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COMMITTEE HEARING

BEFORE THE

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT

COMMISSION OF THE STATE OF CALIFORNIA

In the matter of,	)	
	)	Docket No. 14-AAER-2
	)	
Appliances and Outreach and Education Office	)	

WORKSHOP ON REVISED STAFF ANALYSIS OF COMPUTERS, COMPUTER MONITORS, AND SIGNAGE DISPLAYS EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

FIRST FLOOR, ART ROSENFELD HEARING ROOM

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

TUESDAY, APRIL 26, 2016

10:03 A.M.

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P R O C E E D I N G S

APRIL 26, 2016 10:03 A.M.

MS. DRISKELL: Good morning. Welcome to the California Energy Commission. This is our staff workshop on Proposed Efficiency Standards for Computers, Computer Monitors and Signage Displays.

If you're here for pool pumps, you're in the wrong workshop. Sorry, bad joke.

My name is Kristen Driskell. I'm the Manager of the Appliances and Outreach Education Office, in the Efficiency Division.

I'm going to start with a few housekeeping items before going into my presentation. For those of you who have not been to this building before, restrooms are located outside these doors, to the left, in that area right back there.

If you need a snack or coffee, there's a snack bar upstairs, under the white awning, just to the right.

And in case of an emergency, please follow staff to the nearest exit. We'll re-congregate in Roosevelt Park, which is across the street.

Our agenda today is fairly packed. This morning we'll start off with presentations and discussion on the computer monitors proposal.

After lunch, we will have presentations and

comments on the computers proposal.

The times on this agenda are not precise. So, if we have more time in the morning or more time in the afternoon, we'll move things around so that we can make sure to hear from everyone today.

We began this rulemaking in 2012, with an Order Instituting Rulemaking. We released our first staff report about a year ago and held a workshop, also about a year ago. Followed by two stakeholder-hosted workshops in June and September of 2015. We released our revised staff proposal at the end of March this year.

As an overview of the rulemaking process, we are at the stage highlighted by that giant green arrow, where we sit around a table and discuss the regulations. We've been through this step a couple of times. So, after this workshop we will start preparing formal rulemaking documents and moving into that blue box for the formal rulemaking proceeding, where you will have another opportunity to comment on our proposed regulations.

Written comments are due by 5:00 p.m. on May 16th. You can submit comments in one of these three ways. You can use our website to submit them electronically. You can send a hardcopy to our dockets

office. Or, you can send an e-mail copy to docket@energy.ca.gov. This information's also detailed in our workshop notice.

After the stakeholder presentations today, you will also have an opportunity to provide oral comments and discussion. If you'd like to make oral comments today, please fill out a blue card, located at the front, and hand it to one of our staff members, Ken, Soheila or Harinder.

When we call you up to speak, please say your name and your affiliation. And, if you can, provide a business card to our court reporter, sitting right there, so he can transcribe your name correctly in our record.

Thank you. And now, Harinder Singh will present our proposal for Computer Monitors and Signage Displays.

MR. SINGH: Thank you, Kristen. Good morning, everybody. My name is Harinder Singh. I am presenting Computer Monitors and Signage Displays.

My first slide is the presentation agenda. Thank you. So, I have a presentation agenda. So, this is an overview of proposed changes, changes to the scope, regulatory proposal, units energy savings and cost effectiveness, statewide energy savings, and environmental impact, and a timeline, and comments, and

clarifying questions. This is what we will talk about today.

So, first is the overview of the changes. Staff reviewed stock and sales data for products classified for medical use, industrial use, and professional use. And concluded that these products were not included in the staff analysis. Exclusion of these products from the scope didn't impact this energy savings analysis.

Staff conducted analysis of the enhanced performance displays, EPDs, analysis of all the market data, including the Energy Star Version 7.0, data models shows there are about 68 EPDs that are sRGB, standard RGB that are available in the market. And 24 of those EPDs meet the proposed standards.

There are six models, they are Adobe models, Adobe RGB models on the market. And analysis shows that none of the models would meet the proposed requirements.

We, therefore, are proposing some changes to ensure that EPDs are able to meet the standard. I will talk about these a little bit later.

We changed the standard levels to harmonize the Energy Star Specification Version 7.0, specifically. Standby and sleep mode allowances is changed from 1-watt to 0.5 watt and off mode allowance is changed from .05 watt to three -- .03 watts

Computer monitors that are excluded from the scope are as follows. Displays that operate with batteries and are without AC mains or external DC power, or device mobility, such as electronic readers, battery-powered displays and digital display frames, et cetera, they are excluded from the scope.

And also, products that are classified for use as medical devices and are prohibited the use of power management capabilities or do not have a power state meeting the definition of sleep mode.

Next, there is the professional signage displays of size greater than 1,400 square inches are also excluded. These displays are, number one, typically composed of several displays with a diagonal screen size of greater than 12 inches, designed to be operated by an external data controller, intended to be viewed by multiple people in a non-desk environment, such as indoor and outdoor stadiums. Integrated displays are not included in the computer monitor proposal and are part of the proposed computer standards. So, these are the excluded products.

Changes to the scope in the products that are included in the standard. Staff reviewed the market data for the EPDs and found the market is slowly growing. So, enhanced performance displays have the

following features and functionalities, are included in the standard.

Number one, a contrast ratio of at least 60-to-1, measured as horizontal viewing angle of at least 85 degrees, with or without a screen cover glass. A native resolution of equal to or greater than 2.3 megapixels are also included in the scope. A color gamut size of at least standard RGB as defined by IEC 619662-1, shifts in color space are allowable as long as 99 percent or more of defined standard RGB colors are supported. So, all these EPDs are included in the proposed standard.

So, we have made changes to the test procedure and there are two test procedures. Number one is for the signage displays. This test procedure is the same as the television test procedure. We have updated the test method for the computers from Energy Star Version 6.0 to Energy Star's Version 7.0. So, there is a change in the test procedure for the computer monitors.

So, there are also changes to the scope of the proposed standard. Proposed standard covers monitors of size equal to or greater than 17 inches and less than 61 inches. We exempted smaller computer monitor sizes because the market for them is very small and decreasing over the time.

Effective data for the computer monitors is

January 1st, 2018. The proposed standard requires significant improvements in the on mode power consumption, as shown here. Proposed standards include a sleep mode allowance of 0.5 watts and off mode allowance of 0.3 watts.

There is an additional allowance provided for the enhanced performance displays, 10 percent allowance is proposed for the standard RGBs, RGB monitors, and 50 percent allowance is proposed for Adobe RGBs.

There is no additional allowance proposed for the sleep mode and the off mode at this time.

We have also provided a 1-watt adder for touchscreen displays in on mode.

Technical feasibility. There are several ways to improve the technical feasibility of displays to meet the proposed standards. We have highlighted each of these in our previous staff report.

First, is the high-efficiency user, high-efficiency LED back lights. Improved back light unit efficiency. Number one is to back light unit efficiency can be improved in average-sized monitors that consume 40 to 60 percent of the power. By improving the back light unit, efficacy would produce the same amount of back light with a few LEDs and lower power draw. Improving the LED efficacy of 110 lumens per watt to 150

lumens per watt will significantly improve the efficiency of the back light unit.

Analysis of the data provided by the IOUs shows in back light improvements result in estimated 8 to 30 percent energy savings, with a moderate increase in cost.

Improving back light unit efficacy by adding reflecting polarizing film or improving the liquid crystal band transmittance.

High liquid crystal display panel transmittance can be achieved by optimizing the pixel designs. Also, other pathways to improve the efficiency of the displays is improve the power supply unit efficiency. Use of efficient power supply is one of the pathways that will significantly improve the efficiency of the computer monitors. Upgrading from 80 percent to 88 percent, or 89 percent efficient power supply would result in significant energy savings.

The other pathway is to reduce the default screen brightness by using automatic brightness control. Automatic brightness control for computer monitors relies on three basic components. The ability to display, to dim its back light, an ambient light sensor that measures lighting levels. The software to interpret the light levels and translate them to a

particular display brightness.

Other pathways include emerging technologies to meet the proposed standards approach, so use of quantum dot technology that is currently offered by multiple suppliers. Also, use of all lead, organic light-emitting diodes that do not require the back light or the light filters. So, those are additional two pathways available to comply with the standard.

So, computer monitors cost and efficiency improvements over time, this slide shows the decreasing incremental cost from 2013 to 2016, for each of the technology solutions that I described in the previous slides.

Emerging technology pathways currently cost more to implement, but their cost is coming down more rapidly over time, compared with the traditional technologies. The estimated incremental cost to comply with the proposed standard is about $5.00.

Regulatory proposal. The proposed standards are based on the Energy Star Version 6.0 criteria. Standards are based on the on mode, sleep-mode, and off mode energy consumption of the unit. The Energy Star Version 7.0 specifications require that total energy consumption of the unit proposed -- of the unit. Proposed standard levels are similar to the Energy Start

Version 7.0, but are not based on the total energy consumption.

As of January 2016, about 15 percent of the total monitor market already meets the proposed standards. About 80 percent of the monitors in the market meet the proposed sleep mode and off mode requirements.

Computer stock didn't change. Current computer stock, estimated stock is about 20.2 million. And it includes the residential and the commercial stock. Estimated residential computer stock is based on the 2014 Fraunhofer study. And estimated commercial computer stock is based on the 2009 Navigant study.

Annual duty cycle for the computer monitor is rated averaged duty cycle, shipment-ready average duty cycle. Annual duty cycle for the residential monitor is based on, again, the Fraunhofer study of 2014. And the annual commercial duty cycle is based on the Navigant study of 2009.

Computer energy monitor consumption is given in this table for the non-compliant units. The current unit is 26.16 watts in the on mode. And the standby is 0.35. And the off mode is measured as 0.27 for the non-compliant units. And the annual energy consumption, based on the rated duty average -- the rated average

duty cycle and is 60.58 kilowatt hours a year.

