or things
8 like that, how many of them are actually
9 functioning. We know that when we do a notch test
10 we see good savings, we see a big reduction. But
11 I think with the new systems that are coming into
12 place with advanced metering infrastructure and so
13 forth, if someone tries to tamper with the device
14 we will know right away whether it is functioning
15 or not. So there will be big advantages in the
16 future.
17 Our second program is our voluntary
18 program. This one is super high-tech. We call
19 our customers and say, can you turn off the loads
20 that you agreed to turn off at the beginning of
21 the year.
22 (Laughter)
23 MR. PARKS: And we actually have 45
24 megawatts on that. You know, as simple as it
25 sounds it really does work. And we talk to our

1 customers every year and say, look, last year you
2 said you'd shut off two megawatts, are you still
3 good for it? And they say, yeah, we're good for
4 it. And then the end of the summer season we put
5 an ad in the Business Journal thanking them for
6 their participation. It really does work.
7 And then we have eight megawatts on two
8 programs that we call Power Net and Power Direct.
9 And these are basically Internet-based programs
10 where we can send a price signal over the Internet
11 and they can choose to respond.
12 I'd love to tell you that program has
13 been a smashing success but I think the good thing
14 is that prices have not been high enough for us to
15 send the right signal to generate a response. And
16 so when we tested the program at $250 per megawatt
17 hour we got a great response. But try testing it
18 at, you know, $50 a megawatt hour and the response
19 dwindles dramatically.
20 I'd shown this slide earlier. The Smart
21 Grid Vision. I don't really want to spend a lot
22 of time on it in the interest of time. But I am
23 not going to go as fast as I did last time.
24 One of the technologies we see coming,
25 and a major thing for us, is going to be automated

1 metering infrastructure. We've talked about this
2 a couple of times before the Commission so I'll
3 just point out a few of the things in red.
4 That we want to have the
5 interoperability, have the protocols. We want
6 interoperability in the home and business area
7 network. And we want to be able to enable
8 communicating thermostats and get efficiencies
9 throughout our entire system as a result of this.
10 Our proposals are due next Friday. So
11 we will be evaluating the proposals and making a
12 decision how to proceed from that point on.
13 We also want to use the technology to
14 leverage our existing programs. Actually to
15 transition them to the new technologies. You
16 know, like I said, our air conditioner load
17 management program is great but it just really
18 offers, you know, off and on.
19 And I like the idea of being able to
20 offer a few degree temperature setback or a full
21 shed or a shed for 10 minutes or 20 minutes,
22 whatever we decide to choose or the customer
23 decides to choose. It will give us a lot more
24 options.
25 And I think it will actually expand our

1 customer base on these programs. Right now we
2 have about 110,000 customers participating in the
3 ACLM program out of about 560,000. Which really
4 isn't a bad number when you consider that a lot of
5 the 560,000 are apartments and multifamily and
6 things like that. And there might even be a few
7 homes in Sacramento that don't have air
8 conditioners yet but we have pretty good
9 participation.
10 We also want to develop what we are
11 calling the non-incentive programs. And this is
12 where you send, you know, price signals to
13 customers or you have in-home monitoring devices.
14 Where they shed load on their own and we don't
15 really have to pay them for that. And those are
16 some of the things we see coming in the future.
17 But we want to be able to drop load at
18 the feeder level, which will give us greater
19 control. And we see the advanced metering
20 infrastructure enabling us to do that. Where we
21 can do measurement and evaluation and determine,
22 you know, do some statistically significant
23 samples to determine what types of loads we get
24 per customer.
25 Then you know how many customers are on

1 a specific feeder. So if you've got a feeder
2 that's overloaded you can just shed the load on
3 that feeder, as an example. So you have much
4 greater controls as a utility.
5 Whereas right now we just push the
6 button and turn off all the air conditioners. And
7 sure, we get some level of drop on the feeder in
8 question but we don't really know how much that
9 one feeder is being impacted. So this will give
10 us greater control.
11 We also want to monitor the statewide
12 activities with respect to AMI. For those that
13 are preceding us we say, good job, keep up the
14 good work and share the information that you're
15 learning from that and we will do the same. I
16 think it's good for us to learn from our success
17 stories as well as our failures. Generally we
18 learn more from our failures. And I hate to say
19 this, my friends, but I hope they happen to
20 someone else so that we can learn from them.
21 (Laughter)
22 MR. PARKS: And then continue research
23 on pricing and enabling technologies. We have got
24 a lot planned. We have been presenting different
25 pricing structures to our board. We're looking at

1 time of use rates, critical peak pricing. And we
2 are doing some tests in those areas also and Karen
3 talked about some of that.
4 Three of the research projects we have
5 going on right now are the Power Choice where we
6 are using advanced meters and in-home displays so
7 that customers can better see what their energy
8 use profiles are and make adjustments on their
9 own.
10 We also have a similar project in the
11 small business arena and we are also using the
12 programmable communicating thermostats in that
13 one. And so once again we are able to test some
14 of these rates with our customers so that we can
15 see long-term what we want to do on a wide scale.
16 I know the SMUD board in particular is kind of
17 sensitive about customer opinion and we don't want
18 to deliver a widespread rate that's just going to
19 create great unrest in our utility.
20 And then the third project we have going
21 is a near-zero energy home display pilot. We
22 built some homes a while back, a few subdivisions,
23 that are about 60 percent more efficient than
24 building codes when you factor in the photovoltaic
25 arrays. And we want to install advanced meters in

1 some of those homes with in-home displays that
2 will allow the customers to see how much they are
3 generating and how much they are using. And see
4 what kind of savings we accrue from that.
5 The next project we're working on is
6 what we are calling an Eco-Smart home. This home
7 is about 80 percent more efficient than code. It
8 is under construction right now in Folsom. The
9 framing is up, the outside paneling is up, the
10 insulation is in, the wiring is in. It's going to
11 be hopefully finished in time for us to get a few
12 months of summer data on the home. So a really
13 tight shell.
14 And we are going to install different
15 things in there like -- what's the -- energy
16 storage, that's what I was trying to think of. So
17 that we can simulate like vehicle to grid or
18 vehicle to home. We see plug-in hybrids as kind
19 of a wave of the future for us.
20 We think we are going to see thousands
21 of those in the future as gas prices continue to
22 climb. People are going to move to plug-in
23 hybrids. There will be opportunity for people to
24 charge off-peak at low cost and then return that
25 energy to the grid during periods of high cost.

1 So we see a lot of opportunity there.
2 We talked about that.
3 The other thing we're doing is some
4 energy storage projects. We have a Vanadium Redox
5 Battery system. It's a 20 kW system that we're
6 testing now and we've got another test going on
7 where we are really benchmarking and seeing where
8 we can use larger scale energy storage on the
9 distribution system. This comes back to working
10 with distribution systems that are overloaded.
11 Maybe we could do one or two megawatt scale
12 batteries in there.
13 And we are also doing the tests on our
14 zero energy homes. We really want to simulate the
15 vehicle to home or vehicle to grid.
16 And then lastly we have a project that
17 we are doing with the light rail here in
18 Sacramento, ultra-capacitors. And basically it
19 takes the braking energy of the trains as they
20 pull into the station and stores it in the
21 capacitors. And then as the trains pull out of
22 the station the capacitors deliver energy to those
23 trains.
24 Lastly, this is just showing what
25 happens with -- what we're looking for with our

1 vehicle to grid or vehicle to home and charging
2 with meters for the plug-in hybrids.
3 But really what I want to say in
4 conclusion is I think we haven't really mapped out
5 our load management programs that we're going to
6 have in the future. I think technology is going
7 to determine that. The results of our pilot test
8 are going to determine that. We are just going to
9 do a lot of demonstration projects and pilot
10 testing to determine what the right mix is for us
11 in the future.
12 I think there's kind of an 80/20 rule
13 that I look at in this situation where we can try
14 to get that last little bit of savings but it is
15 going to cost you 80 percent of the cost. And I
16 think we need to find that crossing point where we
17 get the maximum benefit from these technologies.
18 So with that we'll conclude, thank you.
19 PRESIDING MEMBER PFANNENSTIEL: Very
20 good. Thanks, Jim.
21 ASSOCIATE MEMBER ROSENFELD: Jim, I have
22 a really dumb question but I'm a little surprised
23 that it says 110 volts there. I would have sort
24 of thought if you got into charging a car you
25 would use 220. Don't most homes have 220 these

1 days?

2 MR. PARKS: Most homes do have 220. And

3 it may move to 220. It depends on the capacity of

4 the battery. Some of these batteries are down to

5 like the -- I forget the ranges. But there's a

6 real range of battery pack size. Some of them it

7 will be okay to charge them on the 110. Some of

8 the larger battery packs you may need the 220.

9 It's still kind of to be determined.

10 ASSOCIATE MEMBER ROSENFELD: Thanks.

11 MR. TANG: Good afternoon, everyone. I

12 am Andrew Tang and I am with the Pacific Gas and

13 Electric Company. And I manage a group called the

14 Smart Energy Web. So under my responsibilities it

15 includes the demand response programs, the smart

16 meter upgrade program, and the clean air

17 transportation or clean vehicles, alternative

18 vehicle fuels program.

19 I would agree with my colleague from

20 SMUD about how I do want to focus on the forward

21 progress but I thought just taking a quick step

22 back and talking about the enabling technologies

23 of the past.

24 You know, our first demand response

25 program, our first interruptible rate that we had

1 dates back to 1959. And that was -- And really
2 the programs historically were based on a
3 notification-only type of basis. And the
4 technology that we used was the good old
5 telephone. So we could call people up and we
6 could tell them to please shed load.
7 In 1976 the CPUC adopted staged
8 emergencies. Well then we had emergency
9 notifications.
10 In 1998 we really started to step up the
11 technology and suddenly we had the ability to
12 notify our customers that participated in any of
13 these programs with either pagers or faxes.
14 And really was started to change was
15 obviously the advent of the Internet in the late-
16 '90s and early 2000s.
17 And what that really brought to us was
18 this new, this new braver world where we have the
19 concept of notification and control. So for the
20 first time not only could we notify people but we
21 could actually take actions as opposed to just
22 hoping, relying on the kindness of strangers or
23 friends.
24 And so this yellow box is our AutoDR
25 box. This is a -- We heard from someone else in

1 the audience about the OpenAMR protocols, of which
2 we adhere to. But this is our AutoDR program,
3 this is for our large commercial customers, where
4 the notification is actually received over the
5 Internet. And it's pricing signals and policy
6 happens. This device then serves as the energy
7 gateway within that customer and actions will
8 happen. So load will be shed automatically
9 without human intervention.
10 In 2007 we launched our Smart AC
11 program, which is an AC cycling program. And we
12 have actually two devices that we use in our Smart
13 AC program. We use both a programmable
14 thermostat, a programmable communicating
15 thermostat, and then we also use a switch that
16 actually happens at the compressor.
17 And as we look forward into 2008 and
18 beyond we really see the opportunity for our smart
19 meter upgrade program to really take the mantle
20 for a lot of DR control an applications.
21 So taking a step back and looking where
22 we have been. We had about 500 megawatts under
23 control back in 1978.
24 In 1998 that grew to about 550
25 megawatts.

1 We are currently in the, roughly in the
2 988 megawatts of load that we can shed under our
3 demand response programs.
4 One quick note. You will notice that we
5 actually dipped in 2001 to 342 megawatts. This
6 was directly a result of the energy crisis. What
7 ended up happening was we actually used all 100
8 hours of our demand response time or our CPP time
9 on our customers. We used all 100 hours that we
10 told them we'd call them for by January 22nd.
11 And so what ended up happening was that
12 the programs became so onerous from the standpoint
13 of people being able to run their businesses that
14 we had a lot of people leave our programs. They
15 weren't flexible enough because of all the calls
16 that we had in that first month. In the first 22
17 days of that first month.
18 And we just filed our demand response
19 filing for our 2009 to 2011 portfolio. And our
20 goal is by 2011 we are looking to have 1.3
21 gigawatts of load under demand response control.
22 So we've heard a lot from a lot of
23 people in the audience today about the various
24 communications technologies. What I would like to
25 say is there are many developing load management

activities, both demand side management and energy efficiency opportunities. And the common theme here is that a lot of these technologies require a two-way communications capability.

With all due respect, the one-way technologies and the ability to control your thermostat and to increase your temperature are all interesting. But in my mind they are a bit academic.

And the reason they are a bit academic is that we do not truly see the other side of the benefit unless we have concrete data that can really explain what the load shed is. And we share that with the CAISO. And the ISO actually does not procure the power. Because if the ISO continues to go and procure the power then you haven't actually achieved any demand response benefits.

The three California IOUs have agreed and really have centered around the communications infrastructure for the home area network. We have really codified around the Zigbee standard. A lot of that is primarily based on the fact that it is really -- first of all there is a cohesive alliance. It's further along in its development.