For the compliant unit, the energy consumption in the on mode is 13.95 watts. And the standby is 0.3 watts. And the off mode power consumption is 0.21. And the annual energy consumption per unit of the compliant unit is 32.93 kilowatt hours.

Lifecycle cost and per-unit savings, the computer monitor estimated the design life of six and a half years, and it is based on the Fraunhofer and the Navigant studies.

Staff analyzed technically feasible and cost-effective strategies for the lifecycle cost estimates. Analysis of the current data shows most strategies to be cost effective, and feasible, and would result in significant energy savings for computer monitors.

So, the design life is, again, is 6.6 years, and the average incremental cost is $5.00. And the energy, average estimated savings per unit is $26.54. And the lifecycle dollar savings to the consumer is $21.54.

Statewide energy savings estimates. Proposed standards would result in a significant statewide energy savings. The first year, statewide savings and the total statewide savings after stock turnover are provided in the table on this slide3.

So, the first year savings are $18.97 million.

And the stock turnover energy savings are 588 gigawatt hours a year. And the total lifetime savings of $457 million.

And this standard, proposed standard would save 0.184 million metric tons of CO2.

Signage displays. As our original proposal, staff proposes that digital signage displays are covered under the existing television standards. Market data shows that not all manufacturers have been compliant with the existing standards for the signage displays.

Clarification to definitions and harmonizing CEC definitions and industry-accepted definitions, the expectation is that there will be a greater compliance with the existing standards.

So, state standards for the non-federally regulated appliances, which is Section 1605.3, and the Table V-2 has the following allowance for the signage displays. Signage displays that are manufactured on or after January 1st, 2018 shall comply with the following standard in Table V-2.

Screen size of 80, less than or equal to 1,400 square inches, and onboard power allowance is 80.12 multiplied by the screen area, plus 25 is the additional allowance that is given to meet the standard.

Plus, there is a 1-watt standby mode allowance.

And the minimum power factor for the signage displays is 0.9.

And, you know, I am -- you know, my presentation is done so I will take any questions that are clarifications to the presentation. But please hold any substantive comments until the public discussion portion, after the stakeholder presentation is done.

The comment process. Comments are due on or before May 6th, 2016. So, you can electronically upload the comments on the following link or send a copy to the address given here, at the California Energy Commission.

Also, you can send a digital copy to the docket, as the docket address is also given here. Please include the docket number, the docket number is 14-AAER-2, in the subject line.

So, if you have any questions, clarifying questions, please ask those questions.

Okay, our next presentation is Chris Hankin from ITI. Chris, can you please come up.

MR. HANKIN: So, Harinder, I've gotten a lot grayer since this pre-rulemaking started, and you haven't. Just an observation.

(Laughter)

MR. HANKIN: So, ITI and TechNet will have a total of nine presentations today. Mine is a quick

overview, opening comments. Then, I will be followed by three experts on displays, five experts on computers this afternoon. My comments will be the briefest and at the highest level.

So, let's go quickly over the status, at least as we see it. The last workshop, about a year ago, ITI and TechNet delivered, essentially, two messages. One, very serious concerns with the first draft. And second, we proposed constructive engagement with the CEC and other stakeholders.

Indeed, there have been very active consultations since then, to include the face-to-face we hosted at Intel, here in Folsom, and at Energy Solutions, hosted at the home of the Golden State Warriors and Stephen Curry.

(Laughter)

MR. HANKIN: Get healthy, Stephen.

We reached agreements in some areas, especially in definitions. We clarified some facts. There are some areas where we agreed to disagree.

Unfortunately, the progress reached is not adequately reflected in the new staff draft. On a whole, we find the new staff draft as not technically feasible, not cost effective, and feel its promulgation, as is, would significantly limit choices for

Californians.

Going forward. We will continue to engage, if others are interested, constructively with the CEC and other stakeholders.

Our understanding among us, I think, was that there was an agreed goal of a technically feasible, cost effective, final rule by the end of this year. That's ambitious. It's going to take a lot of work and significant changes if we're going to get there.

That's going to have to include reinstatement of various agreements between ourselves and the other stakeholders.

The proposed 1/1/18 effective date is untenable. In this regard, the new staff draft cut the implementation period for desktops in half. That is a huge concern.

As we continue to work on this rulemaking, we hope to also continue to work with the CEC and other stakeholders in a package of voluntary partnership initiatives that would supplement the rulemaking. These have never been envisioned by ITI and TechNet as a substitute, but rather as a supplement to the rulemaking.

Examples of problems. I was just -- you know, surfacely here. The experts following me will explain

to you why we feel this way. But whether this is CEC's intent or not, under the new staff draft, as is, as of 1/1/18 in California, the availability of low-cost, smaller-sized, basically under 19 inches, monitors would significantly diminish.

The availability of enhanced performance displays would significantly diminish.

The availability of gaming monitors and curved monitors would significantly diminish.

The availability of mainstream and performance desktop computers would significantly diminish.

The availability of gaming desktop and notebook desktop -- I'm sorry, notebook computers, would significant diminish.

I don't think it was the intent of the CEC to declare war on the gaming community, but that's the status we're in right now.

The availability of desktop computers using the Linux operating system would significant diminish.

The availability of notebook computers using the Chrome operating system would significantly diminish.

The availability of new monitor technologies, like LED, HDR and wireless could significantly diminish.

The availability of monitors incorporating USB Type C, with power delivery capabilities would

significantly diminish.

And if anybody asks me what that means, I'll immediately turn you to Humberto.

The availability of computers with new innovations, to include emerging cyber security protections, could significantly diminish.

Thank you.

MR. HOLLENBECK: My name's Mark Hollenbeck. I'm speaking on behalf of TechNet and ITI members. I work for Hewlett Packard Company.

I'm going to spend most of the discussion on displays talking about, basically, the impact of the current staff draft language that we've evaluated. And then at the end, I'll spend a little bit of time talking about, in general, the fact that we don't have technology or cost-effective solutions to bridge the gaps. And, a few recommendations.

It's important to understand that we have concerns about both the timeline and the specifications in the regulation. So, this is not just about the timeline, it's about the limits for on mode, sleep mode, and off mode, as well as the timeline.

So, I'm going to start by looking at impacts here. And here, talk about the staff draft that we've just evaluated. It's, surprisingly to us, after having

spent so much time working with CEC and some of the stakeholders, more stringent than the first staff draft. And it's also 30 percent more stringent than the voluntary Energy Star Program, Version 7, that comes into force July of this year.

As I said, we have multiple concerns, not just with the timeline, but all of the limits as well, and some of the details that you'll hear more about from Humberto and Robert, as they get more into the technical and cost-related issues.

The one positive thing I'll say, and it has to be recognized, is that CEC did include an adder for enhanced performance displays. But then, I'll also have to mention that the adders that are in the specifications are not adequate to ensure an adequate supply of displays on the market, in the timeframe that's been proposed.

And, basically, all the other recommendations that we've made between the first staff draft and the second draft, really, from what we can see, haven't been incorporated into the proposed rulemaking, and we're quite concerned about that.

Okay. So, now let's look at some specifics. Here, we're going to look at the compliance rate for current displays on the market and, also, displays that

are on the market in January of 2018. So, looking at overall compliance, we've got a 19 percent compliance rate. That's with some displays already having been redesigned to comply with Energy Star 7, that's effective in July of this year.

Compliance rate for lower-resolution displays are about 20 percent right now. And the higher-resolution displays, enhanced performance displays is at 29 percent.

Looking forward, and probably more importantly to California, is the compliance rate as of January 2018. Here, it does improve somewhat, which is the trend that you'll always see with our products. It comes up and it ranges, we think, between 40 and 50 percent. And that's based on discussions we've had, not only with the display manufacturers, but the panel suppliers, as well.

2019, if you look forward, improves probably to 50 percent. In 2020, 58 percent. And 2021, about 66 percent, if what we're assuming with our suppliers comes to pass. These are our best technical evaluations of the effect of what's been proposed in this regulation.

And as I mentioned earlier, you have to realize that it isn't just the timeline, or one mode, like the on mode limits. Depending on the display, you can be

non-compliant to one or all three of the on, sleep and off modes.

The other thing that's important to mention is the cost analysis. Our experts have looked at this and determined that the power consumption percentage required to comply with the current draft regulation is anywhere from 4.8 to 10.2 watts. Not the 3 to 5 watts that CEC is assuming.

And as Chris mentioned earlier, now I'm going to talk about some other, specific impacts. So, the smaller displays, lower-cost, lower-resolution are a diminishing market and suppliers aren't going to be willing to invest in a diminishing market, with low-cost margins, to redesign the supply with these proposed limits. It will simply limit availability of these products.

But there are also impacts to displays that are bigger than 19 or 20 inch. And you've already seen the percentages on those.

Now, I'm going to switch to the impact to enhanced performance displays. These are the displays that are typically used in industry, by governments, by large corporations, people doing graphics design, science, et cetera.

Twenty-nine percent of the displays that are

currently on the market could meet the proposed limits. And then, we've done a forecast that would say, all things we're assuming come to force, we could improve that to 50 percent, as you've seen before. This is for enhanced performance displays.

And we've really got additional research and work to do with our suppliers to make sure that we could hit that 50 percent value by January of 2018.

And so, what I'm doing here is, and I won't read the list to you, I want to list the customers that use these displays. Scientists, engineers, professionals, graphics designers, people doing motion picture design, CAD/CAM, on and on. And we've provided this information to California before.

These are low margin -- excuse me, these are low-shipment volume displays, less than 5 percent of the market. They are considerably more expensive than a traditional desktop computer display. And they're required for productivity of people that need these, that are willing to pay for these type displays.

And we don't feel that a reduction to 50 percent to the market is an acceptable level.

As mentioned earlier, the .3 watt sleep mode -- excuse me, the .3 watt off mode and the .5 watt sleep modes are problematic, as well. We've currently got

about 15 percent of our displays that are unable to comply with this limit.