1 There is a cohesive alliance that is
2 built around building the protocols. Defining the
3 protocols for how do you control smart appliances.
4 What are the actual commands and protocols that
5 you standardize in order to control devices.
6 But having said that, on the home area
7 network we have looked at a variety of
8 technologies. Zigbee, 6LOWPAN, Home Plug, WiFi,
9 Z-Wave, Insteon, would be examples of some of the
10 technologies that we have looked at. We have
11 heard a lot from people in the audience about
12 Zigbee, 6LOWPAN and Home Plug.
13 And then on the Smart Grid side or on
14 the AMI side we have looked at Powerline Carrier-
15 type technologies, both narrowband and broadband.
16 We have looked at various radio
17 frequency technologies. There's Fixed RF and then
18 there's RF MESH.
19 And then we have looked at third-party
20 type opportunities where we would have to partner
21 with a communications carrier. So those would be
22 opportunities like relying on the cellular
23 companies like Verizon or Sprint. Or leasing
24 lines from the fixed line telecommunications
25 companies or looking at WiMAX as an opportunity.

1 Well the three California IOUs have
2 really settled on radio frequency solutions for a
3 variety of reasons. But really, primarily,
4 because it is the right solution at the right
5 price point.
6 The one thing, though, that I wanted to
7 bring up and distinguish here is that this home
8 area network is a very separate, distinct network.
9 There has been a lot of talk about where is the
10 gateway or this ability so that if someone buys a
11 device or buys a thermostat or buys a smart device
12 and they move within the state, they want this
13 ability to make sure that that is not a stranded
14 investment. That they can move from Northern
15 California to Southern California, for instance,
16 and still be able to use their energy management
17 system.
18 The way we architected this, the HAN is
19 completely separate from the AMI network. In our
20 case you can almost think of it as the home area
21 network has a back hall. And in our case the back
22 hall is our AMI network. But there is nothing
23 preventing that back hall from being the public
24 Internet. There is nothing preventing it from
25 being various Internet service providers. Or even

the good old telephone line in a dial-up.

There's was one comment, one clarifying comment I did want to make which was there was a question about whether or not we can get the energy consumption data out of the PCT. And we had that very informative demonstration where we did see the energy consumption.

The one thing though to bear in mind is that was the energy consumption of the HVAC unit. This thing doesn't -- You have to be careful about how much we load up. How much capability we load up into this, right. Because you won't be seeing the $40 price point then, right.

The real issue is not just how much you're consuming.

ASSOCIATE MEMBER ROSENFELD: Sorry, I just didn't hear you. You won't be seeing the what?

MR. TANG: The $40 price point. In other words, if you want this device to suddenly really -- What you really want is not just the amount of energy that is being consumed by HVAC, you want whole house, right. You want the consumer or the customer to understand the impacts of his entire lifestyle, right. The fact that he

may have a plasma television, and if he's got that turned on. What are those impacts. Not just the HVAC. That's only one component in a customer's total energy consumption.

You know, this device is basically a sensor. That's all it is. The device that gets you towards where we want to go, which is whole house energy consumption, is typically called a gateway. And we have had people from various companies come and present and talk to us about what the gateway can be.

We feel that our architecture that we are working on maximizes the flexibility. The gateway can be anything. We initially think that the gateway for PG&E-sponsored programs, we think the gateway will actually reside in the meter for our programs.

But there's nothing in our architecture that would prevent that. And in fact we have worked with companies in Silicon Valley and we have worked with venture capitalists to talk about what does an energy management system look like. There is a gateway device here. Or there could be a gateway device here. We don't have to get in the way.

1 So that would be the vision. And I
2 guess the next question would be, what are the
3 requirements to start making this a reality. And
4 in order to achieve commercial success the home
5 area network architecture, we believe at least,
6 will need to adhere to the following tenets.
7 First of all, open architecture. So
8 true IP addressability end to end. One thing to
9 think about this. And I think most people, I
10 think everyone in this audience is really -- I
11 think this issue has now become almost just a
12 truth, right.
13 But if you look at even in the consumer
14 electronics space you actually had a, we have had
15 30, 40, 50 years of consumer electronics being
16 fairly proprietary. And what you are actually now
17 starting to see, you actually go and buy an audio/
18 video receiver these days, a stereo, and it
19 actually has an Ethernet port on the back of it.
20 You can actually plug it into your home network.
21 So as we have heard from people, IP has
22 won. IP has really proven its resiliency. And
23 Ethernet as the wired form of IP has also won in
24 proving its resiliency. So we think that open
25 architecture and Internet protocols are very

1 important.

2 We think interoperability is absolutely

3 essential. And we think that -- well one thing

4 is, you know -- And I wish Commissioner Chong were

5 here with her telecom background. But Metcalfe's

6 Law. A very famous scientist, Metcalfe. He

7 basically quoted a law which is sort of like a

8 Moore's Law but the Moore's Law equivalent of the

9 telecommunications industry. Which basically said

10 that the value of a network grows by the square of

11 the number of end points on that network.

12 So to the extent that we have

13 interoperable networks, all using the same

14 standard, and you have multiple devices out there

15 in the home, the value of what you can suddenly do

16 with that network just grows by a square factor.

17 I guess further, the install process on

18 this has to be easy and simple. We have to avoid

19 a situation where it requires a call to a help

20 line.

21 Future flexibility. Another thing that

22 I think we need to be careful of or mindful of is

23 that while Zigbee does look like an emerging

24 standard right now, we need the ability to make

25 sure that we make hardware decisions that are

1 relatively certain and provide the flexibility or
2 the ability to make sure that changes can be
3 accommodated in software. So this is typically in
4 the industry called a flash download. The ability
5 to flash download different software onto a
6 particular chip.
7 So on that 802.15.4 chip that some
8 people refer to. Do you put a Zigbee stack on it
9 or do you put a IPV6 LOWPAN stack on it? Well, I
10 want to remain as flexible and indifferent to that
11 as possible, right. Because I want the ability to
12 go -- If the industry takes a different direction
13 I want to be able to go in that direction without
14 having to strand assets and go back to my homes
15 and replace hardware.
16 We are also working with both standards
17 groups, with both alliances, both the Home Plug
18 and the Zigbee alliance. And what we are actually
19 doing is we made a proposal to the Home Plug
20 alliance to harmonize the application layer of
21 both the Zigbee, of both the Zigbee standard and
22 the Home Plug standard.
23 Now what that means in English is what
24 we are trying to do is make sure that people can
25 develop devices and those devices will innately

work, whether it's Zigbee or Home Plug. Now there has been a lot of division and a lot of fighting between those two industry groups over the past four or five years. And we are trying to bring them together to harmonize because we think that the right solution is actually a blend of the two.

Scale economies, I would say, are really, really important here. Really the issue here is in order for the PCT manufacturers to get interested in this space we have to make sure that there is a market opportunity. And not only that but we also have to make sure that we set very clear, technology requirements to provide device manufacturers with a very clear development path. So they need to see that the market opportunity is large enough and they need to see that the requirements are clear enough.

I would argue that Zigbee has achieved that point where the market size opportunity is big enough. Between the three California IOUs we have all committed to Zigbee. We have got 12.5, 13 million -- We have got a 12.5, 13 million household market opportunity right there.

The state of Texas actually enforced in their law mandated Zigbee under glass as well. So

1 you've got all the households in Texas. And the
2 country of Australia mandated Zigbee as well. So
3 I would say that you have got an over 20 million
4 marketplace opportunity in front of you with
5 Zigbee.
6 And the reason I bring this up is
7 because my last point down here which is, ensuring
8 a large market opportunity with standardized
9 interoperable product is what helps the
10 manufacturers drive product. And what is critical
11 to avoid at this point is what I would call,
12 feature creep.
13 And what I mean by feature creep are
14 hedging strategies. Okay, so we have heard a lot
15 about well, what about in the interim time period.
16 What do we do just in case the technologies don't
17 evolve.
18 I would argue that the California market
19 alone has created a market opportunity that's big
20 enough for the Honeywells and the Tranes and the
21 other PCT manufacturers to stand up and take
22 notice and say that this is a market opportunity.
23 And what I would say is that if you have
24 backup to backup measures, or Plan B and Plan C,
25 all that does is it adds cost. Which we've heard

1 from people that it might be a buck or two or
2 three. But, you know, a buck or two or three on
3 the bill of materials actually has a three to four
4 to five X result on the retail price.
5 We also have, we also have a situation
6 where you confuse manufacturers. Well I thought
7 you had a standard. What is the standard? Which
8 is it? Why do I have to put in both? It
9 introduces delay because you confuse people and
10 they say, format war. Why don't I sit back on the
11 side.
12 This is VHS versus Betamax. This is HD-
13 DVD versus Blue Ray, right? The standard approach
14 that people take is, I'm not going to be leading
15 edge. Let someone else sort it out, let someone
16 else make the wrong selection. I'll wait until
17 one selection is there and then I'll come forward
18 and I'll make my solution.
19 So really to wait it out until a clear
20 market and specifications emerge.
21 I guess one other thing I would like to
22 talk about is that one thing we really support
23 here is, with the PCT in particular, is pricing
24 signals. Our architecture is all about
25 introducing over our network, pricing signals.

1 And that's the key reason, by the way,
2 that we don't believe we need broadband, okay. A
3 key element that we don't believe we need
4 broadband is because we are looking at an
5 architecture where the intelligence is distributed
6 and pushed to the edge of the network.
7 And what I mean by that is, you have
8 intelligence as we have shown, as we have been
9 demonstrated to. There is intelligence at these,
10 at these devices. So all we have to do as a
11 utility is send a pricing signal, right. The
12 policy of what to do with that pricing signal is
13 all determined by all these smart devices on the
14 end.
15 So what are the current and future
16 potential HAN applications? Well, load shifting
17 and shaping and load limiting. The next
18 generation of our AC cycling programs. More of
19 the automated demand response. In-home displays.
20 Energy management systems. Plug-in hybrid
21 electric vehicle smart charging. And distributed
22 generation and storage. Control of distributed
23 generation and distributed storage.
24 So I wanted to just highlight a couple
25 of examples of the benefits of this enhanced

1 communication. What it does for us.
2 If we look at our Smart AC program today
3 we have got both thermostats and compressor
4 switches that are basically a one-way receiver via
5 the paging network. The PCT does have some
6 Internet accessibility but there is obviously the
7 possibility to disconnect this without notice. So
8 we have limited ability -- Once we put it in we
9 think it's good but we don't know for sure whether
10 or not a customer disables its functionality.
11 So basically what we are left with is
12 low-impact estimates that are based on statically
13 accurate M&E or M&V studies.
14 So what do we get with combining two-way
15 communications with the AC cycling program? Well,
16 we suddenly have two-way communications via the
17 meter. Our disconnects are identifiable via
18 interval data. We have real granular data as far
19 as what is happening.
20 The participation and the load impact is
21 measurable and confirmable. The PCT can also act
22 as the in-home display, as we saw in the
23 demonstration.
24 And we have the potential here for do-
25 it-yourself installation.

(Whereupon, CPUC Commissioner Chong rejoined the workshop.)

MR. TANG: So what would be some examples to some other emerging technologies that we are looking to leverage with the home area network? I broke them up into basically three categories.

One would be in-home displays and smart appliances. What is the opportunity here? The opportunity for conservation savings is really through information feedback and instantaneous and cumulative cost information.

Comfort controls. We spent a lot of time talking about comfort controls. But nevertheless, it is the ability to adjust temperature, humidity. To react to the weather, to react to historical data. To even do some pre-cooling. Right? Pre-cool a household at three p.m. before we actually really start hitting our critical peak periods.

And another category would be integrated wireless lighting. But basically I was giving a presentation at Google a few weeks ago and I was in what must have been at least a LEED-certified Gold if not Platinum building. And we were in

this conference room. There was a lot of natural light. But we still had the lights on because people wanted to be able to take notes.

So I asked to please turn off the lights because it was actually a day that we, PG&E, were running one of our -- we were actually running our CPP program. So this was about a month ago.

And the person went over to turn the light switch off. And interestingly enough, when they turned the light switch off, every single light in the room turned off. So every single light in that room was on one circuit. Why, right? If the builder had enough foresight to think it through and put --

ASSOCIATE MEMBER ROSENFELD: It also violates Title 24. Title 24 requires two light switches. Title 24 requires two light switches in every space.

MR. TANG: They had two switches but those switches controlled one set of lights. So I guess my point was, I would love to have seen, you know, half the room or every other light on one switch and every other light on the other switch. Because they could have had their energy consumption --

ASSOCIATE MEMBER ROSENFELD: Title 24 requires that.

MR. TANG: Okay.

ASSOCIATE MEMBER ROSENFELD: But we agree.

(Laughter)

MR. TANG: A real simple thing, right?

ASSOCIATE MEMBER ROSENFELD: Right.

MR. TANG: But you look at it and you say, okay. So we can try to get ahead of that in the building code but that only addresses permanent retrofits and new construction.

So is there a solution? Is there a way to address this problem? We have actually found a number of companies that are working on kind of integrated, wireless lighting where you actually put something between the light bulb and the socket that the light bulb goes into and you have the ability to actually have more granular control over which lights will actually turn on.

Now this can all be -- In a commercial environment this can all be part of an energy management system.

And that's really it. I just have this slide on peak choice, which is our demand response

program. And I guess my only comment on this is that customers like choice.

Our latest demand response program, which the Commission approved, allows us to go in front of our customers and really let them define what is the amount of reduction, what is the commitment level that they are willing to sign up for.

What sort of lead time do they need in order to be able to respond to the event.

What is the maximum number of events that they are willing to participate in.

What's the maximum number of hours that they are willing to participate for each event.

What is the window? So what time of day can an event occur for you and what are the number of consecutive event days that you are willing to stand up for.

So we think that as we continue to think through these demand response programs and load management issues we also have to think about what keeps the customer happy. Otherwise we could have that same situation as we did back in 2001 where we inadvertently lose customers' willingness to participate in this program because it becomes too

1 inflexible. Thank you.

2 PRESIDING MEMBER PFANNENSTIEL: Andrew,

3 before you -- I have two quick questions.

4 Hopefully quick questions. On your emerging

5 technologies. What do you see the utility role

6 being in promoting those technologies?

7 MR. TANG: We have, we have -- We are

8 funded to do both a demand response program --

9 cost-effective innovative demand response programs

10 and cost-effective energy-efficiency programs. So

11 we have mechanisms in place where we actually

12 bring these opportunities to our customers and

13 show them as opportunities for them to reduce

14 their energy bills or conserve energy.

15 PRESIDING MEMBER PFANNENSTIEL: So you

16 are facilitating between the manufacturer or the

17 retailer and the customer?

18 MR. TANG: Yes.

19 PRESIDING MEMBER PFANNENSTIEL: And then

20 -- You don't have to go back to the slide. But

21 earlier on you were talking about your expected

22 megawatts on demand response programs. And I

23 think you said 1.3 gigawatts, something like that.

24 MR. TANG: By 2011.

25 PRESIDING MEMBER PFANNENSTIEL: By 2011.

1 Is that both load control programs and price
2 responsive programs?
3 MR. TANG: That is, yes.
4 ASSOCIATE MEMBER ROSENFELD: And just
5 one second. Could you convert that to percentage.
6 That's on the total demand of PG&E on a hot day of
7 how much?
8 MR. TANG: That's a good question.
9 Statewide on a hot day is 50 gigawatts, right. So
10 PG&E --
11 ASSOCIATE MEMBER ROSENFELD: How much?
12 PRESIDING MEMBER PFANNENSTIEL: The
13 system is 55.
14 MR. TANG: Is 55. So PG&E is probably
15 about a third of the statewide load.
16 PRESIDING MEMBER PFANNENSTIEL: So it's
17 20 or thereabouts.
18 ASSOCIATE MEMBER ROSENFELD: Twenty. So
19 it's an eight percent effect, it's a big deal.
20 Yes, go ahead, Jackie.
21 PRESIDING MEMBER PFANNENSTIEL: Well it
22 is a big deal but it's still a little below, I
23 think, what we had thought back when we set the
24 goals for price responsive programs. I think we
25 thought we would get farther than this by 2011.

1 So was this a base case estimate? Are
2 you looking at accelerating from there or is this
3 about as much as you think you are going to be
4 able to achieve?
5 MR. TANG: Well the key issue is cost
6 effectiveness, right?
7 PRESIDING MEMBER PFANNENSTIEL: Yes,
8 right.
9 MR. TANG: That's the rub. And can we
10 achieve more, possibly. But would it necessarily
11 be cost-effective? That's the issue. And that's
12 one of the reasons why we actually do look at the
13 smart meter upgrade with a lot of excitement.
14 Because the issue on cost-effectiveness is
15 literally the communications costs or the hardware
16 costs to get at devices.
17 PRESIDING MEMBER PFANNENSTIEL: Right.
18 But you will have the meters in, right?
19 MR. TANG: The meter deployment wraps up
20 in 2012.
21 PRESIDING MEMBER PFANNENSTIEL: So you
22 will have most of them in by 2011. I am just a
23 little surprised that your number is, frankly, as
24 low as it is, given the fact that millions of your
25 customers will have the basic -- lots of metering

capability at that point.

So are you looking at new programs that aren't currently on your radar screen for the smaller customers, residential, small commercial, in that time frame? Or are you extrapolating from where you are today?

MR. TANG: So this is the portfolio that we actually, currently have on file that we filed on June 2 with the CPUC. Do we continue to evaluate other programs? Would we look to bring on other programs of other technology or uses of technology evolved? I think the answer is, yes. But as far as what's on the record for what Commissioner Chong is going to hold our feet to the fire on, that is that 1.3 gigawatts of demand response by 2011.

PRESIDING MEMBER PFANNENSTIEL: And how about price responsive programs? Are you assuming that you have some active and well-participated in CPP programs at that point?

MR. TANG: We do, yes.

PRESIDING MEMBER PFANNENSTIEL: Okay, thank you. Other questions?

ASSOCIATE MEMBER ROSENFELD: Yes, I do.

PRESIDING MEMBER PFANNENSTIEL: Art, go

1 ahead.

2 ASSOCIATE MEMBER ROSENFELD: A couple of

3 slides back near the end you were talking about

4 the spec. You had a slide about what your system

5 should enable and you talked about two bucks. Of

6 one-way communication adding $6 to the price or

7 something. Are you suggesting that you want

8 changes in the specs for the PCT?

9 MR. TANG: No. I like the concept of

10 having the flexibility that it's an open port. I

11 guess it's an SDIO port, Ron. I like the concept

12 of the fact that it's an open port so that there

13 is that flexibility. So that if somehow, some

14 way, some reason that the 13 million meter

15 opportunity that the three IOUs have is not big

16 enough you don't strand the entire PCT. You just

17 strand the communications chip. That's part of

18 that expansion port.

19 ASSOCIATE MEMBER ROSENFELD: I may be

20 complicating my own life here. But you said that

21 the three utilities have pretty much decided they

22 want Zigbee.

23 MR. TANG: Yes.

24 ASSOCIATE MEMBER ROSENFELD: Does that

25 very important decision, does that affect your

1 design or the ideal PCT?
2 MR. TANG: I don't believe so. From my
3 standpoint that is the functional requirements
4 that we go out to the market and say, well we want
5 a PCT that communicates over Zigbee.
6 ASSOCIATE MEMBER ROSENFELD: So you want
7 it to be Zigbee, you want to depend on Zigbee, but
8 you don't necessarily want to build Zigbee into
9 the PCT to save money?
10 MR. TANG: No, I do want Zigbee built
11 into the PCT.
12 ASSOCIATE MEMBER ROSENFELD: You do want
13 it.
14 MR. TANG: Absolutely.
15 ASSOCIATE MEMBER ROSENFELD: We would
16 have objection to that.
17 MR. TANG: I would have no objection to
18 that. I question whether or not we need to have
19 other communications technologies built into,
20 built into it.
21 ASSOCIATE MEMBER ROSENFELD: We had a
22 conversation last night with the three IOUs and
23 Janet Corey representing PG&E. And we tried to
24 assure her that we, given a few years down the
25 road and everything is working fine with Zigbee or

1 whatever else and no hiccups and so on, we
2 certainly would not expect the one-way backup to
3 have to go on forever. Title 24 gets revised
4 every three years, after all. So we do regard it
5 as a sort of temporary test.
6 MR. TANG: Yes. My only comment on that
7 is that it adds overhead.
8 ASSOCIATE MEMBER ROSENFELD: Yes.
9 MR. TANG: I just think that, you know.
10 I just think that that adds confusion in the
11 marketplace. My opinion.
12 ASSOCIATE MEMBER ROSENFELD: When this
13 all ends I'd like to gossip with you some more.
14 MR. TANG: Okay.
15 ASSOCIATE MEMBER ROSENFELD: Okay.
16 MR. OLIVA: Good afternoon Commissioners
17 and staff. Thank you for inviting us to speak
18 today. My name is Larry Oliva and I run the
19 demand response programs for Southern California
20 Edison. I, in the interest of time, are not going
21 to go over some of the ground that Andrew went
22 over. We are much aligned on the concepts here
23 with respect to devices in the home and
24 communications technologies and so on.
25 And what I would like to talk about

today is what we have been have been doing and what we are planning to do with respect to demand response and load control in communications and enabling devices.

I just want to put this up. Everybody loves George Burns. And everybody remembers, even today, commercials that we had back in the 1970s where the theme was, why don't you give your appliances the afternoon off. And the pitch man was George Burns and it actually worked very well. It was before we had time of use rates. It was just an information message and people still remember it.

We do have a strong history in looking at different demand response approaches. We had actually tested and used in a pilot program a meter in 1980 which is similar to the kind of meter that we are going to be installing in AMI today where it is remotely communicating and demand limiting in the meter. And we did a demand response program where we actually limited the demand, the total demand of the customer.

We initiated AC cycling in 1983. We had 91,000 customers on the program by 1985. Today we have 305,000 customers on the program.

We also started large customer programs in the '80s. And as everybody knows, they were used very heavily during the energy crisis.

The key technologies that Edison is working on, looking at developing over the next decade include the information display devices, programmable communicating thermostats, electric vehicles, PHEVs, solar and technologies that enable renewables such as wind.

This is the direction we're heading. We're spending a lot of time and money on all of these things and they are part of our Smart Connect applications as well as our demand response applications and our electric vehicle research.

Our demand response portfolio can be looked at different ways. Today I would like to just present them in a sort of communication, enabling technology way.

On the upper left hand corner is our dispatchable DR resources. So these are basically our AC cycling where it's a one-way communication to air conditioners, ag pumps, water pumping. It works very well. We have about 665 megawatts on those types of programs.

1 On the upper right are what I all
2 customer-advised demand response. And we have 735
3 megawatts there. And that includes our
4 interruptible program, capacity bidding, demand
5 bidding, CPP, dynamic pricing, real-time pricing
6 and our aggregator DR contracts. And the
7 difference here is that we are providing the
8 participants a signal. There's a signal that
9 there is an event or there's a signal that there's
10 a price.
11 And where we want to move both of these
12 types of programs is to the lower boxes where we
13 are taking, getting our dispatch programs and
14 making them more precise. Getting more
15 granularity so that we can dispatch these devices
16 on a circuit-by-circuit basis.
17 We already do that today. Many of our
18 AC cycling devices can be dispatched on a district
19 or substation basis. But we have different
20 vintages of devices out there so we can't do it
21 uniformly. But we are moving in the direction of
22 doing that.
23 And then on predictability and amount of
24 demand response. We are moving in the direction
25 of AutoDR in our demand response application filed

1 June 2. We have put in $4 million for an expanded
2 AutoDR program. We also have $27 million in for
3 our technology assessment technology incentive
4 program, which also is a part of an AutoDR
5 program.
6 So we are moving in the direction of
7 automating demand response for all the reasons
8 that were talked about this morning.
9 ASSOCIATE MEMBER ROSENFELD: Sorry.
10 Could you give the two numbers again you gave for
11 AutoDR. I just couldn't hear you.
12 MR. OLIVA: I'm sorry. Four million
13 dollars for the AutoDR program and $27 million for
14 the TATI program.
15 A large part of our Smart Connect
16 application is providing customers information.
17 And we will on the website provide lots of
18 information to the customers about their monthly
19 usage, about their costs, about their daily usage.
20 Many things can be provided through that portal.
21 Another thing that we are going to be
22 providing is information to customers about their
23 usage on the tiered rate structure that we
24 currently have. And I want to talk to you about
25 that a little bit.