And the thing that's interesting about this is that there aren't as many design levers that we can pull to make our products comply to this requirement. It's not like on mode. So, this is an issue.

Also, and we've talked about this before as well, displays that are configured with additional functionality and performance beyond basic display of content are impacted, as well. And there isn't provision in the current regulation, such as an adder, or taking them out of scope, that would allow displays to ship with additional features that are becoming more and more common as these displays are designed in the future.

And even if CEC had accepted the 1-watt sleep mode limit and half-a-watt off mode limit that we proposed in our submission to California, it still wouldn't address the problems we're seeing with the additional features and functionality.

Some of which we've talked about because we're aware of them, they're on the market now. And then, there are obviously going to be features and functionality that we haven't even thought about, that will be impacted in the future because of these limits.

And as I mentioned earlier, and I'll hit this at a fairly high level because you're going to get a lot of the technical detail from Humberto and Robert, as well, we don't have technical solutions to bridge the gap. We've talked with our display OEMs, the panel suppliers, and with what we're seeing, the technology just isn't there to get there by July of 2018.

And it hits traditional computer displays, as well as enhanced performance displays, as well.

It's worth noting that some of our manufacturers have already implemented some of the changes that Harinder listed out in his presentation, earlier. So, in preparation for complying with the July 2016 E. Star 7.0 compliance date, many of those technologies have already been built into those displays to comply with Energy Star.

And we still have a huge gap with the ones where those have been implemented and don't comply. And for those, there just simply isn't -- there aren't other design solutions available that we can use to close the gap.

So, some high level -- now, this is just the details on the sleep and off mode. I'm repeating, for the record, the recommendations we had made for the 1-watt sleep mode and the half-a-watt off mode. Plus, the

need for additional adders to address the functionality if they're active in the sleep and off modes.

And this is the position that remains unchanged from the previous submissions that we've made and the input that we've given to California.

Okay, recommendations. This is going to be input that we've given you before. California has certainly heard it before, but it bear repetition, particularly in light of the limits that we've seen.

We have and will continue to reduce the power consumption of our computer monitors and displays. We do that in response to customer need and demand. And the best example to that is in response to the voluntary Energy Star program.

The nice thing about using a program like Energy Star is that they can frequently update the specifications to keep them fresh. They're updated about every two years. They reset the limits based on data so that only the top 25 percent most efficient products in the market comply. And then, as a result, manufacturers compete vigorously to do whatever we can to bring that percentage up over the remaining timeframe, until the specification is adjusted again.

If we try and do something similar to that, with a regulatory requirement, or worse yet, make it more

stringent than Energy Star in an attempt to future proof the regulatory limits, the result is simply going to be that there's going to be a period of time where technology can't bridge the gap.

And what you're going to see in the marketplace is reduction of choice in the types of displays that can be purchased and the performance of those displays.

And I mentioned earlier, particularly for enhanced displays it's not just that we're impacting what consumers have access to, we're impacting what industries and businesses have access to. And that's a productivity problem and could even be an economic problem.

That's it, thank you. Questions?

MR. FOSSATI: Good morning. My name is Humberto Fossati and I'm going to be presenting for displays.

I would like to start by giving you some of the fundamentals on where we are, where we could get, and then I'll turn it over to Robert to discuss some of the more specific details and some of the specific impacts as we see them today.

So, as mentioned earlier, right now we are in the process of updating many displays for retest for Energy Star 7. So, we're starting to see the results of some of the early testing and some of the results of the

improvements in efficiency seen between Energy Star 6 and 7.

At this moment, we see about a 19 percent compliance rate. We see it a little bit better, 20 percent for standard resolution displays and 29 percent for enhanced performance displays when using the new formula for greater than 5-megapixel resolutions.

So as you can see on the table, the three tiers that have been defined under regulations are the 17- to 23-inch. We have tested a total of 44 displays between the ones that are Energy Star 6 and some of the new ones that are going to be applied for Energy Star 7. And we see about a 14 percent compliance on those. Six of those displays have met compliance.

The problem here is that these are the low-end models and most of these low-end models, as I'll describe later, will not benefit from a lot of the technologies and improvements that we can do on higher-end monitors.

The next segment is your 23 to 25 inches, which is more of your mainstream models. We have tested up to 35 of those and that's where we get about 25 percent compliance rate.

And the, we tested some of the 25- to 30-inch monitors, 17 of them so far. And that's where we are at

about the 29-percent compliance rate.

So, out of data from 96 tested systems, we have about 18 compliant systems at this moment, which is representing that 19 percent compliance.

This is a historical chart of both Energy Star 6, our projections for Energy Star 7, and where we think CEC limits will land.

So, Energy Star 6, released in September 2012, and at the time that it released we were about, on average, 32 percent compliance. Energy Star 6 started its face in June 2013. And at the moment of introduction, at that point the industry was at about 45 percent compliance.

By October of ’15, which is when Energy Star 7 released, we were averaging about 82 percent compliance through Energy Star 6. And we project that the last few monitors that will be submitted for compliance to Energy Star 6, between last October and July of this year -- actually, a little bit earlier. We may get about 88 percent compliance.

So, what we have done for Energy Star 7, it’s a projection based on actuals from Energy Star 6. We’re making an assumption that the LEDs are going to keep on improving its efficiency as the same rate as what happened between 2012 and 2016. We are assuming that

we're going to be able to use some of the enhancement films, although that's a one-time shot. Once you use it on a model, essentially you cannot keep on adding more of those to get a lot more efficiencies.

And we are looking at panel makers to see if they are willing, and when are they willing to improve the transmissivity of their cells, meaning a redesign of the LCD. And so far, we have kind of convinced one of them. We do not know, yet, how fast are we going to get some of the other ones.

But if I made that same assumption for Energy Star 7, if the stars align and I can get the same type of efficiencies, then we can expect to be at about 36 percent compliance at the start, in July 2016. And if you notice, we use the same, and we expect to be at about 60 percent compliance by January '18, which is the proposed start for the CEC regulation.

And we expect to be at about 78 percent by the projected end of life, if you want to call it, of Energy Star 7, around the July 2019 timeframe.

And I should note that the purpose of Energy Star is not to make compliant systems. The purpose of Energy Star is to have a small set of gold star monitors that are worthy enough of an Energy Star certification. To them, there is no issue in failing a monitor. In

fact, every time that they do a new update to Energy Star, their stated purpose is to make it tougher to get the certification. That's why this second time around we don't expect to ever get to the compliance level that we got on Energy Star 6.

And whenever Energy Star 8 comes around, we don't expect to be able to get to the 78 percent that we were able to get this time around.

But again, their purpose is to have that 25 percent of the top, best energy-efficient monitors at the start and that stays that way.

It's no good for them to have a hundred percent of the monitors meeting Energy Star because, then, the value for Energy Star is lost, okay.

That's opposite to what we're trying to accomplish with CEC. Here, we're trying to see a meaningful set of limits that could be a mandatory set of limits for something that we want to be able to sell in the State of California. So, the objective is not quite the same.

We reference, a lot of times, the formulas or the limits that Energy Star 6 or 7 puts, but you have to keep in mind the objectives of that organization versus what we're trying to accomplish here.

As we mentioned on the previous slide, we are

low on compliance if we are looking at the CEC limits. We expect to be at about -- we expect to be at about 42 percent compliance by January '18, and it grows about 66 compliance by 2021. And that's a projection, again, based on the history of Energy Star 6 and where it would be under Energy Star 7. And then, on the assumption that CEC is more stringent on its requirement than Energy Star 6 or 7. Okay.

So, the big question really here is, is it acceptable for California, its citizens, to have 66 percent compliance by 2021? Meaning that 34 percent plus of products are removed from the market here in California and available elsewhere.

For the next slides, I wanted to make sure that you guys understand the meaning of them. The data that I'm showing on the next slide is an industry average. It's not for any particular company. Some data that was not readily available for many sources, it's data that's been obtained by HP.

So, representation of the marketplace, so usually coming from some of the independent research firms or some of the research reports that are available for review.

Where there is some cost information, I want to make sure that you guys understand that this cost data

is an average and it's also the cost to the OEM to upload to an HP. That's a lot less than the cost to your end customer in California. By the time that you go through the supply chain, you go through retailers, you go through websites, the price that the customer pays is a lot more than what you're seeing here. And it's different by OEM because HP, and Dell, and Apple, and others have different business models, different distribution models. So, each one of us are going to have different markups and different intermediaries.

So, I'm going to show you some of the basic cost data that's an average of the industry, but you have to keep in mind that that's not representative of what California customers would see.

So the current product. So, this is a little bit of more details from what they markup. As we show them, the graph, about 82 percent of the product is Energy Star 6 compliant. And we think about 60 percent will be Energy Star 7 compliant by 2018.

And we know that the CEC proposed limits are about 30 percent more stringent. So, that's where we start, at about 42, and then go up from there.

But the takeaway here is that 58 percent will not comply regardless of cost. I mean, we will start 1/1/18 with 58 percent that we have retested,

resubmitted for Energy Star and we have kept on improving as we went through our normal development cycles, but they will not be compliant. We feel that that's a large amount.

The other thing to notice is that even though we were 82 percent compliance on Energy Star 6, that means that 18 percent of products today did not meet the Energy Star 6. So, those ones will not meet the Energy Star 7. And for sure will not meet CEC. So, we are starting with about 18 percent of the product line, of the average OEM, saying that it's not going to make it in California beyond 1/1/18.

You know, these 18 percent were the 18 percent that were already at the bottom of the pile, which did not even get to Energy Star 6, but they're products that people need. Products that we still have in the lineup to meet some customer need.

Our estimates on others are anywhere from $2 to $10 from a cost point of view. And as I say, that could translate anywhere from, I would say, $5 to $20 at the time of retail. It's mostly for your sweet spot. For what we're going to call the 20- to 25-inch size monitors.

Some of the higher end monitors, the cost could be a lot higher. But again, we're assuming that that's

a smaller volume. And some of the smaller monitors, they're just not attainable. We're just not going to get there. So, we're also going to show you why diminishing volumes make it not a good proposition.

Assuming that we can manage the same rate of power reduction, we think we can get to about 66 percent by 2021. The question is, here, what do we do with the other 34 percent? You know, does it go through an exemption process? Does it go through an alternate regulation? There has to be some way to manage that segment because it's too large of a percentage at this time.

The other part that we need to understand is that 30 percent more stringent requirements. It's understood that we want to make a more stringent requirement because it's a long-term regulation, it's a five-year cycle. But at the same time, that's also hurting the ability to have initial product, at the beginning be compliant.

The things that we are proposing for further relaxation, and we will describe those in the next slides a little bit better, is to remove from scope some of the smaller monitors. We're going to show you data why we think that we should remove anything below 20 inches.

We should rewrite to the limits that we had before, for sleep and off mode, and we'll explain why.

We should not have that restriction on greater than 5-megapixel monitors. That's just going to prevent innovation and advancement of technology.

So, right now, for less than 5 megapixels, the formulas that are shown on this slide are the ones that were on draft one, and also repeated for draft two. The changes, as we mentioned, that the size was increased to 17-inch and then it was limited to 30-inch on the upper side.

As I mentioned, the industry proposal is that we should put out of scope anything below 20. No alternate limits for the greater-than-5-megapixel displays. Delayed effective date.

Now, I say delayed effective date. I limit that right now because depending on how much can we delay effective date, there may be a different answer on how much we may need to relax or change some of the proposed regulation. So, it goes hand in hand and we have to see which are the levers that we're willing to work with.

And then at the end of the day, we just have to see for that sweet spot of monitors, between 23 and 30 inches, how much the formulas would need to be relaxed to increase percent compliance. So, at one point we

have to more or less sit down and figure out what is an acceptable level of monitors that go out of the market in California and that would determine where would you want to put these levels. So, whether it's 10 percent, or 20 percent, or 30 percent that will allow us to have a better idea as to how much we have to adjust these limits.

This one I will not go through all the details because we have presented this in our workshop last year. But this is one of the things that gets mentioned a lot. We do have the possibility to increase efficiency by increasing the LED efficiency. And, yes, we do see from our panel maker and our backlight suppliers that LEDs will continue to improve efficiency.

The question is whether it's going to improve efficiency at the same 10-percent clip rate that we have between 2012 and 2016, or whether we're going to start getting into some diminishing returns where getting that extra lumen per watt starts becoming either more expensive or more difficult.

So far, for Energy Star 7, we're assuming that same improvement rate. This is where we're seeing that, again, for smaller displays we may be talking about $3 to $5 for every 10 percent efficiency. For bigger displays, we may be talking about $5 to $10 for every 10

percent efficiency.

And again, depending on the model, and depending on the size, and on the technology used, or the combination of whether we use this or something else, that's where the cost data moves a little bit. So, I will leave that for now.

The other area that we have discussed before, and the reason why we are talking about this here, is the enhancement films. So, enhancement films indeed can help us. We have discussed this before. They go up in price by size, so they're more expensive on some of our larger monitors. It's a one-shot deal. You add the film, you get the improvement. I cannot add three or four of the films to get three or four times the improvement.

So, normally the cycle, the same cycle that we go through is that we use the film as a quick fix, and then we're trying to get improvements on the other areas, like LED efficiency or cell design. And as soon as we can, we remove the film again because it's, again, a cost adder.

So, in a lot of the projects that you're going to see Energy Star 7 compliant, that's going to be the first aim at getting that product compliant. We're going to add the film. That's the one that is the

quickest on a design cycle. And then, we're going to take up to two years to figure out how to get better LEDs or better designs on the cells to still be compliant and be able to remove this, and then save it for next time we need it.

There has been some questions about how much is used or, you know, how pervasive is the use of these enhancement films. So, what we can say is that a hundred percent of performance displays use them. And that's where we were going that, you know, a lot of our high end monitors, all the silver bullets have been used. We have used the best efficient LEDs, we have used the films, we have the latest cell designs, so there's not too much left to do there. Because, again, on those ones we're driven by performance. You need to get certain metrics and the customer is paying for that. And these ones, we are already putting some of these enhancements.

There is room for that on standard displays, about a third of them have it. So, that's where we see how we can do it, if cost is affordable.

There is a lower cost option to the enhancement displays, which is your prisms. You can add the prism display, and films as well, and you see those used more often. So, you see them in about 58 percent of your

standard displays and you also see them, sometimes, on your performance displays.

One thing that it's been talked about before, it's power supply improvements. So, for monitors, for displays we are already efficient. It's not really a design level.

If you follow the DOE standards, most Energy Star 6 products we're using Plus-5 power supplies, which were required to be, on average, 87 percent efficient or better. And a lot of the Energy Star 7 products, as of, I believe April 2016, is going to be, most of them have to be upgraded to Plus-6. And those ones are rated at about 89 percent efficiency.

And you're starting to reach diminishing returns. There has been a lot of work and it took a lot of time to get the 87 to 89. There may be a few more improvements. But this is an area that, maybe compared to computers, monitors are a little bit farther ahead.

There is not the improvement that we were hoping to get. Yes, I understand that there has been some tests done, some other monitors where maybe the ILUs seen 80 percent efficiency power supplies. But for the most part, we are already at the higher level. And again, that's trying to meet or being compliant to the DOE 2016 specs.

The other two at our disposal was the redesign of the pixel structure that has been discussed also, in the past. The thing is that it costs a lot. For that panel maker to make a new cell, it cost them about a million per mask, and we need about five to eight masks per size. So, they need to do that for the 17 inch, and the 19 inch, and the 19.12, and the 19.6, and the 20, and every other size.

So, a panel maker looks at this from a return on investment point of view. Yes, I redesign a new cell. Am I going to recoup that investment?

What we can see is that we have not changed the design of a 17-inch cell in the last five years. We continue to sell a five-year-old cell design and there is no plans by any of the panel makers to make a change based on what IDC and other research firms show, as a declining production and volume of those products.

We expect to see similar things for 18 and a half, 19, 19.5. There is just not the volume there for multiple panel makers to invest on that and we would need multiple of them to agree to do that. They would rather spend that money on the sweet spot, anywhere 20 to 27 inch, where they can recoup their investment and they can try something.

So far, we have one confirmed panel maker.

Sometime by the first half of 2018, they will have some new cell redesigns. We're still working with the other five major panel makers and we do not have, yet, commitments.

I have two more slides. One quick thing on test methods, we just want to make sure that we are talking apples to apples. The limits that we're setting for CEC are based on an absolutely power on, sleep and off mode. The concern with Energy Star 7 testing is that Energy Star 7 is trying to do a test for total power consumption and, therefore, they are doing tests over a long time, and you have to measure power at different times, using different inputs, different test patterns. And it actually allows you to play with your sleep and your on mode in order to get the total compliant energy.

So, we think that we should keep it simple and continue to use Energy Star 6 as a way to measure a single power number.

Let me skip this one. And this, it's my understanding that there were two definitions that we saw on the regulation proposal and that the second one is going to be dropped from the updated work, that we're going to define a computer monitor as we have seen on the first section.

That's it. Thank you. Robert, now, is going to

take you through some of the specifics for this.

MR. WHITE: Hi, my name is Robert White. I work for Dell.

Humberto went a little bit long, so I'm going to kind of just skip and hit the highlights. We can cover more in comments later. And I think at some point, after these meetings, our slide decks will be probably loaded to the docket so we can have further conversations.

So again, the data that Humberto provided, a lot of this was average cost. Again, that's cost to us as manufacturers and our panel suppliers. By the time we redesign, you know, create the new fabs, or the equipment needed to build these products, you know, distribute those, get those to the U.S., get them through retail, there are many points along the supply chain that add cost. It's not free for us to offer this to consumers.

And again, as Humberto pointed out, we would really like to see the regulation not focus on the smaller displays. We think, really, in the 20-inch or greater is the right mode.

And again, we found issues, upon our own analysis here, with the stated requirements from the CEC that it was only a 3-watt to 5-watt reduction. Again,

once you look at all the different sizes, and the cost, and improvements that are needed, our analysis shows that it's a lot greater than that.

And here, we did some different modeling with the watts saved and the cost of that. Looking at different lifecycles. And again, we estimate that, you know, a little over $7 on a 3-watt average savings and up to $12 with a 5-watt average savings versus the $29 savings estimate that the CEC published in the final draft.

And then this, again, is based on new stock, not on the installed base, and it's based upon the end of the product life.

And again, we had some issues with the timeline on the lifecycle costs, but we'll get into some more details on that in just a moment.

And again, as I've stated and will continue to state is, you know, our numbers don't agree. And I kind of want to stop right here and say we, as industry, are not opposed to reducing carbon emissions and saving energy. That's not our goal here today. We're just saying, as manufacturers of these products and bringing them to market, we just can't throw a switch and make this happen in such a short development timeline.

And again, the cost, the average power

consumption savings, again, you know, we see a variance of 59 to 75 percent error in the savings estimates. And this signifies a 250 to 400 percent increase in power reductions are needed.

And again, with our R&D, and as you look at our industry, we have technology roadmaps out for, you know, the next so many years. We have new technologies that are coming in. A lot of times you're seeing more technology integrated into your display because it's right in front of the end user, they can connect components and other products there.

And so a lot of times, instead of hanging on the computer yourself, will integrate those into the display, and those require additional power allowances.

And again, we had some issue with the estimate on the number of cells of displays in California. We have a sheet here where we've gone through the different sizes and types, and looked at the analysis and the percent of total. And we just want to make sure that the CEC and industry, that we're both aligned on the percent of the U.S. market share. Because we're showing about 2.87 estimate doesn't correlate with the assumptions in the final draft.

And if I'm going to fast, I guess you can ask me to slow down. I'm trying to catch up on time.