1 We can, with AMI, tell customers where
2 they are with respect to their tier position in
3 the Tiers 1, 2, 3, 4 and 5. A customer can get on
4 the website -- And this is not available today yet
5 but this is just a mock-up of what could be
6 provided.
7 A customer can go on the website and
8 see, oh gee, today I am in Tier 3. So far in the
9 billing cycle it's 18 days. I've got seven more
10 days on average, based on my usage historically.
11 It's going to take me seven days and I'll be in
12 Tier 4. Then I face different prices in those
13 tiers. So with tier position customers know more
14 about their costs during the month.
15 So they don't have to wait for their
16 bill. And since we do have hot summers in
17 Southern California many customers run up into
18 Tier 3, 4 and 5 and the Tier 5 costs are pretty
19 significant. And people can look at, you know,
20 how soon they will be in Tier 5 and that will
21 remind them to stay away from Tier 5 if they can.
22 And then the next version of this would
23 be to provide notifications to customers about
24 what tier they might or the tier that they are
25 entering into. A customer could sign up for a

1 tier notification that says, please provide me an
2 e-mail or a phone call or a text message as to
3 when I am entering Tier 4 or when I am entering
4 Tier 5. And this can easily be done. So we call
5 that tier alert notifications.
6 And the next iteration of that, as the
7 technology is developed, is we could even have a
8 refrigerator magnet-type device. And we have
9 already talked to a manufacturer about this. That
10 could display via Zigbee communication to this
11 refrigerator magnet, what tier the customer is in
12 at the moment.
13 So we think this is pretty interesting.
14 And given that we do have a tiered rate structure
15 right now it would encourage energy conservation.
16 And that is a big part of our savings that we are
17 hoping for with AMI.
18 Now with our load control program.
19 Which I mentioned, 305,000 customers on it over
20 600 megawatts. We are going to be expanding that
21 program dramatically. We have the cycling devices
22 there now. As we deploy AMI between 2009 and
23 2012, some customers will be enabled to have a PCT
24 device. But customers without meters won't be
25 enabled. So if they want to be on a load control

program we can still install an SDP device, a summer discount plan device or a cycling device.

However, what we would like to do is move away from our cycling devices and encourage customers more to PCTs. So we can, because we are going to be offering a peak-time rebate as our incentive mechanism for participation in these programs, we can change the incentives. In fact lower some incentives for the cycling devices and have higher incentives on the PCTs to encourage customers to go to the PCTs.

Also the PCTs have an override option and they provide customers information on their comfort and so on. So we do think that we will see a migration by customers from the cycling devices to PCTs over time.

Our business case, which we filed with the Commission, has us installing, or customers installing, PCTs. About 500,000 by 2012, devices, PCT devices.

Now on both the summer discount plan cycling device or the PCT the paper performance can work in a variety of ways. You're familiar with the peak-time rebate where a customer if they just lower their usage on a peak-time rebate event

1 day, they will get a rebate. And what we will be
2 filing in our GRC Phase 2 next week is a 75 cent
3 per kilowatt hour rebate just for the load
4 reduction during a peak-time rebate event.
5 But if they have enabling technology,
6 where we actually dispatch the control. That is,
7 an increase in temperature, say four or six
8 degrees. Then we would pay an additional 75 cents
9 a kilowatt hour. So with enabling technology the
10 customer would earn a rebate of $1.50 per kilowatt
11 hour under that program.
12 So it would encourage customers to go to
13 PCTs. It would encourage customers to participate
14 in advance. And it would be paper performance so
15 we wouldn't, we would go away from the current
16 program we have today, which is an up-front
17 incentive in the beginning of the summer and then
18 we don't know whether we have events and we don't
19 know exactly who is participating in them. With
20 metering we will know all of that.
21 Also we are looking at providing
22 customers different options with respect to the
23 settings for automated controls. So that it could
24 be a four degree setback or a six degree setback
25 and it could be for four hours or it could be for

1 six hours. It could be total shutoff. These are
2 things that we are going to be testing with a
3 pilot, a customer behavior pilot, to see if it
4 actually does make a difference to customers when
5 it is giving them these different choices.
6 The other key initiatives we have.
7 Plug-in hybrid vehicles. We have a partnership
8 with Ford where we are actually working with them
9 on use cases for integrating the PHEVs into the
10 home with respect to demand response and Smart
11 Grid.
12 You're familiar with the California
13 Solar Initiative. We are working with various
14 manufacturers on integrated home/business energy
15 management systems, in-home displays. A number of
16 devices. We are contacted by vendors and
17 manufacturers all the time about their products.
18 And we are not looking for partnerships
19 in terms of an investment partnership or
20 participating in the market itself for devices in
21 the home. We are really just trying to tell them,
22 here is the information we're providing. Here is
23 the protocol we're using. We're going to be
24 sending price signals. We may be sending other
25 signals.

1 And you'll need to -- you know. Here
2 are the interoperability requirements. You know,
3 here's what it is. Take it and use it, please.
4 So the vendors like Control Four, which is
5 software approach that has information on the
6 television screen and tells customers about many
7 things. Their energy usage, their appliances and
8 status in the home. Their investment portfolio,
9 all kinds of stuff the customer can go or a person
10 can go to on their television screen and look at
11 all kinds of things.
12 But the point is that we are
13 communicating, working with all of these different
14 vendors. We would like to facilitate all
15 solutions to customers that will help encourage
16 conservation and demand response.
17 We are not interested on the customer
18 side of the meter in terms of investment. We just
19 want to implement programs the best way. We want
20 to make the market work.
21 So I think that Ms. Pepetone earlier
22 today listed, which I thought in a very nice way
23 and comprehensive way, the utility requirements
24 and customer requirements. They were like
25 functional requirements. And I think we are

aligned. I think the three utilities are aligned in complying with all of those six requirements that she laid out.

So I am ready for questions.

PRESIDING MEMBER PFANNENSTIEL: Thank you. The one that I just want to make sure I am understanding this. Right now Edison has two ideas for in-home display. One will be essentially through the Internet on computers, home computers, and the other will be PCTs?

MR. OLIVA: Those are the two that I talked about, yes. But we're talking with a vendor about a USB port-type device that plugs into your computer, communicates with the meter, and then gives you real-time information on usage.

PRESIDING MEMBER PFANNENSTIEL: So there are many other technologies that we would expect the market to develop and to offer and you are working with any number of those.

MR. OLIVA: Exactly.

PRESIDING MEMBER PFANNENSTIEL: But the two that you are actually working on right now are the two you talked about.

MR. OLIVA: We're working on -- right, yes. And on the PCT we have an RFI out. We have

not issued an RFP yet. We are actually hoping to -- the Open HAN reference design. We'd like to -- I think earlier it was mentioned that in a few weeks or months that that would be finalized. That would be very helpful for our RFP.

PRESIDING MEMBER PFANNENSTIEL: Because your idea is to migrate the air conditioning cycling customers on to PCTs.

MR. OLIVA: That's correct.

PRESIDING MEMBER PFANNENSTIEL: Great. Thank you. Other questions? Anything else?

ASSOCIATE MEMBER ROSENFELD: Yes. You mentioned warning the customer that he or she is within seven days of entering Tier 4 or whatever.

MR. OLIVA: Yes.

ASSOCIATE MEMBER ROSENFELD: At the same time, I presume, you also will offer to the customer what his or her real-time price is, time of use price on a regular afternoon and CPP price.

MR. OLIVA: Well if they had a CPP rate that would be available also. Under this concept it would be that the customer is on a tiered rate design. So if they are on that rate then we are showing the customer what the price is for each tier. And how long they are going to be in that

1 tier before they reach the next one.
2 ASSOCIATE MEMBER ROSENFELD: You know,
3 it's just that we have to learn, and the customer
4 is going to have to learn once we get onto
5 critical peak pricing, that there are two
6 considerations. So I'm sort of visualizing a
7 world in which you go up to the screen to find out
8 how you're doing and it says, which of two things
9 do you want to know. One is the tier issue.
10 MR. OLIVA: Right.
11 ASSOCIATE MEMBER ROSENFELD: And the
12 other is, what am I using right now. And am I --
13 And if you have peak-time rebate, am I complying
14 with my -- Am I below the peak-time rebate
15 requirement.
16 MR. OLIVA: Right. It's what we call a
17 customer reference service level or something,
18 something like that. But the baseline is what
19 you're talking about.
20 PRESIDING MEMBER PFANNENSTIEL: If there
21 is a time-varying rate of some ilk that the
22 customer would be eligible for, perhaps you could
23 also show what the customer's bill would be if
24 that customer had chosen that rate.
25 MR. OLIVA: That's absolutely correct.

1 And as we get experienced where the customer has
2 usage data over a period of time. Say they have a
3 year. They have had the meter for a year. They
4 have the usage data hourly for a year.
5 And they can see. We can show them a
6 comparison. If you were on CPP here is what your
7 bills would have been. If you were on TOU, you
8 know. And it could be comparing their performance
9 on peak-time rebate compared to CPP. Many things
10 are possible. The data enables lots of, lots of
11 ideas.
12 PRESIDING MEMBER PFANNENSTIEL: Thank
13 you. Anything else? Very good, thanks.
14 MR. OLIVA: Thank you.
15 MR. D'LIMA: Good afternoon. I want to
16 start up by thanking the Commission, the
17 Commission staff and everyone out here and
18 listening herein on this workshop. We are
19 delighted to participate and we feel it's an honor
20 to be part of this working group.
21 Let me start out by telling you what I
22 do. I am in the emerging technologies group and
23 we look at, I specifically look at demand response
24 and emerging technologies. I manage that program.
25 We have others that do the energy efficiency

1 programs as well.
2 And in our scope of activities we
3 basically look at technologies that are near-term
4 to future. So some things that would be in a lab
5 environment all the way into where it's almost
6 marketable. It's commercially available and we
7 are trying to distinguish as to how to introduce
8 them into our programs.
9 The type of technologies that we look at
10 are quite diverse. Our methods are basically
11 evaluations and demonstrations. So we take
12 technologies that are available, the research
13 organization or the vendor would come in with
14 their technology and they display it to us and we
15 see the value in it. Then we actually do
16 demonstrations at customer sites. We try not to
17 do lab-type demonstrations because that doesn't
18 really give us a whole lot. So we anticipate
19 customer site demonstrations.
20 So what I am going to do is I am going
21 to describe some of the technologies that we have
22 used in the past in our programs. These have been
23 successfully done in our programs. Some of them
24 have proven out. Some of them have been
25 eliminated on account of costs and budgets.

1 And then I will go into the technologies
2 that we are looking at presently and then what we
3 are looking at in the future. Some of them will
4 apply to home area networks in a big way and
5 others will also be applicable to commercial/
6 industrial facilities.
7 Starting off with the enabling
8 technologies that we have used. We had the smart
9 thermostat program. And I think somebody alluded
10 to it earlier about getting some data on that
11 program. It was basically a one-way paging
12 system. Sorry, it was a two-way paging system in
13 which an MDU, which is a module that was installed
14 in the attic space of a home, and then would send
15 a signal downstream to a thermostat.
16 It was hard-wired. It was quite
17 expensive because of the two-way paging
18 capabilities. At its peak we had around 4,000
19 customers. It is no longer in operation on
20 account of costs.
21 The Summer Saver program is presently in
22 operation. It's one-way paging system in which a
23 page is sent, or can be sent, to a module of the
24 DCU unit. Which is mounted on the air conditioner
25 on the outside of the building, outside of the

1 facility.
2 So while the Carrier system was two-way
3 and was only for residential, the Summer Saver AC
4 cycling program, Comverge program, is really for
5 residential and commercial, small commercial.
6 The control unit basically shuts off the
7 compressor. That's what its function is. And it
8 goes through that cycling mode. Customers can
9 enroll in different cycling methodologies. There
10 will be 50 percent cycling or 100 percent cycling
11 and then they get certain incentives on account of
12 that. That's for the residential.
13 For the commercial it's 30 and 50
14 percent cycling.
15 In talking to the Comverge company they
16 have indicated that they have around 28,000 -- I
17 think about 34,000 customers so far with around,
18 they're claiming about 50 percent. Fifty
19 megawatts of load reduction, of capability.
20 Okay, let me get into the on-line energy
21 tool that we have. Which applies to any customer
22 that has an ADR meter and that would be enrolled
23 in a demand response program. So those are the
24 two requirements.
25 And the reason for an ADR meter is

because that information can be uploaded into our system and they can see it the next day and various things.

They have capabilities to do comparisons, they have capabilities to do trending. Actually discriminations between different facilities that they own in the same area. They can group facilities and then do discrimination analysis from those. But this is an on-line tool so you basically have to get an on-line log-in and access it.

It also is our means of implementing demand response presently. So a customer that's enrolled in demand response, we would have that information loaded up in here so that -- and ask them how they wanted to be notified.

Accordingly this would send out the e-mail, pager, cell phone, telephone, text message, whatever you want to do. And we have different flavors of that so they can accordingly get this notification that a demand response event is going to occur or will be occurring the next day.

And then the final one that I wanted to talk about really doesn't have demand response access or activity right now but we're looking for

it in the future. It would be the permanent load shifting. This is a program that was recently approved.

So we have got two different technologies on there with a total of around three and a third megawatts thermal mass of freezer space. So this is basically pre-cooling the freezer space and then letting it ride through a critical peak in our system. So it's shifting it on a permanent basis but it is basically a pre-cooling capability.

(Whereupon, CPUC Commissioner Chong and CPUC Advisor Campbell exited the meeting room.)

MR. D'LIMA: And then the last one is gas absorption AC systems, or engine-driven AC systems. Which is not really geared towards demand response at this time.