(Laughter)

MR. WHITE: So, again, we have information in here that we'll share with you. This is based on IDC and display research. We're not seeing significant changes. We're seeing volumes decrease somewhat.

Again, we're seeing, you know, a decline in the smaller monitors, the 17 inch, the 18 and a half inch. Those are declining significantly. And we're going to see 19 inch is kind of the baseline that's going to absorb those smaller displays.

We do have issues with the proposal to mandate a 200 nits brightness setting. We, Dell, HP, and all the other companies represented by ITI and TechNet, we work with -- we spend a lot of time with our customers. We bring them in, on-site. We do studies. We put displays up in front of them. We do multiple settings and testing with those and get input from them on what works right, what works in what environment.

So we, as a company, Dell, we have displays that are less than 200 nits, we have displays that are greater than 200 nits. We agree with 200 nits should be used to set a test standard so we're comparing apples to apples. We do not agree that a 200 nits setting, as an as-shipped display requirement, should be used as a regulatory requirement for the State of California.

And again, it was stated in here that consumers can easily increase brightness. Well, I guess the converse is true because they can also decrease it if it's too bright.

We go into more detail here on why 19 inch and smaller, why that market is declining. These are very cost sensitive. A lot of, you know, lower income models you might see at retailers, like Walmart, or other stores like that. Those are very cost-sensitive models that are priced and featured specifically for that market. An increase in $5 for the OEM cost, you know, could relate in a $10 to $15 increase in what the end user pays for one of these lower-performance, is what I will call them, displays.

And again, reasons why we think these should be out of scope. Because of the declining market share of most of these sizes. Again, most of your 17 inches, nobody has changed those designs in, really, the last five years. That's a very cost-sensitive, you know, market entry point. Again, those will not absorb the higher cost required to redesign these. Those will just be phased out of the market.

A lot of the data that we have here is from publicly available websites. And we've proposed some changes to the sizes to account for this, that we'd like

the CEC to consider.

And your proposal on the enhanced performance displays. We would like the allowances at 10 percent for 99 SRGB and a 50 percent allowance for 99 percent of WRGB displays.

We have a lot of these models are not compliant, you know, 50 and 40 percent, respectively. Some of these we can't even redesign our models that were compliant to 6.0 to achieve the 7.0 limits.

And Humberto touched on this. But the high performance displays, these models have the most efficient power supply, you know, films, everything is already incorporated into those models. We don't have any lever, or as he said, silver bullet left to add to these. They are as efficient as they're going to be. The customer pays a premium for those models.

And again, those models are very, you know, specific, unique market segment that requires those, and they need that performance, and they pay a premium for that.

So, our proposal would, again contrary to what CEC published, we'd like a 40 percent allowance for 99 percent sRGB and an 80 percent allowance for Adobe RGB.

And we'd like to drop for greater than 5 megapixels. Again, I've touched on this before, all the

levers have been pulled to make these models efficient. There's not much else that we could actually do.

Again, this is kind of the impact to our market if we stayed with a 1/1 effective date. And this includes the limits proposed for sleep and off mode. We will eliminate 15 percent of the models because they cannot meet the sleep or off.

The difference between, say between regulating a 1-watt sleep and a half-watt sleep is, on average, about 37 cents a year. And the fact that you set a 1-watt limit doesn't mean that we, as manufacturers are going to de3sign to 99.99. We're going to design that -- I'm sorry, quit talking with my hands.

We're going to design those to consume as low amount of energy as possible. So, some of those models might be .51. They might be less. But we're going to do everything we can.

Because you set a 1-watt limit doesn't mean we're going to design to a 1-watt limit. We're going to design to the lowest limit that we can possibly and technically achieve.

And again, to reiterate, we think the 1/1/18 date is really not attainable for our market. We are spending a lot of time right now, July 1st is the compliance date for Energy Star 7.0. And if you look at

all the labs that are doing the testing around the world, those are pretty backed up and we're all on a very tight schedule to meet that. So, we still don't have results from some of those displays to even test them to these new limits. It's just we have an intersection point of the publication of this standard and the Energy Star 7 effective date. And so, there still remains a lot of unknowns that we need to go back and validate once we've cleared the backlog that we're experiencing right now with Energy Star 7.0 certification.

And again, it's unclear -- on touch monitors, it's unclear to us in the regulatory language if the 1-watt adder for touch is only available for a specific mode or is it available for all the modes, for sleep, off, and on. So, we'd like some clarification on that. You can look at the regulatory language and the narrative, it's a little bit misleading, but we'd just like you to clarify which area that's applicable for, or if it's available for all.

And that's it. And I know I talk fast so --

MR. RIDER: Harinder, you want to go ahead and answer that question while I queue up the next presentation, on the 1-watt? Do you -- yeah, it's going to take me a second. And then we have the IOUs.

MR. SINGH: I think after the presentations I will respond to it.

MR. KUCH: Okay, good morning, everybody. My name is Chris Kuch and I'm here on behalf of the California IOU's Codes and Standards Program. So, I'm the other Chris in the room and my hair's still pretty dark, much like Harinder's. That was a bad joke, sorry.

(Laughter)

MR. KUCH: So, we're just going to provide some comments on the update computer display staff report. So, as you can see, the IOUs have been very active participants in this displays rulemaking since 2013. We've provided several docketed comments to the CEC throughout the process and these include extensive test data, costs, and marketing information.

So, the computer displays market continues to grow in units sold in California. Average screen size is increasing, as well as the screen resolution and different features, leading to an overall growth of energy consumption in this sector.

And through the IOUs' rigorous testing and research, large range inefficiency levels have been identified between different computer display models of similar size and features, and up to a factor of 5 in some cases.

And the IOUs have also found cost-effective hardware and software solutions available on the market today to reduce this waste.

So, in regards to the CEC proposal on computer displays, the California IOUs are generally supportive, although there are several areas for improvement. And we're going to go through some of those today in this presentation.

And next, I'd like to hand off the presentation to our technical team. So, first up is Bijit Kundu from Energy Solutions.

MR. KUNDU: Thanks. I'm pretty sure I'm the only Bijit in this room, but correct me if I'm wrong here.

(Laughter)

MR. KUNDU: So, today we're going to be talking about some of the feedback from the California IOUs. I'll be going over some of these items where we support the CEC proposal. And my colleague, Katherine Dayem, of Xergy, will be going through some of the areas where the IOUs would like to see some modifications and improvements in the proposal.

As Chris mentioned, we will be submitting detailed written comments for the comment period, to CEC, where we will be providing -- we'll expand on these

comments.

So, as my colleague, Chris, mentioned, we've been advocating for efficiency standards for computer monitors since 2013. We, based on testing and market assessments, based on our research that we've conducted throughout this rulemaking, since 2013, and you saw all the documents that we've published, docketed with the CEC for the public record, all of those documents point to these levels, listed here in Table 9, of the CEC staff report. All of those documents that we've prepared and all the testing we've done points that these modal power requirements are, indeed, cost effective and are technically feasible.

So, if you look at the data, the product data available on the Energy Star site, you'll know that there's hundreds of models that meet or -- well, 169 models that meet, specifically, across all different-sized categories that meet the levels.

Now, these are models that require no additional modifications, no tweaking. They are able to qualify today for the California IOU -- or the CEC proposal.

And when we talk about choice, you can see in the sub-bullets here that many manufacturers are represented, many different resolutions are included in the qualified models, all different panel types. And

also, a range of price points are included. So, we're not talking about, you know, only the lowest-featured models or only the highest-featured models. We're talking about a wide range of choices for consumers.

In addition to the models today that would be able to meet the CEC's proposal, we've also done an analysis and there's over 100 models that are within 5 percent of the standard. So, these are models that don't need a lot of modifications. They just need some minor improvements in the efficiency and they'd be able to meet the proposed levels.

I plotted out these data points here. And I think what you'll see, based on the data here, is that there are close to 300 models that are available today that almost two years before -- so, are available today that come close or meet the current levels that CEC is proposing, almost two years before the standard takes effect.

So, you know, this is without any -- these are models that right now will meet, not accounting for any improvements in the future.

We also support the CEC proposal for a constant resolution past 5 megapixels. What we've -- this chart shows all the computer models, computer monitor models, their on mode power versus resolution.

And based on our analysis of this data, again from the Energy Star data set, incremental power needs decrease with resolutions that go beyond 5 megapixels.

And again, with this constant resolution allowance past 5 megapixels, you see plenty of examples of 4K UHD monitors, so these are 8.3 megapixels, being able to meet CEC's proposal today. And again, it's in various screen sizes. It's kind of hard to see the dots from afar, but you've got models that are 24 inches, 27 inches, as well as 32 inches that are 4K UHD, that meet today's levels.

We also were pleased to see the standby or sleep, and off mode updated levels in CEC's report. We think they better reflect the power requirements for today's monitors in both sleep and off mode.

As indicated in the CEC report, a majority, I think it's over 80 percent of models are able to meet these levels. Not only that, but based on the CEC staff report, we've also -- we also see that there are models with networking and data connections that are still able to meet the .5 and .3 levels.

One exception, we will note that there were two models in the dataset that have a gigabyte Ethernet connection. They are not able to meet the proposed levels. Although, we do know of currently available,

technically feasible solutions for those models to be able, in the future, to meet the sleep and off mode levels.

In terms of test procedure brightness setting, the California IOUs continue to recommend and advocate for testing to be done at a brightness level that's as shipped, or in the default mode. We think that testing for in this mode is more representative of actual energy use.

If CEC decides to align with the Energy Star testing and have models that are calibrated to 200 candelas per square meter, yeah, you support the provision proposed by CEC to limit the display being shipped excessively bright. That is that the monitor wouldn't be able to be shipped brighter than what it's tested at.

Now, my colleague, Katherine Dayem, will be talking about some other areas for improvement.

MS. DAYEM: Okay, I'm Katherine Dayem, with Xergy Consulting.

So, I think we outlined six areas of improvement here. Firstly, we'd like to see models less than 17 inches back in the scope. We feel that excluding these just opens a potential loophole in case of future market shifts. And we don't really see any technical

justification for excluding these at this point.

The second recommendation is pretty simple and just for clarity, to define the screen sizes in terms of screen area, rather than diagonal screen size. Energy Star has started doing this because there are several aspect ratios available and given a screen diagonal, you might end up with multiple screen areas. So, that's simply for clarification.

Thirdly, we argue that the proposed levels for the large screen size are too large and they're too lenient for these displays. So, we recommend a smaller -- a lower level for the large displays over 25 inches. And in our written comments, there's a schematic here of what we're thinking. But in our written comments, we'll have some more specific recommendations for that.

Additionally, we argue that we don't need these increased adders for enhanced performance displays. The previous version of the staff report included no adder for sRGB type displays and a 40 percent adder for Adobe RGB. So, we'd like to see a return to those levels.

As the market moves towards higher resolution displays that have a broader color coverage, we just see the market share of EPDs becoming larger in the future.

So, the sRGB displays, we feel we don't need an

adder. They're becoming more prevalent on the market, sometimes you can't even tell when you buy a display that it's sRGB EPD. And CEC has presented data showing that a large number of EPDs that are sRGB actually meet the proposal today, without an adder.

We do understand that for a broader color gamut, like Adobe RGB, the power demand is higher. And so, and there are no compliant products today. However, we have outlined one route to compliance, which is using quantum dot film, with white or blue LEDs, that can be more efficient than the colored LEDs we understand to be necessary right now to produce the broad color gamut.

And because we see this technical feasibility, we advocate for sunsetting this adder so that we can encourage these efficiency improvements in the next design cycle.

The definitions outlined in the staff report need some clarification and improvement. We suggest that staff just leverages the Energy Star definitions, which have been vetted with industry and advocacy groups. There are multiple revisions of the specification.

We can go to Version 7 for all the definitions we need on product types and modes of operation, with the exception of EPDs, but there's a definition in

Version 6 for those.

And finally, we continue to advocate for including signage displays in this rulemaking. This would align the scope of the CEC regulation to Energy Star's. And the IOUs have done testing and cost-efficiency analysis and provided proposed power levels that are cost effective and technically feasible today.

And finally, we just want to pose a couple of questions that we will provide some comments to in our written comments. The first is a relatively new type of product on the market. They're called tuner free displays or TVs. These are functionally a TV that the manufacturer has chosen to pull out the integrated display because most consumers don't use their TV to watch broadcasts over the air television anymore. They rely on their box or streaming.

And so the question is, where should these be regulated. Should they be covered by the TVs, because the TV's regulation, because they're functionally a TV or are they, by definition, a display and covered here.

And finally, just some thoughts on automatic brightness control. The CEC has outlined these and the IOUs have noted that ABC can be a strategy for improving the efficiency of a display. However, the Energy Star test method, Version 7 and 6, the on mode power they

instruct us to measure is actually the power at 200 candelas per square meeting, just like displays without ABC. And so, how should we test and calculate power for products with ABC and credit that energy efficiency strategy?

So, that's all we have, thanks.

MR. RIDER: Yes, so that concludes the presentations. So at this point, we'll move on to just public comment in the room.

Remember to also state your name, and your affiliation when you come to speak, so that the court reporter can get that down.

MR. SINGH: This is Harinder Singh. And I just wanted to answer Robert's question related to the touch screen. The allowance is only for the on mode, because the sleep mode and the off mode is controlled by the computer, itself. So, when the monitor is not working, then the allowance is not allowed. So, it's only in the on mode. Thank you.

MR. RIDER: And just a reminder to folks on the phone, if you have something to say, just go ahead and raise your hand or write it into the comment window and I will read it out loud.

MR. DEL FORGE: Who should I give my card to? Pierre Delforge, NRDC. I'd like start by thanking the

Commission staff for pursuing this important rulemaking and for giving us the opportunity to have this discussion today.

I'd like to start my comment by why this rulemaking matters and emphasize some of the points made by the IOU speakers earlier on. Monitors and displays are a large energy use in California. They are a significant portion of a computer system's energy use. And we are seeing large differences between models on the market.

We're also seeing an increase in sales in the large size and the high resolution models, which are the ones which use the most energy. Which, even though volume is decreasing, it leads to an increase in the energy use of computers, of monitors.

We're also seeing a proliferation of signage displays. I'm sure it's very noticeable on every public space. And commercial space, retail stores have more and more of those models. They're on for longer hours, they're brighter, they're larger, and they are a significant and growing use of energy.

So with that in mind, we generally and strongly support the Commission's proposal. We think that some of the changes address some of the industry concerns that were mentioned last year. And we understand and we

acknowledge that some of the changes also create additional concerns.

But we think that overall it's a balanced proposal between stringency and cost effectiveness. And clearly, you know, it will impact the market and I think that's by design. You cannot have energy savings if you do not impact the market and create incentive to redesign products.

You know, I think the industry concerns with the 50 percent protected pass rates by effective dates, you know, I acknowledge them. But I think this is also -- with all due respect, dispute the premise that, you know, these are business as usual projections, without redesigns caused by this regulation. With redesign we will see higher pass rates and, therefore, you know, little or no reduced availability of these products in the market.

I think it's important to consider this. I think the purpose of this regulation is to save energy, it's not to reduce product availability. And based on the data that was shown, both on the docket and today, it seems clear to me that there is a pathway for cost effective redesign of these products so that they can meet the levels and not impact product availability in the market.

We do have some improvements, you know, wishes. I generally support the ones that the IOUs mentioned. I'd like to emphasize a few key ones. First, in terms of the test procedure, for NRDC, it's really important to test as shipped and in order to be much more representative of the actual energy use.

Today, there's a big difference between the brightness in the Energy Star test procedure of 200 nits, and some of the monitors we've seen ship much higher and are using a much higher energy level. Obviously, there is energy use or power is very sensitive to the brightness.

So, we believe that the best path forward would be to test as shipped, with a minimum brightness level to ensure that this does not encourage manufacturers to ship with an overly low brightness. And if that's not, you know, implemented, then we also agree with the fall back that was presented by the IOUs, of tested at ship brightness. But I understand the industry concerns with that, so we really think the best solution would be to test as shipped.

Also want to agree with the IOU proposals on the EPD adder and particularly levels for large sizes and high resolutions where we think that the levels are overly generous for these sizes. Not for mainstream,

but for the larger sizes and high resolutions.

The last point is on signage displays. As I mentioned, it's a large, growing use of energy and we think it's the largest missed opportunity for savings. The TV standards are outdated. They provide minimal savings for these products.

We think that you have a strong proposal and we encourage CEC, ideally, to include it and reconsider it in this rule. And if not, to cover them in a separate rule as soon as possible after this rule.

So with this, we encourage CEC to maintain current levels for mainstream monitors. And we are open, I think, to tweaks and adjustments as necessary to provide flexibility on low volume products and low savings impact requirements. But I think on the mainstream we think it's technically feasible, cost effective, and we encourage CEC to maintain its proposal. Thank you.

MR. RIDER: We have David Maciel on the phone. David, I believe you're unmuted. Or, maybe you're not. Let me double check. I'm sorry, David, it looks like you called in separately than the WebEx account so -- so if you could go ahead and type your question and I'll go ahead and read it into the docket.

In the meantime, if there's anyone in the room?

MR. SINGH: I have two questions. I wanted to respond to Katherine's questions, in the meantime, you know, until you get David, that would be good.

One of the things that I want to mention is that we modified our definition for clarity purposes and they are not specifically the Energy Star definitions. So, looking at our process, so we had modified the definitions.

Number two was the testing in the automatic brightness control. We'll look at it and if clarification is needed for that, we'll modify the instructions for testing.

As far as the third question you had about the televisions without the tuners, the televisions are covered with or without the tuner. So, I don't see any issue there. So, I just wanted to mention that. Thank you.

Ken, is David available, now?

MR. KUNDU: Bijit Kundu, with Energy Solutions, on behalf of the California IOUs. Just for the record, based on our analysis, we compared the Energy Star Version 7 levels with the current CEC proposal and we saw the levels being very close together, not a 30 percent more stringency with the CEC proposals.

We saw the levels, across most of the screen

sizes, very similar. And in fact, with the largest screen sizes, we saw the CEC proposal being significantly more generous than the Energy Star. So, just that's what we saw. We'll be providing details in our written comments on that.

MR. RIDER: Okay, let's try that again. David, are you able to speak?

MR. MACIEL: Can you hear me, now?

MR. RIDER: Yes, I can.

MR. MACIEL: Excellent. Thank you. And I apologize for the mishaps.

First, I'd like to thank the Commission for the webinar and the work that has been done thus far. We do believe that there's still more work that needs to be done to come up to a final rulemaking.

But I'm going to limit my comments, today, to the exclusions that Harinder explained in his presentation. And to be exact, I'm going to be talking about the medical devices and professional signage displays.

There was something that was introduced in this new draft, as far as medical devices is concerned, there were two more items that were introduced in this new definition of a medical device. And that is that the medical device will be excluded if the product does not

have power management capabilities or a standby mode.

I would just like to clarify that some medical devices do have power management capabilities and they do have a standby mode. It's just that it's not enabled by default.

We've started to introduce power management capabilities for two reasons. To, you know, reduce energy consumption and because our customers demand that. Customers need that flexibility. There are some environments in which they do employ or enable power management, and there are some environments in which they don't.

So the difference is we do provide the capability, they are just not enabled by default. So, we would like to ask the Commission to look into that and possibly remove those two items that were added to the exclusion and leave it just as medical devices are excluded from this proposed rulemaking.

And on the second one, professional signage displays, I believe the last few words that were added to what a professional signage display is, is they're used in indoor and outdoor stadiums. I'd just like to clarify that it would be very beneficial not to make it so specific to those environments. Professional signage displays are used in convention centers, in auditoriums,

educational institutions such as universities, schools. They're not just limited to stadiums. So, to the extent possible, I would like to ask the Commission to remove the words "stadiums" from that definition.