All right. So now this is where we are at in terms of what we are doing right now. We are looking, and this is one of the several technologies we are looking at. And actually I wanted to spend more time on what we are looking at in the near-term and future. So I will just go over this very briefly.

This is hotel room or a hospitality energy control. As we know we have seen classrooms, we have seen various facilities having motion sensors and light activation methods to either turn on lighting and turn it off when there's nothing in the room. But very few have penetrated the hospitality industry. We are trying to see what it would take to get this kind of technology into that particular customer base.

So we are doing a present study and evaluation of three different hotels. We have taken up I think about ten rooms in each hotel and we have outfitted them with control systems. These are stand-alone, islanded control systems. But in the future, after this initial study is done as to how interaction would occur and whether the particular hospitality or that particular hotel sees benefits from it. Then we could go to the next step where we actually try to inject demand response signals into these hotel rooms.

ASSOCIATE MEMBER ROSENFELD: Could I ask you?

MR. D'LIMA: Sure.

ASSOCIATE MEMBER ROSENFELD: In most of the world this trick is done with key cards. That

is, in China or Japan or Europe, everything is off until you put your door card, your key card in. And we were actually experimenting with some of hotels in Sacramento. Why didn't you just go the key card route?

MR. D'LIMA: Well, we thought of that. We went to the, to the hotels that we were targeting and their response was, well, that's pretty easy to override. Everyone gets two key cards when they walk in, are issued two key cards. You put one in the slot and you forget it.

ASSOCIATE MEMBER ROSENFELD: Or just your business card will work also.

(Laughter)

MR. D'LIMA: I don't know about that.

ASSOCIATE MEMBER ROSENFELD: Oh yeah, sure.

MR. D'LIMA: Okay. So you put the card in. A credit card maybe. And it would stay on. Basically you get no benefit from it. And so they were preferring that we try something that was different in order to get energy savings.

ASSOCIATE MEMBER ROSENFELD: No, that's very interesting, you answered my question. I would like to stay in touch with you because we

1 were thinking of using the key card trick for
2 Title 24, next edition. And so if you think
3 that's a serious problem, that it is too easy to
4 override. We should stay in touch. Thank you.
5 MR. D'LIMA: Yes. That's what the
6 industry has told us. That they have seen this.
7 And actually I have got to admit I did this when I
8 was outside of the country.
9 ADVISOR TUTT: And I would also add that
10 what I have experienced is that the hotel
11 hospitality staff has blank cards that they stick
12 in there to clean the rooms and they leave them
13 behind all the time.
14 MR. D'LIMA: Okay. All right.
15 So this is what we are doing right now.
16 One of the technologies we are demonstrating,
17 there are others. We are doing something in
18 lighting as well.
19 Now I want to talk about home area
20 networks. And these are, these are plans that we
21 have on the drawing board right now for actual
22 projects that we are going to start rolling out in
23 the next few months to the next few years. Some
24 of these require the technology to be constructed.
25 It may not exist there right now. Like a home

energy manager or a home energy EMS, a management system.

While we know that they do exist in a very rudimentary form we are thinking about more like the ones that you have in commercial/ industrial buildings where you can identify specific appliances, specific nodes that you want to control. That's not there yet. And so that's going to be further down the line. That is our wish list for future demonstrations.

But what we are looking at is some of these appliances that have some controls in them. We have been in discussions with some of the major appliance manufacturers and they told us that, you know, unless you show us some value. Show us some value. Not the utilities, us some value. We are not willing to even put in an extra bolt in our appliance. An extra nut in our appliance. So it has been a hard sell for them. We see the consumer pushing it more than the utility trying to force them in that direction.

All of this we anticipate doing through our electric meter. So while our roll-out plans are to 2011, we will be piloting or actually doing some pilot studies of our AMI over the next few

1 months. After that initial evaluation is done on
2 AMI, our smart meter system, then we will start
3 looking at doing this kind of work. We'll be
4 using different types of home area network
5 technologies and then trying to connect through
6 our smart meter.
7 One thing. An integrated appliance and
8 non-appliance integrated controller. So as I
9 mentioned, we have appliances that would have
10 integrated controllers and then we have other non-
11 appliances. Meaning like lighting, maybe a TV or
12 something like that, which would not have a
13 controller in it and that we could turn off or
14 control somehow.
15 There are plug-in controllers that you
16 can buy today. That you plug into the wall and
17 you plug your appliance into it. Those are very
18 hard controllers. Meaning in the sense that they
19 can cause some damage, possibly if it's frequented
20 a lot in the future. Because it basically hard-
21 shuts off your appliance. So if your particular
22 refrigerator, for instance, is running through its
23 cooling mode and is making ice and you shut it off
24 that way it could cause some damage. You'll have
25 a big block of ice somewhere to deal with.

1 And the last one is we are looking at
2 doing some testing on wireless and PLC protocols.
3 So we look at home area networks using a
4 combination. And I think one of the gentlemen
5 before me stated that too. That we don't see one,
6 single protocol existing in the home. We see
7 multiple protocols. In fact, there may be already
8 existing wireless or wired home area networks
9 existing in the -- do I need to leave? Existing
10 in the home. And the question would be, how do we
11 leverage all of those. And I will go into a
12 little bit of detail next.
13 So these are the kinds of technologies
14 that we are focusing on. Programmable
15 communicating thermostats are very big on the
16 list, very high up on the list. Simple
17 controllers and sensors and energy management
18 devices. Smart controllers. And of course energy
19 storage. With the, with the plan that the PV and
20 the PHEV will one day be a possible energy storage
21 device.
22 Se we have heard a lot of discussions
23 about PCTs. For the most part we agree with them.
24 We want PCTs to have basic functionality and have
25 the control capability that will be compatible

with our infrastructure. In that case it would need to be two-way, standards-based communications. That way we can control it, we can get direct feedback from the PCT.

And one thing. We do not really see the PCT being the -- How do I want to put this? The big plasma TV type of thing. We see the PCT as having a role in the home but not where the customer is basically focusing all their time.

So we envision that there will be other display devices. Whether they be the TV, whether it be another computer, whether it be your in-home display or it would be your cell phone. We see that being an alternative means of getting information to the customer. The PCT will be one very important -- will play a very important role there but it will not be the only role, the only place that you would get messaging sent to.

All right. So this is a basic diagram of our energy management scheme. So what we see is customers, once they have this capability -- And we are talking to different vendors of technologies that already exist in the home like companies that make gaming technology, companies that are making computer application technologies,

automation technologies.

We would like to use that means of however they're deploying it to put on top of that some sort of an application-based, energy management system. So that it's not a separate device and not a separate box that goes into the home. We see it as being an integrated part of a bigger concept that the homeowner wants.

So what we see here is basically the utility signals would come two-way into the home, out of the home. But that would not be the way that the consumer will get access to their utility information. Meaning that they would get information from the meter, but that's about all that they would go to. They could not access our AMI system by any means.

The way that they could get access to their information remotely would be through the Internet, would be through other processes in the home or whatever they set up as their capabilities to enable that to happen. Whether it be some sort of a telephone line or it would be something else. We do not see them using our AMI system to get access to their information.

We see them using our meter to get

1 access to their meter data and that's it. If they
2 want to get day-old meter information they can go
3 on-line to our system and they can access it there
4 too. But that would not mean direct access
5 through our AMI. That's very secure, that's very
6 limiting. We had some problems trying to have
7 customers on demand trying to get meter reads
8 through our system.
9 Okay, let's go to the next one. So now
10 here is a scenario in which there are companies
11 out there that provide energy services that
12 basically will put in all of these smart devices
13 in your home and then come to the utility and say,
14 okay, we can offer this capability because now
15 this customer has enrolled in our smart home
16 concept.
17 They are primarily doing this out from
18 the vantage of having security in the home or
19 providing some sort of entertainment or some sort
20 of other service to the home. But they have in
21 addition to that some capability to do energy
22 management. Those are important, I think,
23 alliances that we want to maintain because that
24 way we can leverage what other companies are doing
25 for the consumer and we can benefit from it.

1 Once again, the access is through the
2 Internet, it is not through our AMI system. What
3 we have here is a secure, customer interface.
4 Whether it resides on a router or resides on a --
5 gosh, what's the word I'm thinking. Anyway, it
6 resides on another device in the home.
7 It will control smart loads. So these
8 are, these are not necessarily loads that are --
9 These are not -- These are loads that can be
10 programmed inside the home. They do not
11 necessarily have to go outside to get programming
12 information. And they don't necessarily need
13 another device like an energy manager to tell them
14 when to turn off or to set certain rules.
15 Energy managers would be things that you
16 set rules. You tell it, at so-and-so price you
17 turn off this. At this other price you turn off
18 something else. This on the other hand would say,
19 this particular appliance you turn off at this
20 particular price and above. So that's the smart
21 part of it that this simple connection would
22 entail.
23 And then we get into the concept of
24 energy storage. We know that there's a big push
25 towards energy -- actually a big push towards zero

energy homes by 2020. And so we want to start working on that right now to enable that to happen by that date if not earlier.

So in that respect we are presently working with a vendor to install a large battery in a, in a commercial site. This is about a 100 kilowatt battery. It's only a part of that particular commercial site load. What the plan is, to initially look at just seeing how the battery performs. So for the next nine to 12 months we'd be looking at battery performance.

Subsequent to that we will then be looking at how we can take that same battery and try to get demand response. And maybe even battery to grid opportunities. But that's, you know, assuming that a lot of things happen by that date. Meaning, the rates are such that it enables that to happen. So that there is no penalty to the customer to enable this.

Also we need to make sure that the technology is capable of doing that without blowing up a whole bunch of things inside the customer home.

What I am showing here is really a depiction of what could happen in terms of how

load can be shifted to off-peak periods. Sorry, can be -- Actually, the battery can be discharged at particular periods.

And I think that's my conclusions. We know that technologies need stimulation. This is not going to happen without some sort of stimulus, either through monetary means, through rate design, through Title 24. There has to be some sort of stimulus that these vendors are looking at. They are not going to put them -- They are not going to make this change. Maybe the customers will stimulate the market. But that's assuming a lot.

We encourage technology diversity. And by that I mean not just a protocol diversity but also the different ideas on achieving the same goal. We don't think that just one type of technology is going to work for every customer. We think that there will be other technologies that will do the same thing, provide the same benefit, as the other.

I think you have already heard my spiel on PCTs.

And then we presently are proposing a residential appliance controls and automation

technology program. One of the problems that we face in emerging technologies is that while we can commercial facilities and we can look at, you know, 50 demonstrations at commercial sites, we cannot, we really don't have the budget to do large scale demonstrations. And by this I mean hundreds of facilities. And so we propose to the Utilities Commission that we get funding to enable us to do something like this for the residential side.

And then the last thing is, of course, goals and standards. It's important that we have some of these technologies eventually migrate to goals and standards. Because we see that being the stimulus. That's it.

PRESIDING MEMBER PFANNENSTIEL: Thank you very much. I think because we are running late we are probably not going to hold the panel in-panel longer even though we may have other cross-cutting questions.

I think what we'll do now is move into public comment. I think we have others here who have expressed a desire to have an opportunity to address us. And the hour is late so Gabe, unless you or David have something else I think we should

1 move into the Public and Industry Comment section.
2 MR. G. TAYLOR: That's correct.
3 PRESIDING MEMBER PFANNENSTIEL: Do you
4 have -- Did you gather cards or will we just
5 invite participants to come up?
6 MR. G. TAYLOR: I have three cards and I
7 have, I believe, four speakers who contacted me
8 ahead of time and asked to speak.
9 PRESIDING MEMBER PFANNENSTIEL: All
10 right. All right, we'll do that. And we will ask
11 people to be respectful of other people's time and
12 the hour and limit your remarks to us. With that,
13 who is first?
14 MR. G. TAYLOR: Since there is no
15 volunteer I would like just jump right in and call
16 people. Is that okay?
17 PRESIDING MEMBER PFANNENSTIEL: Please.
18 MR. G. TAYLOR: We have a
19 representative, I believe from Cassatt
20 Corporation. Cassatt, I apologize. And I have
21 spoken to all of these presenters ahead of time
22 and they have assured me approximately five
23 minutes.
24 MR. OESTREICH: Thanks again. I'm Ken
25 Oestreich with Cassatt Corporation. What I want

to do, actually, is shift gears just a little bit. It seemed like the day was really highly weighted toward residential demand response.

And looking at some of the statistics that the Demand Response Research Center had, and others had today, there's actually a lot of opportunity in the commercial and industrial space. And I think the DRRC guys said, there's a lot of participation. I think 51 percent megawatts or something, I forget the number, from industrial but very little from commercial.

And what I want to address is an opportunity we see in commercial that's untapped and kind of dive into that. Okay.