MR. SINGH: Okay, David. You know, we have the limit at 1,400 square inches. So, those professional signage displays are greater than 1,400 square inches, anyway, so I don't know what exemption is going to add to it. You know, if they're greater than 1,400 square inches in the area, then they are exempted from the standard at this time.

Anyway, thank you.

MR. MACIEL: Okay, thank you.

MR. RIDER: I think that wraps up the part of today for displays. I think we should go ahead and break for lunch. And according to -- we're right on schedule. So, please be back by 1:00. We'll start the computer workshop at that time. And thank you all for your comments on displays.

(Off the record at 11:55 a.m.)

(On the record at 1:03 p.m.)

MR. RIDER: Thank you. Welcome back, everybody. Hope you had a great lunch.

My name's Ken Rider. I'm an electrical engineer working for the Appliance Efficiency Program. And I'm

here to present to you on the proposed regulations on computers.

And just so you know, this is a very open process. We have contact information on that slide. If any stakeholder here has any question or concern that they didn't get to say today, please feel free to contact myself or my colleague, Soheila, with any further questions.

So, I'm going to give an overview of the proposed regulations and then I'll go on to changes in both the draft and in technical feasibility.

So, the regulation, the most important thing to talk about, first of all, is what is included and what is not included.

In the proposed regulations, and this is encapsulated in Section 1601, so things that are included in the proposed regulations are desktop computers, like the one I'm using right now. Also, notebook computers, like that one over there, laptops, notebooks. Small-scale servers, workstations, and thin-client computers, which are treated similarly to desktops in the standards.

What is not included in the scope of the proposed regulations are tablets, game consoles, and I'll talk more about those later, hand-held video games,

servers and, basically, larger servers, larger-scale servers, so like enterprise style services. Industrial computers and controllers. And I'll speak more on that later, as well. Smart phones and set top boxes.

The next section of the regulations deals with definitions. Originally, in the first draft of the standards we really tried to take definitions as verbatim as possible from Energy Star. These definitions define, in detail, product types that are covered. It talks about exactly what we mean by desktop computer, for example. The different modes of operation, what we mean by standby mode, or long idle, or short idle.

We've also modified, since the first draft, the definitions slightly to try to enhance clarity, and also to be more specific about what is not included in the scope.

The next relevant section is Section 1604. It deals with the test procedure. The proposed test procedure is very harmonized with the Energy Start test procedure for computers, from Version 6.1.

And then the duty cycles for annual energy use calculations are the same.

I should clarify, there was some confusion about the duty cycle, the intended duty cycle for notebook

computers. And we also intend, in this draft, for notebook computers to use the notebook computer duty cycle from Energy Star. And we've issued a document, a supplemental document to explain that.

We've added a new duty cycle, and I'll get into that later, but essentially to incentivize improvements in power management to try to avoid cases where computers never achieve sleep.

We also included a calculation methodology for expandability score, and that's based on a number of different ports that are enumerated in a table. And then, also, there's just a hundred score as the baseline, so every computer gets a hundred points.

The score is somewhat based on power supply sizing calculations that we discussed over the course of this rulemaking.

We also added a description of what the screen resolution or what the native screen resolution of a connected monitor should be. And that came out of a discussion about the fact that if you have different resolution monitor that can actually change the energy consumption of the computer, so it was very important to get apples-to-apples testing to define the standard resolution of monitors that's attached during testing.

We also have -- so, the next section is Section

1605.3. This is where requirements for both the performance and design requirements are held. One thing, and this is across all computers, is we are requiring that the computer turn off the display after 15 minutes of inactivity.

Also, for all computers, except for small-scale servers, we're requiring that the computer enter sleep mode after 30 minutes or less of user inactivity.

There are some prescriptive requirements for small-servers and workstations. They are, under the proposal, would be required to be manufactured with an 80 plus gold level power supply, and also energy-efficient Ethernet.

Unlike small-scale servers and workstations, notebooks, desktops, and thin-clients would have to meet energy consumption targets. And the difference there is energy consumption target is set at a kilowatt hour per year target and allows tradeoffs between different modes of operations.

So, a manufacturer can choose to improve short idle, long idle, sleep or off, and any combination, so long as the total calculated energy consumption meets that target. So, it allows manufacturers to pursue a number of -- it allows them to choose amongst a number of possible ways to comply. Whereas, the workstation

and small-scale server, you have to choose the power supply.

In addition, and we started with these energy consumption adders in the last draft as well, from Energy Star. But these are, essentially, in the standard we have adders. And what these adders do is to provide additional amounts of energy consumption in the target to allow for expanded functionality.

We've made some changes here, but the idea is essentially that, you know, if you add extra hard drive, you add more memory, or you have an integrated display we adjust for that from the baseline of 50 kilowatt hours it was for desktops, and 30 kilowatt hours per year for notebooks.

We also added this discrete graphics adder and I'll discuss that in more detail later.

Another relevant section is Section 1606. This outlines the certification to the Energy Commission. It states which pieces of data are necessary to provide to the Energy Commission, who then -- what pieces of data are necessary to show compliance.

The Energy Commission is not proposing any type of labeling or marking, other than the standard labeling and marking that is required on all products, which is model number, manufacturer name, and the date of

manufacture. And that there's not a single product that's regulated that doesn't -- but we're not proposing any unique or special labels for computers of any kind.

The analysis in the staff report shows that the proposed standards are cost effective. They've been revised, these numbers, especially for desktops the incremental cost is higher than it was before. And also, the energy savings are slightly lower as the stringency was decreased.

But that being said, the cost effectiveness is still a very cost-effective proposal. The payback is less than two years for, I believe, every product class. The desktops have a savings of, over the lifetime, of almost $62, just shy of $62, for a cost of $18. And the other products are similarly cost effective.

The impact to statewide energy consumption is significant, with the total being about -- almost just short of 2,000 gigawatt hours per year, which is a pretty sizeable savings for the State of California. And equates to hundreds of millions of dollars of expenditures on electricity saved.

So, I'm going to go into some very specific changes, kind of the major changes that were made between the draft and spend some more attention on those.

So, probably the largest change is the addition of an expandability score. This score only applies -- of all the product classes we've discussed, it only applies to desktop computers. And the purpose of it is to provide additional amounts of power allowance to computers that have more features, and ports, and functionality.

And you can see, you know, an example on the screen of a very small, probably mini ITX or micro ATX board in the lower left. That type of machine would not really see much of an adder.

To the right is, I think, even an extended ATX, much larger motherboard. It has a lot more going on, on the motherboard. This type of computer that would incorporate this kind of motherboard would see a fairly large amount of adder.

And also, using this score we created a boundary at which a computer would just no longer have to comply with this energy target and would, instead, have to comply with the -- essentially, with the workstation requirements.

So, this is graphically what the adder looks like, based on the -- the X axis are the different expandability scores and the Y axis are the different amounts of kilowatt hour per year adders.

And as you can see, once you cross the border of 750, you no longer -- you're now considered a workstation or you have to meet the workstation requirement. You can also see that the adder starts at around an expandability score of 200. A lot of machines that have very small form factor are, you know, around there.

And so, as you move away from the smaller form factor and you have more ports, et cetera, you start to see an adder. And it peaks out at about 27. I don't know if it's exactly 27, but around 27 kilowatt hours per year. And that roughly translates to an AC power of 6 watts. So, if you make a really large, expandable machine, you'd get about 6 watts more of power to use in idle.

Another pretty large change we made to the proposed standards is we added a discrete graphics adder. The original proposal did not give any additional amount of power for a discrete graphics card. This adder we've added not only deals with the first card, but also any subsequent cards. So, some computers are shipped with, let's say, two discrete graphics cards.

The allowance scales with the graphic card's frame buffer bandwidth, which is kind of similar to its

power, its computational power. So, it scales to the more powerful a graphics card is, the more allowance it would get.

The adder also is phased in, in stringency. So, there's a first, initial level and that level is intended to come into effect along with the computers and notebooks standards. And then, it transitions to a second, more stringent level, which is intended to capture additional feasible energy savings. The levels are significantly more stringent than Energy Star or the European Union's levels, but we believe that they are feasible. And we also worked with manufacturers to ensure that they are feasible.

We made a number of other adder modifications. One thing we did is we reduced the display adder by 20 percent. And that was really to account for the additional technologies and improvements that were identified in the displays portion of the report.

Then, we also changed the memory adder. In the Energy Star and in the original proposal it used to scale by the amount of memory by gigabytes. Now, we proposed to change that to by per module. And that is to reflect some findings in actually measuring energy consumption, that the energy consumption of memory seems to have more to do with the number of modules than the

actual capacity of the memory.

We also changed the storage adders for desktops. And we've changed it so that the adder depends on what kind of hard drive you add. For example, in the past proposal, if you had added a 3.5 inch drive -- or, sorry, if you had added a solid state drive, you would still get the same allowance of 26 kilowatt hours, as if you had added a 3.5 inch drive. And so, we tried to change it so it scales appropriately to the type of drive that is added.

We also, in the staff report at least, tried to clarify that the storage adder does not apply to the primary storage. And the primary storage is essentially the hard drive, where the operating system is installed.

An interesting change we added was a power management incentive. And this is not a mandate in any way. It's essentially to provide a new compliance pathway that manufacturers can choose to pursue, if they want to.

The first change to the duty cycle is we offer an incentive of 5 percent shift from short idle time to sleep time, if display power management cannot be disabled. And that is to account for the reduction in energy we would see from displays turning off more often.

We also are providing an incentive of a 10 percent shift from long idle to sleep, if the computer power management cannot be disabled. So, you cannot prevent the computer from going to sleep. And that is to give credit for the assumed longer and more frequent transitions to sleep.

We added a couple definitions for some products that would be excluded from the regulations. We had said, in the prior draft, that we intend to exclude industrial computers, but did not have a definition for that. So, we've added a definition.