So some of you might have seen this graph. This is from the Department of Energy. And it depicts what the energy consumption of data centers in commercial space have been. These are these huge, very dense energy consumers that are essentially on all the time. These are not things that have been traditionally thought of as open to demand response programs.

So I just want to, rather than talk about specific technologies, talk about some opportunities for technology to apply toward. So

this graph shows there's been about an estimated 60 gigawatts of energy that goes toward these data centers. It's expected to climb. The Department of Energy has shown what some of the opportunities are to reduce this, even through demand response or through voluntary curtailment.

The reason the problem has been really huge is that these computers in these data centers are on all the time. So it's the moral equivalent of keeping the lights on in the house all the time. And when they're busy they use only marginally more power than when they are not. So when they are not busy they're just chewing up power.

And no one is looking at either voluntary curtailment during these periods of idleness when the blue lines are essentially idle, curtailing the use of these computers during these periods. Or during a DR event saying, which of these computers are actually less important than others.

What we are proposing, and I am not going to go through all the technology, is that there are policy-based approaches. And I think I heard some folks talk about the economics of

signaling price and using policy to determine curtailment based on price.

Knowing something about these computers, what's running on them, what's important, the moral equivalent of knowing who is in the room and not turning the lights off in that room if somebody is there. The equivalent is if you know the computers are busy don't turn them off, but if they are not busy, turn them off. And being independent of the software and the vendors and the technologies. This has to be compatible with what's out there today, so vendor neutrality.

And the concept is really, really simple, right. You have a data center full of high, medium, low priority computers. And let me just give you the sense of magnitude here by the way. These data centers are tens of thousands of square feet and we're talking megawatts. We're not talking a couple of PCs on desks but we're talking rooms five times the size of this one.

And should you get an event you can perhaps peel back, say for the PG&E programs, a minimum of 15 percent or perhaps more based on the bidding process or the requirements of the program. And when the event is over restore these

1 computers to their state.
2 Now the reason this hasn't been done is
3 there's been this myth that you can't turn
4 computers off the way you can turn lights off or
5 HVAC off or whatever. And what we want to do in
6 this forum of emerging technologies is say,
7 there's the ability to do that now. So I am here
8 to kind of heighten your awareness about this, I
9 suppose. That there's this huge opportunity.
10 The way, kind of schematically, this
11 works is there's forms of controllers here that
12 talk to the computers. And they listen for
13 things. They listen for DRAS servers from the DRC
14 and from the utilities. They can listen to the
15 clock, they can listen to essentially any input,
16 even price signaling. The react to policy and
17 they control these energy-consuming devices.
18 We happen to market one of these.
19 There's other companies that do the same thing.
20 But what I just wanted to take the forum of five
21 minutes for was to say, there isn't specific
22 incentive or even -- incentive for the utilities
23 or awareness here, particularly from the amount of
24 residential conversation we've had today, around
25 this huge opportunity of 60 gigawatts.

1 Granted, not all of it can be reduced.
2 But even if a few percentage of it can be reduced,
3 even just in California, it seems like a big,
4 untapped opportunity for the forum here. So thank
5 you.
6 PRESIDING MEMBER PFANNENSTIEL: Well let
7 me just ask this. When we suggest, and of course
8 this body does not set rates. But when we suggest
9 the possibility of critical peak pricing rates in
10 this commercial segment of the population we hear
11 really wild screams because they say, part of the
12 commercial segment is --
13 The commercial sector has to do with
14 customers coming into their buildings all the time
15 and they say there's very little room to respond
16 and the other half is office buildings, or another
17 part is office buildings with computers. And they
18 say, we can't shut down the computers.
19 So somehow there's a chicken and egg
20 problem. And who is going to put the rates out
21 there first and who is going to market the devices
22 to show that they, in fact, can reduce their
23 computer usage.
24 MR. OESTREICH: And that's one of the
25 myths we are trying to get over. Which is -- The

truth there are some of these. A percentage, not an entirety, that can be reduced voluntarily during periods. So we're doing our best. And I hope through the forum here we can at least begin to change the behavior.

PRESIDING MEMBER PFANNENSTIEL: That's very good to know. Thank you for coming in and sharing this with us.

MR. OESTREICH: Thank you.

MR. G. TAYLOR: We started off with a very good example. Thank you very much, Ken.

Do we have Eco-Factor here? I'm just going down the list. This is purely random order.

MR. STEINBERG: Thank you. My name is John Steinberg, I am here for Eco-Factor. And Ron Hofmann spoke earlier in the morning about how the transition from analog technology to digital technology has enabled a bunch of new capabilities. And we think really what that's about is about the transition from hardware, sort of hardwired hardware capabilities, to having capabilities in software. And the advantage of having the capabilities in software is flexibility.

And Mike Gravely spoke this morning

about how one size fits all demand response really didn't work. And we think that's exactly the kind of place that demonstrates the flexibility of software because software gives you the capability of doing demand response on a customized, individual house, individual day basis.

And so what software will let you do is, using just a two-way communicating thermostat, and this would be the reference PCT design or the thermostats that Tim Simon will be telling you about shortly I guess. Using just that minimal hardware and putting the software and the algorithms on a centralized server. The software will enable you to do individualized integrated demand side management on a house by house, day by day basis.

So the way this works. And I should say that we are leveraging work that was PIER-sponsored, done at the Center for the Built Environment at the University of California Berkeley by David Auslander and others.

With this system you can reduce HVAC cycling by up to 40 percent without sacrificing comfort, give consumers complete control and let them choose how to optimize for their preferences.

And again, consumers retain control over everything about how it's used because, again, it's software, it's customizable. It delivers both energy efficiency and demand response advantages over hardware-only systems. So the way this would work is, again --

ASSOCIATE MEMBER ROSENFELD: Hold on, I just didn't understand. What do you mean when you say, reduces cycling by 40 percent. I just didn't follow.

MR. STEINBERG: The software system, if time permits I'll get more into this in another slide or so here. But essentially what the software does is monitors on a minute-by-minute basis the on and off behavior of the air conditioner or in the winter context of the furnace.

And by optimizing the programming, by running various algorithms that can reduce energy consumption without sacrificing comfort, we have actually found in the field that we can do, if you add up all the various algorithms that were running, that you can actually reduce the number of minutes in a day that the HVAC system is running by 40 percent.

Does that answer the question?

ASSOCIATE MEMBER ROSENFELD: So you reduce the HVAC load by 40 percent.

MR. STEINBERG: Yes.

ASSOCIATE MEMBER ROSENFELD: Okay.

MR. STEINBERG: Yes sir. So essentially the way this works is, any two-way communicating device. And data is sent from the thermostat to the central server essentially using the thermostat as a sensor, recording various kinds of data in the house. And then recommendations are sent back from the server to the thermostat.

And the consumer will be able to choose either to ignore the recommendation, to manually accept the recommendation, or to implement the recommendations automatically. Express general preferences that the server then optimizes and implements sort of on a minute-by-minute basis. And at any point, as with the PCT reference design, this can obviously be overridden by the consumer.

So essentially the way this works is, again, our server -- The server in a system like this would be logging data on a minute-by-minute basis. Not just from the individual thermostats

1 but from a number of other sources, including
2 outside weather information and the like.
3 And by analyzing that data, is able to
4 determine what we're calling the dynamic signature
5 of each individual house. Which essentially
6 means, how much energy, how long with the HVAC
7 system have to run to raise the temperature in a
8 house by a certain amount. And how long it will
9 take for that energy to dissipate once the HVAC
10 system is turned off. And that varies from house
11 to house, from day to day.
12 And once you determine that dynamic
13 signature that then allows you to do prediction,
14 not just a few minutes ahead but as far as day-
15 ahead of what the HVAC cycling behavior will be,
16 what the temperatures inside the house will be and
17 what the energy consumption inside the house will
18 be.
19 And so there are a number of benefits
20 both on the consumer side and back to the grid.
21 On the consumer side what software like this will
22 allow is for consumers to understand why their
23 bills are as high as they are.
24 You can think of your energy bill for
25 running the HVAC system as sort of a composite of

three components. There's the cost that's associated with how well or poorly insulated your house is.

There's costs associated with how efficient your HVAC system is.

And then there's costs associated with your behavior in the form of the setback schedule, or lack thereof, and of the manual overrides that you're doing on an ongoing basis.

And with a server-based software system like this it's possible to identify and separate and quantify how each of those three components interact and determine the bill. So three different consumers could have the same $500 a month energy bill but Consumer A it's high because of terrible insulation. Consumer B is because it's a defective air conditioner. And Consumer C because they have terrible programming. A system like this can distinguish between those three different kinds of reasons for that bill.

On the grid side of things a system like this, as I mentioned, can do hourly forecasting up to a day ahead to understand what the loads will look like for the houses under management with a system like this. It can help improve penetration

of a demand response system into the residential marketplace because now there are benefits for the consumers.

There is an energy efficiency aspect to it. A system like this will allow intelligent customized pre-cooling. Which means that the impact on the homeowners can be significantly reduced of actually running a demand response event in that house.

It allows real-time demand response verification because minute-by-minute data is coming back from the thermostat to the server. So it will be known if the house is not heating up as it should be during a demand response event.

And a system like this also can produce different kinds of demand response benefits. The reliability demand response is the most common today. It can easily optimize for time of use, real-time pricing, critical peak pricing, by shifting loads based upon the varying prices. And because of the fast response of something like the PCT it can help with spinning reserve as well.

And this is something that's working today. There have been successful field trials both in the northern and southern hemispheres.

1 The savings aspect, the load shifting and the
2 forecasting have all been verified.
3 PRESIDING MEMBER PFANNENSTIEL: Thank
4 you. Let me point out that those who are coming
5 up at the end of the day, short presentations for
6 some very big ideas. And so I really encourage
7 people to send us something in writing. This
8 whets our appetite for reading it and we will read
9 it and we will review it. But clearly don't feel
10 like your five minutes is the whole time we are
11 going to devote to this. We really want to hear
12 more about it. So thank you.
13 MR. STEINBERG: Okay, thank you.
14 MR. TOCA: Commissioners and staff,
15 thanks for giving us a chance to go over some more
16 detail. I wanted to enter into the record a case
17 study of a project we're working on with bulk
18 energy storage and show how it can enable demand
19 response, perhaps where it wasn't available
20 before. I won't go through the entire slide. I
21 just want to hit the high points of the bulk
22 storage project. I am working with Mike Gravely
23 on this and there's some other work we're doing as
24 well.
25 This situation we have is a

1 semiconductor manufacturer down in Southern
2 California Edison territory. They have a 7.5
3 megawatt peak load pretty much 24/7.
4 Power quality is an important issue for
5 them. As a result they have a 33 kilovolt
6 dedicated line from the Edison substation. It's
7 an eight mile line. In an attempt to get good
8 power quality.
9 This facility cannot provide demand
10 response because of their production.
11 However, they are interrupted so they do
12 drop load non-voluntarily. They have seven to
13 nine significant power quality events a year.
14 Typically in an industry like this the scrap and
15 the down time is worth about $500,000 per hour.
16 They just had an interruption this last
17 month on a Friday afternoon, they were down for
18 two hours. Apparently a bird landed on two wires
19 and caused a short circuit. So it was a pretty
20 bad situation for them.
21 Back in 2000 they installed emergency
22 generation. Rental generators cost them $1.6
23 million in order to cover this need.
24 This particular manufacturer also has a
25 corporate priority to be green, environmentally

1 sensitive and to reduce greenhouse gas emissions.
2 So that's their situation.
3 Our solution is to install a five
4 megawatt energy storage system. That's not on the
5 screen here. It talks about the particular
6 technology. But it's a five megawatt system with
7 eight hours of storage, which would be a 40
8 megawatt hour system for this facility.
9 The benefit to the host is, right off
10 the bat they receive an uninterruptible power
11 supply and emergency backup. This also improves
12 their power quality at the system.
13 This allows them to not rely on their
14 diesel generation and have uninterrupted service.
15 The environmental and social benefits
16 related to this are, of course, no diesel BUG,
17 renewable energy integration.
18 One of the ways that the battery will
19 pay for itself is by providing frequency
20 regulation services, ancillary services to CAISO
21 from behind the customer meter. This will be done
22 without exporting power to the grid but simply by
23 modulating the amount of power that this customer
24 will receive. And of course CAISO needs this
25 service in order to integrate wind energy coming

1 up in the next couple of years.
2 This will be allowed under the MRTU
3 Release 1A, about this time, hopefully next year.
4 So the cost of the system will be
5 subsidized for the customer by providing ancillary
6 services and, of course, by demand response
7 incentives.
8 So now you have got a situation where an
9 industrial load could not provide demand response
10 and now they can provide five megawatts of
11 response. And since it is controlled
12 electronically, all these other infrastructure
13 issues, electronic issues and means of controlling
14 the demand, can be applied for this system.
15 This is an aerial view of the plant
16 we're working with. You can tell in the upper
17 left hand corner they've got an open space there.
18 If you look really close you can see the pad where
19 the ten megawatt -- excuse me. Yes, it's ten
20 megawatts of diesel generation that was installed
21 to get them through the rolling blackouts. The
22 energy storage device will go right in that spot.
23 I would just point out there are no
24 incentives currently for energy storage so this
25 project has to be entirely economically based upon

the direct benefit to the customer, ancillary service sales to CAISO and the tariff provisions for demand response in the current retail tariffs for Edison.

There may be additional opportunities in terms of support to the grid. Right now Edison is very happy for us to put this there because it removes a -- it cleans up five megawatts of customer load that otherwise might cause problems on the grid. But they haven't yet talked about ways to support that. Thank you.

ASSOCIATE MEMBER ROSENFELD: Could I ask you a question?

MR. TOCA: Yes.

ASSOCIATE MEMBER ROSENFELD: You provide regulation to the ISO or a spinning reserve or something. Can you actually do frequency regulation?

MR. TOCA: Yes. Of course the battery can respond very quickly.

ASSOCIATE MEMBER ROSENFELD: Yes.

MR. TOCA: That will be our intention. When the CAISO requires regulation down to reduce power on the grid -- Let me keep it straight. Regulation down will pull power from the grid by

charging the battery, five megawatts to the battery. That will increase the demand at the Edison meter from 7.5 to 12.5 megawatts.

And then when CAISO needs regulation up, power put back on to the grid, we will discharge the battery. And that will reduce the draw at the Edison meter from 7.5 megawatts to 2.5 megawatts. So that way there's no power exported onto the grid but CAISO still gets the result of a 5 megawatt pulse, both up and down.

ASSOCIATE MEMBER ROSENFELD: Good.

MR. TOCA: Thank you.

PRESIDING MEMBER PFANNENSTIEL: Thank you.

MR. G. TAYLOR: Next up we have Corporate Systems Engineering.

MR. S. TAYLOR: Good afternoon. My name is Steve Taylor, I am the President of Corporate Systems Engineering. And I have a lot of information that I won't provide so rest assured I'm only going to give you bullets right now and everything else will be followed up in writing.

The main reason you care about, what I think at this point, is that I have spent 27 years deploying systems just like what you are

contemplating now. And there are some bullet items that you really need to seriously consider.

The first one is the topic of price response versus grid reliability. Let's say we actually have full deployment of these smart thermostats. PCTs as we're talking about. What happens if the ISO changes the price from 15 cents to a buck and a half? They're all going to turn off, right? That's what they're supposed to do.

Let's say you actually survive that event. Four hours later it goes from a buck and a half to 15 cents. What's going to happen now? They're all going to come back on. The technology isn't the problem. The rulemaking about how you control them is.

So if you look at it from the ISO's perspective, what do they have? They're pushing a string. It's price. That's all they've got. They can't go from $1.50 to $1.40 to $1.30 to ramp this load back in. You need hard, direct load control capabilities.

So that having been said, once you have the technology in place, what can you do with it? Balances for renewables. What if the solar panel says to the other electrical deferrable devices in

the house, I am not generating electricity right now, and the water heater automatically shuts off. You don't have to have gas peaking over here to offset your solar and to offset your wind.

Not only does that give you better efficiency, no-carbon credits, et cetera. But you have the ability to respond automatically. So you can put more renewables on your system now than you could before. Because you automatically have the offset for them. So if you are going to incentivize them to put a solar panel on the roof, incentivize them to put a switch on the water heater, or the pool pump, or the air conditioner to offset it and save us the carbon credits.

Which brings me to the next point. If you really want this to work, how do you actually monetize properly the value of that load. And that's really the problem. If we had trading rules at the ISO so that a unit of energy was a unit of energy, no matter where it came from. We had fair, equitable, transparent treatment. You would have people coming to the table providing this technology, providing these programs.

So how do you do that? Well, the real question is, is electricity an entitlement? I own

a home. I've paid my bills all these years. Should I have that energy? And if I do, should I not be able to sell it at the prevailing rate right now? And if as a customer I am not large enough should I not be able to band together and sell my power at the same rate someone else can?

So how do you arrive at that true price? Locational marginal pricing, capacity payments, transmission distribution expenses being offset.

What about line loss? You would have had to generate 110 or 120 units to get down there where they're using 100. So if I shut it off shouldn't I get paid for 120, not 100? So how do you get that true value? And I'll follow up in writing on all those points. Thank you.

PRESIDING MEMBER PFANNENSTIEL: Thank you very much. Art, a question.

ASSOCIATE MEMBER ROSENFELD: I would like to make one small point. This is the overshoot business. The ISO drops the price from over $1 back to 15 cents.

MR. S. TAYLOR: Right.

ASSOCIATE MEMBER ROSENFELD: The PCTs do have a random delay of up to half an hour before something comes back on. And as I remember on the

statewide pilot project, which was a few thousand houses.

MR. S. TAYLOR: Right.

ASSOCIATE MEMBER ROSENFELD: To our happy surprise, there was no overshoot visible at all. It just wasn't a problem.

MR. S. TAYLOR: That is not actually the point I'm trying to make. Because we have been able to do that with the technology that's out there now. I have about two million endpoints about, a little shy of four gigawatts under control nationwide in some of these major programs, two of which were discussed here today, here in California.

The problem is you have economic benefit. I discussed this with John Glidden at the ISO. These tools could be used as ramping tools. We're talking about increased economic efficiency in operation of the grid. This is true money that you can point to. How do we get that in the hands of the people who want to participate?

All that we are talking about here is economically viable, it's technologically feasible. It's here today. We just don't have

the rules to cash in on it properly. And we're waiting on the power companies in-between to find rate structures to implement programs.

We know we can put load out there under control very, very quickly. We're demonstrating it in Los Angeles right now. So it is not just the overshoot, it's all of these items. And I won't drone on about it today. I'll give you a list in writing.

ASSOCIATE MEMBER ROSENFELD: All right.

PRESIDING MEMBER PFANNENSTIEL: Thank you.

MR. G. TAYLOR: Next up we have ICE Energy.

MR. WEINGARTEN: Thank you very much. My name is Irwin Weingarten. I have been tasked by ICE Energy to come and open the Northern California office for ICE Energy.

We have been very fortunate. We are going to be receiving -- We received a contract from PG&E to install a sizable amount of ICE storage air conditioning. And so today --

ASSOCIATE MEMBER ROSENFELD: Can you get a little closer to your mic.

MR. WEINGARTEN: Oh, I'm sorry.

1 ASSOCIATE MEMBER ROSENFELD: Thank you.
2 MR. WEINGARTEN: Is that better?
3 ASSOCIATE MEMBER ROSENFELD: Yes.
4 MR. WEINGARTEN: Good. So today I'd
5 like to discuss permanent load shifting for load
6 management.
7 Just a bit of history. We know that DR
8 funds for PLS to reduce peak load is reasonable.
9 And in the first quarter of '08 we
10 received PLS contracts for storage both in
11 Northern California and in Southern California.
12 In Northern California it's administered through
13 Trane and Cypress. Down in Southern California
14 it's through Honeywell.
15 When both of these programs are fully
16 subscribed to we anticipate 140,000 megawatt hours
17 of load shifting over the course of the 20-year
18 life period for our ice storage air conditioning.
19 This is a table that comes directly from
20 the CEC staff report. And it shows in the climate
21 zones almost a 50 percent reduction in cooling
22 energy using ice storage air conditioning. But
23 what's more important is the 95 percent reductio
24 in building cooling during the period peaks of on-
25 peak noon to six.

1 The chart basically speaks for itself.
2 ASSOCIATE MEMBER ROSENFELD: I'm sorry
3 to be slow with the figures but how many 40,000
4 megawatt hours? But over 20 years.
5 MR. WEINGARTEN: Yes.
6 ASSOCIATE MEMBER ROSENFELD: So to get
7 some idea of what it is annually I have to divide
8 by 20?
9 MR. WEINGARTEN: Correct.
10 ASSOCIATE MEMBER ROSENFELD: Thank you.
11 MR. WEINGARTEN: Now the problem is most
12 buildings have poor load factor. And there's
13 really not much we can do with buildings that have
14 poor load factors because most of them are
15 operating between eight and six.
16 The preferred method would be, of
17 course, to shift the load. And TOU rates will
18 help do that. However, TOU rates will not help
19 with cooling comfort, as you already indicated, in
20 many of the commercial buildings. Because they
21 must have cooling comfort. They can't curtail
22 there.
23 Our ICE Energy changes the load profile
24 substantially and its advantage is to lower off-
25 peak rates. And how is that done? This is a

simple example of one of our systems in Victorville. Victorville has made a citywide adoption of our units for many of its city-owned facilities. The police department, fire department, city hall, et cetera.

So by shifting the load of our ice storage air conditioning, producing the air conditioning in the evening when the rates are lower, the ambient temperature is lower, our units work better, the remaining DX units -- the existing HVAC units are not working in 110 degree ambient. We remove the peak load and have the load transferred off-peak.

We have just developed with this our CoolData Smart Grid Controller. This controller mentions a lot of the aspects that you were discussing today. It can control schedule, dispatch, measurement and verification.

It is Smart Grid ready.

It has network communications with many of the platforms that have been mentioned today.

It can be locally scheduled and remotely dispatched.

Direct load control for demand response of other building assets that can be tied into our

1 Smart Data controller.
2 This is what our unit looked like in the
3 first generation. The storage medium was on the
4 left, the generating compressor was on the right.
5 And now this is our new unit. Our new
6 unit is a fully integrated unit which is sized
7 smaller than the previous unit and contains all
8 the components that are listed here, including the
9 Smart Data controller.
10 Now we know that the CEC in your
11 handout, the number two items end use storage
12 systems to store energy during off-peak periods.
13 This is a wonderful solution that I think should
14 be adopted. Thank you for your time.
15 PRESIDING MEMBER PFANNENSTIEL: Thank
16 you. Wait a minute.
17 ASSOCIATE MEMBER ROSENFELD: I guess I
18 have a question.
19 PRESIDING MEMBER PFANNENSTIEL: Go
20 ahead.
21 ASSOCIATE MEMBER ROSENFELD: Ice
22 storage, or water storage or thermal storage is a
23 great idea. But what is it that it needs to turn
24 it back into a big success? Is it tariffs? Is it
25 stability of tariffs? I'm not quite clear. It

1 sounds a little bit like you're bashing your way
2 through an open door.
3 (Laughter)
4 MR. WEINGARTEN: I don't like that
5 example. Please define the question a little bit.
6 ASSOCIATE MEMBER ROSENFELD: It's such a
7 good idea it should pay without any, without you
8 having to see us particularly.
9 PRESIDING MEMBER PFANNENSTIEL: Yes,
10 what is the role of regulators in helping this
11 technology?
12 ASSOCIATE MEMBER ROSENFELD: Yes, what
13 am I supposed to do, except applaud?
14 (Laughter and applause)
15 MR. WEINGARTEN: We feel -- Well first
16 of all, the demonstration programs at PG&E and
17 Southern California Edison are certainly a good
18 start. But this could certainly be used as a
19 utility resource. And not just individually to
20 the individual business owners. I know it is not
21 in the utility model for their business structure
22 but this certainly can be considered a utility
23 resource.
24 PRESIDING MEMBER PFANNENSTIEL: Right.
25 So you should talk to the utilities about using it

as a utility resource. I think Art and I agree that it sounds like it is a terrific technology.

MR. WEINGARTEN: Yes.

PRESIDING MEMBER PFANNENSTIEL: We've watched it being used and we support it. But we're just, and I share his confusion about the appropriate role of government in the market that should be out there for your technology.

MR. WEINGARTEN: All right. We'll prepare a written comment to that and address it.

PRESIDING MEMBER PFANNENSTIEL: I appreciate it.

MR. WEINGARTEN: Thank you.

PRESIDING MEMBER PFANNENSTIEL: Thank you.

ASSOCIATE MEMBER ROSENFELD: Thank you.

MR. WANG: Thank you Commissioners for affording us the opportunity to explain a little bit more about how some of the demonstrations -- the demonstration you saw a little bit earlier. My name is Jackson Wang with e-Radio USA, Inc.

ASSOCIATE MEMBER ROSENFELD: I didn't catch your last name, Jackson.

MR. WANG: Wang, it's W-A-N-G.

ASSOCIATE MEMBER ROSENFELD: Thank you.

1 MR. WANG: We have been working with FM
2 technology -- Personally I have been working with
3 FM technology since the early '90s. So it is
4 very, very satisfying to see that through the
5 years it has been evaluated for a number of uses.
6 We work in the automotive industry as
7 well. And just like the home system, the
8 automobile will also have -- you draw a bubble
9 around a vehicle and there are a number of
10 communication technologies that can penetrate in
11 and out. In the automotive industry they chose
12 the FM technology as almost a ubiquitous way of
13 communicating. Certainly in the infotainment
14 arena. You cannot buy a vehicle today, pretty
15 much -- very, very difficult to buy a car without
16 an FM radio.
17 So in the context for demand response we
18 feel that the existing infrastructure, which cost
19 billions of dollars to build. And we were able to
20 leverage that infrastructure to deliver a very
21 low-cost way of performing to demand response.
22 The standard is a global standard. You
23 can pretty much to go to any continent in the
24 world and deploy this technology. As you can see,
25 it's effectively able to communicate with

1 programmable, communicating thermostats.
2 There are very, very few areas in North
3 America that you cannot reach with an FM signal.
4 I could show you some coverage maps. They look
5 like big concentric circles. Certainly in the
6 state of California.
7 We have also worked on technology so
8 that we could deliver the message -- the signal.
9 Not only in a secure manner but it also is
10 targeted. In fact we could even target, as
11 alluded to earlier, within a zip code or even a
12 street by street.
13 And I mentioned the automotive industry.
14 The RDS-specific technology has been installed
15 through some of the clients that we have worked
16 with over the last decade or so and there are well
17 over 20 million vehicles deployed.
18 So we feel that RDS or FM enables a
19 consumer to be able to participate in a smart
20 program, almost naming the tune in the fewest
21 notes. And we could deploy a system in a new
22 market in a matter of weeks rather than months or
23 years.
24 The RDS technology receiver. The technology
25 is very, very mature. Therefore the cost is very,

very low. We are able to manufacture or assemble some of these units for literally several dollars.

One of the characteristics is because it's one way. There is no way for someone else to be able to access the information that's private. Again if you draw a bubble around, whether it's a vehicle or a home, if the air only goes in but doesn't come out, obviously there is no information. Having said that, it is also compatible with very, very sophisticated networks, both in the car and in the home.

And lastly, I'm sure Tim Simon is going t be describing some of the -- the thermostat that can be installed by the consumer and they have done so for a number of years.

Here is a simplified architecture drawing of what is it that we do. So in our operations center at e-Radio we have a number of sockets. And Clay Collier earlier made a presentation on some of the -- on the utility side. Interestingly enough, Clay and I worked on the intelligent transportation systems a number of years ago. In fact, we co-authored a number of papers in the early '90s.

The arrows that connect to our

1 operations center, these are independent but
2 complementary data. For example, we do work with
3 centers like NOAA and other weather centers. So
4 if there are warnings -- And more importantly, you
5 can have predictive information. At the home you
6 normally would get what the outside temperature is
7 already. But if there's a cold front moving in
8 you might have a different cooling strategy than
9 if you didn't have -- It's kind of like when you
10 play a game of Tetris. You could have a fair
11 score and you can see what blocks are coming down.
12 So we have a ubiquitous coverage through
13 our radio partners and we are able to also
14 communicate in the event of a blackout through
15 something like a satellite communication network,
16 which does not depend on terrestrial lines.
17 On the receiver side we are working with
18 a number of automotive manufacturers, as we have
19 done in the telematics field. And a number of
20 them now have plug-in electric hybrid vehicles.
21 So since the FM technology is already embedded in
22 we feel that there is an opportunity to take
23 advantage of that. At absolutely no additional
24 hardware costs the information can come in and be
25 used for demand response.

We are also in conversation with a number of appliance makers. Because of the coverage along with the low cost for the receiver chip set a number of appliance makers have expressed interest in trying this technology out as well. And that's all I have for today.

PRESIDING MEMBER PFANNENSTIEL: Thank you.

MR. G. TAYLOR: Tim Simon. If anybody else would like to make a public comment at this time please see me and I'll give you a blue card to fill out.

MR. SIMON: If you don't mind I'll sit here because I have a couple of products. Well partly because it's late and partly because most people have said most of the things I was going to say, I'll be very brief.

ASSOCIATE MEMBER ROSENFELD: You should identify yourself.

MR. SIMON: I won't read most of this book I brought with me.

PRESIDING MEMBER PFANNENSTIEL: Mr. Simon, identify yourself for the record, please.

MR. SIMON: My name is Tim Simon, Golden

1 Power Manufacturing, Hong Kong.
2 Earlier somebody, and I forgot which of
3 the panel asked the question about Home Depot and
4 the PCT. I forgot who asked that. But the
5 question was, where do they stand. Home Depot had
6 orders placed for us to ship this product to them
7 in October of 2008, which would be a few months
8 from now.
9 When the Title 24 issue came up as to
10 questionability they pulled that and delayed it.
11 And not because it had been delayed but because
12 there is a question as to what was going on. If
13 the statement had been, California is abandoning
14 the Title 24 PCT the product would be on the shelf
15 in October.
16 But because there was a question of,
17 what will the Title 24 say and will it change and
18 be in conflict with the product, the decision was
19 made, we had to then say, we can't go forward with
20 that. We are coming up with a similar product,
21 which will be on the shelf probably in January,
22 which will meet what we think Title 24 is or was
23 and so forth.
24 In our world as a thermostat
25 manufacturer, and while we make other products a

1 good part of our business is thermostats. And we
2 make them for a number of different customers. We
3 never have our name on the product but we make
4 them for Home Depot, for some of their
5 competitors, for people in the HVAC business and
6 so on and so on. We have 11 major customers that
7 carry the product with their name on it.
8 We look at it slightly differently,
9 though. We look at it that our product would
10 prosper even if Title 24 and the whole concept of
11 utilities and smart thermostats was totally
12 abandoned and banned from history and could never
13 continue. We use the product as an interface for
14 a lot of other uses inside the home besides just
15 energy management.
16 And the way we do that is our product
17 uses modules like this which plug into the
18 thermostat. We currently have a Zigbee module,
19 which the utilities have embraced, a Z-Wave
20 module, which the consumer electronics industry
21 has embraced for a lot of consumer products. A
22 WiFi module to be ready in a few weeks. And the
23 RDS module, which e-Radio has demonstrated. And
24 we have a 6LOWPAN module. So we give the customer
25 the ability to use those modules by themselves or

in tandem with each other. For example --

ASSOCIATE MEMBER ROSENFELD: In tandem means you could have both RDS and Zigbee installed at the same time?

MR. SIMON: Yes, you could have four modules installed at one time in one thermostat.

So in theory the utility could send out a command over Zigbee or over e-Radio saying there's an event, I want you to change your HVAC system and raise the target temperature. The thermostat seeing that, the customer could easily program it to say, when that happens also turn off my pool pump.

If the price of electricity gets over X number of cents a kilowatt hour, turn off my pool pump or my ice machine or something else. Which the consumer would choose how that was. That's his choice to build that into it. So it could have a Z-Wave signal that would go out to those devices or a Zigbee signal or whatever. So it could come in under one format and continue through it. So the thermostat becomes a gateway as well as a display.

And rather than go through what we've said before. You saw the demonstration that they

had earlier. We do that. So we have that with our e-Radio module. Which e-Radio had ready to demonstrate but I don't want to take the time now, obviously.

So from our standpoint, the question was asked earlier, why is someone here addressing you, what do we hope to gain? I could tell you all about what we do and say that's nice.

But at the end of it what I would say is, the best thing you can do to help us is to come up with a definition for a Title 24 or something similar. Or make the statement, we're out of that business, let the marketplace decide. And if you make that statement, let the marketplace decide, our products will be on the shelf very quickly doing exactly what I think you want them to do right now, along the way you have already described them.

But if we had this gray area that goes back and forth and we don't know if your decision is going to be different than what we thought it was and therefore we have to hold the product off because we may be in conflict with some future decision, it makes it difficult for us.

ASSOCIATE MEMBER ROSENFELD: Understood.

1 MR. SIMON: So just in closing we'll say
2 some of what we do. One of the things that we do
3 is we make a good, better, best scenario. So we
4 have thermostats which we'll call CT.
5 Communicating thermostat, not programmable.
6 Because even though I've made millions and
7 millions and millions of programmable thermostats
8 I don't believe in them. I think that time is an
9 outmoded way to do it. We believe in occupancy
10 sensing and other ways of knowing. So we have a
11 low-end thermostat at around the $59 range. It
12 does everything you want but it's not
13 programmable.
14 Then we have a mid-range that you have
15 always talked about. The $99 retail range.
16 And then the higher-end one with the
17 large display, which is about $159. So we're
18 looking at filling all those different needs.
19 We also have the idea of taking the
20 thermostat off the wall. We think it should be on
21 the bed stand or near the TV or somewhere else and
22 that's one of the things that we do. So I kept it
23 short. Any other questions?
24 PRESIDING MEMBER PFANNENSTIEL: No.
25 Thank you very much.

ASSOCIATE MEMBER ROSENFELD: Yes. Just a trivial point. You said you can very easily tell it at a certain price, not only raise the temperature four degrees but also turn off the pool pump.

MR. SIMON: Correct.

ASSOCIATE MEMBER ROSENFELD: Is that programmability built into that little device?

MR. SIMON: Yes, it's built into there. And the thermostat -- This is what one of my -- One of the previous speakers said, this is like the postal system. This is the mailbox. It accepts anything. It could be a FedEx package, a UPS package, post office, whatever.

It has the ability to be programmed by the consumer or by the maker of a specific product. In other words, a pool pump manufacturer might sell their pool pump and include with it one of these modules. And say, when you plug this module into that thermostat that you have it will then be able to communicate, number one. It will have the programming information displayed on the screen, number two.

And it will send information from the pool pump. It will tell the thermostat, I am

1 using more current than I usually do so maybe I'm
2 clogged, maybe I'm getting old. Maybe there's
3 some other problem so you might want to go look at
4 it. Or if it was a sump pump it would say, today
5 I am operating more often than I normally do. And
6 that software lives on this module. So when you
7 buy that product it is going to communicate with
8 this thermostat when you plug that module in. It
9 then updates itself instantly.
10 ASSOCIATE MEMBER ROSENFELD: So two last
11 questions. So you could accept quite a few of
12 these modules.
13 MR. SIMON: Absolutely. And we even
14 have an expansion port for those people that say
15 no, no, no, I need more than that.
16 ASSOCIATE MEMBER ROSENFELD: And the
17 other trivial point is, from where I can see now I
18 don't see any keypad or how I can talk to the damn
19 thing.
20 MR. SIMON: Two things happen. One is
21 that we have a WiFi module, so you suddenly have
22 your computer.
23 ASSOCIATE MEMBER ROSENFELD: Okay.
24 MR. SIMON: The other is we have an
25 Ethernet module so you suddenly have your

computer.

The last is, because it's a fairly large touch screen you have the ability of displaying a keypad on it to allow you to do that if you feel comfortable doing that.

ASSOCIATE MEMBER ROSENFELD: Thank you.

PRESIDING MEMBER PFANNENSTIEL: Thank you. Is that it, Gabe?

MR. G. TAYLOR: We have one more public commenter, Ed Cazalet from MegaWatt Storage Farms.

MR. CAZALET: I'm Ed Cazalet, MegaWatt Storage Farms. Just a very brief comment and I have come here to ask for nothing.

We are intending to install large quantities of batteries on the wholesale grid for preforming demand response activities, interacting mainly with the ISO markets. And so these -- The technologies we're using is proven technology from Japan and it comes in two megawatt boxes. And you can put hundreds to gigawatts worth of batteries on the grid to solve a variety of problems, including the renewables integration as we put thousands of megawatts of wind on the grid.

The only challenge with this technology is we would like to move it closer to the load to

1 achieve additional benefits. And because of the
2 way the retail rates work you are limited in how
3 far you can push it close to the load. In Japan
4 you'll see this technology, ten megawatts, sitting
5 at a plant like Hitachi on the grid, in addition
6 to having 50 megawatts at a wind farm.
7 So it would be very nice to be able to
8 have retail rates that would allow us to fully
9 utilize this technology. Thank you.
10 PRESIDING MEMBER PFANNENSTIEL: Thank
11 you. That's it, Mr. Taylor?
12 MR. G. TAYLOR: Yes, thank you so much.
13 PRESIDING MEMBER PFANNENSTIEL: I'm
14 exhausted. A very meaty day, as I think we knew
15 going in. I do encourage written comments to
16 focus our attention on the points that are most
17 important for us in coming away from this with
18 some proposed load management standards.
19 But we really want to thank all of you,
20 and those who were here who have since left, for
21 making this a really, very useful workshop. And
22 if there is nothing further we will be adjourned.
23 (Whereupon, at 5:28 p.m., the Committee
24 Workshop was adjourned.)
25 --oOo--

CERTIFICATE OF REPORTER

I, JOHN COTA, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Committee Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said workshop, nor in any way interested in outcome of said workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 7th day of July, 2008.