And, essentially, there's two types of industrial computers. One that would be exempt. One is where a computer is incorporated into the chassis of a larger machine. And an example of that is in the lower left, where you can see there's clearly a computer in there, with a screen, but it's part of something that's much bigger. It's not just sitting on a desk or something like that. So, these types of computers would be exempt.

And then, also, a computer that is specifically designed to automate an industrial process. And an example of that is on the bottom right, where you can see, I mean just by the number of COM ports, that this thing is really designed to control some sort of

industrial process. And it's marketed that way. It's manual discusses this. It's very clearly an industrial process controller.

We also added a definition of game console, which is an excluded product from the proposed regulations, but needed a definition. So, we proposed that game console is essentially something that is marketed and sold for video game usage and does not have the ability to expand volatile memory. Drawing a line, essentially, between the computer and game consoles, and by the fact that these do not have the same characteristics of expandability and that a desktop computer might have.

I already discussed -- so, we made a few other changes. I already discussed the change to 1089p testing for the monitors.

We also added some language to address computers that are sold without an operating system, specifying that if you sell a computer without an operating system, other than the bios, that that computer would not need to meet the power management requirements because it has no way of doing that.

We also updated a couple of definitions. Again, for clarity, to avoid arbitrary words into the definitions.

I'm going to now talk about some changes in the technical feasibility analysis. So, one big change that became apparent from lots of discussions, very fruitful discussions, I would say, with industry is that actually there's a fairly large amount of inefficient desktop power supplies.

The original staff report had some assumptions about power supplies that were -- that they were essentially 75 percent efficient at low loads. That is not the case. And a lot of power supplies are worse than even 50 percent efficient at low loads.

And here's just a piece of test data as an example, of a 450-watt power supply. It was drawing, and this is a real, measured number, it was drawing 14.5 watts and it was only delivering 6 watts. So, there's an example of a real power supply, a commonly available one, that is less than 50 percent efficient.

So, a lot of the technical feasibility and discussion refocuses on what is necessary. Although, there are some power supplies that are fairly efficient and do a good job at low power, the staff report is really kind of focused on, okay, how can that be done and what are the technologies that can do that.

One of those technologies is fan control at idle. So, when a power supply is at very low loads,

power supplies have fans, they get hot. They can be using 200 watts or something like that, so they need a fan to dissipate the losses in the power supply. But that's not always necessary and that in very low powers you can essentially dissipate the heat just with the incorporated heat syncs. You don't need to run the fan.

And so that, actually, in some cases can reduce the idle mode power of just the power supply by a couple watts, surprisingly.

And I want to emphasize that these changes are very different. We were talking a lot in the last workshop about 80 plus, and 80 plus levels, gold, bronze, platinum. Those specifications really focus on active mode. And what we talked about in the staff report is really -- it's not covered by 80 plus. Getting an 80 plus, silver power supply, for example, doesn't guarantee any kind of performance at these low loads that we're talking about. Because 80 plus covers loads that are only significantly higher than the idle modes that we were investigating.

And also to address desktop power supplies, to some extent that is incorporated in the expandability adder. So, we do recognize in the revised proposal that a larger power supply is going to have larger fixed losses and inefficiencies at low load. And to some

extent, that's incorporated in the expandability score.

We also spent a lot of time in the staff report in revising our analysis on desktop storage, looking at some of the additional opportunities that came up in discussions with industry and with other stakeholders. We evaluated a number of existing technologies and costs.

The proposed levels in the cost benefit analysis for desktops choose an option of an integrated 64 gigabits of, you know, bytes of solid state memory into a 3.5-inch drive. And that specific option was chosen out of many. You could substitute a 2.5-inch drive. You could do a lot of different things to improve desktop storage.

But this one was chosen because it enhanced performance. So, the performance was only better after incorporating such an improvement.

And there are lots of different options that would improve it even higher. For example, going to solid state drive. Or, you know, be a much lower cost, like going to 2.l5-inch drive, or just spinning the hard drive down. But those have different effects on performance.

So, the staff report really focuses down on these two things, the power supplies and the desktop

storage, where the assumptions were found to be that these two items really can be a barrier to idle mode power.

The number of compliant desktops has changed significantly since the last staff report, as well. There are a growing number of desktop computers, certified in Energy Star 6.1 database, that are hitting 50 kilowatt hours or less. When we first started, there was a handful. Now, there's more than 20.

But what we looked at these and we found them to be mostly small form factor and often using external power supplies. So, that kind of goes well with the expandability layout that we have, where the small computers don't get an adder because they can meet the levels and are meeting the levels today.

We also changed -- also changed in the compliance is all these adders. So, overall, mostly the adders have added to the energy use targets and we've significantly closed the gaps on a number of product times, between where the computer uses today and what the standards would require.

And so here on this chart or on this slide I've given an example of a system from Energy Star. So, D-2 is a type of higher performance desktop with the discrete graphics and G-7 is the highest end of a

graphics card. And essentially, through the adders we've added, for that product type, 62 kilowatt hours per year.

And then, also, through the agreements on discrete graphics, the graphics industry is essentially agreeing to lower their graphics' idle consumption by 42 kilowatt hours per year, thereby closing the gap between where the proposal was before and where computers are today by 104 kilowatt hours a year. So, that's a very significant change in the distance a manufacturer has to go to reach the targets in the proposal. Very large change in that distance.

We have another important change. My colleague, Soheila, will present on it. It's on small manufacturers. So, Soheila, if you could.

MS. PASHA: All right, thank you, Ken. Good afternoon, my name is Soheila Pasha. I'm an electrical engineer with the Appliances Unit, here at California Energy Commission. And I'm going to present the section for the small volume manufacturers today.

Based on comments received during the pre-rulemaking proceedings, staff is proposing some changes that affect small volume manufacturers. For that purpose, the following factors are taken into account.

First, unlike most of the size, there are

manufacturers that make a small number of specialty computers each year. The testing and compliant cost may have a large effect on such small businesses.

Second, the cost of comply and testing must not outweigh the benefit of improved energy efficiency.

And lastly, in order to maximize any energy savings opportunity, energy efficiency standards that cost little to nothing, such as software improvements, should be applied.

The energy savings cost grows as the volume of sale increases and it sustained incremental cost at about 15 units. Therefore, staff proposes that computers that are manufactured by small volume manufacturers, and are 15 units or less of similar systems are exempted from complying with most proposed standards, with the exception of the power management.

That is the same as the power management that is required for other computers. Similar units here are defined as the units that have the same size motherboard and power supply.

To develop the exemption, staff investigated the revenue caps, location of assembly and sale, and minimum number of sold units as main consideration factors. Manufacturers that make $750,000 or less per year, and assemble and sell computers at the same location are

qualified to be small volume manufacturers.

They can apply to the Commission's website to exempt the computer units that they manufacture and sell, less than 15 units of them, to be exempted. This flow chart here shows the process that we are going to apply.

We welcome your comments on this topic, so please submit your comments. You can submit your comments three ways. The first, you can electronically upload your comments to the link that's provided here. You can also send a hardcopy to the California Energy Commission, Docket Office, at the address that's shown here. And also, you can e-mail a digital copy to docket@energy.ca.gov. Please include the docket number 14-AAER-2 in the subject line.

You can also find this information in the workshop notice. You can submit your comments by 5:00 p.m., on May 16, 2016.

So with that, we conclude our presentation. If there is any clarifying questions you can ask now, or we can go to the next section.

MR. SHEIKH: Yeah, this is Shahid Sheikh from Intel. Just a quick clarification question on the integrated displays for all-in-ones, the display has been reduced by 20 percent. And which, I think in your

presentation, when you first started, it still has -- it is not reduced.

MR. RIDER: Yeah, and we issued a supplemental to explain that.

MR. SHEIKH: I'm talking about today's presentation.

MR. RIDER: Yeah, okay. It was copied in, obviously, from the reg, which has an issue. But, yeah, so it is our intent -- just to be clear, I think the factor -- let me pull it up, just so everyone knows what the correction should be. So, essentially, you'll see here, it says, "desktop and thin-client adder" and you'll see the number there. That number needs to multiplied by the 0.8. And that is, essentially, what we intend to propose and we've issued a clarification on that.

Thank you for raising that, and in case anyone's confused. Okay.

MR. HOLLENBECK: Mark Hollenbeck, HP. Just a quick question about the physical marking requirements. You had mentioned putting the actual date of manufacture physically on the product. A lot of that build that into the serial number and it's pretty standard in regulatory circles that, as long as someone wants to know, we provide the decoder and that's an acceptable

way of meeting a requirement like that. Does that make sense?

MR. RIDER: Yeah, that's actually, just going more into detail, that is also embedded in our regulation. We say the date code has to be somewhere, printed on the machine, and that also it can be in a serial number.

MR. HOLLENBECK: Oh, okay.

MR. RIDER: And that you need to, if/when requested by the CEC, provide an ability for us to decode it. So, I didn't get into that detail, but that is actually the same way it works here.

Okay, a slight change to the agenda. We have a gentleman who needs to catch a plane. So, Chris Granda, if you're still here, if you could make remarks and then we'll move on to the presentation by Paul, just after that.

MR. GRANDA: Thank you. I'm Chris Granda, a Senior Researcher Advocate with the Appliance Standards Awareness Project. And thank you for modifying the agenda to accommodate my travel schedule.

First of all, I'd like to thank the Commission for the work that's been done on the proposed energy efficiency standards that we're discussing today.

I'm here because of the national importance of

the proposed standards. ASAP is a nonprofit organization that operates under the umbrella of the American Council for an Energy Efficient Economy. And we tend, primarily, to the Federal energy efficiency standards developed and administered by the Department of Energy. But we also monitor and contribute, when asked to, State level standards that -- particularly those that have a national importance, like the proposed standards for computers, monitors and displays.

My comments today are going to relate to the broader policy context that today -- the standards that we're discussing today are being developed. But we also support the technical comments that were presented by Pierre Delforge of NRDC, but I'm not going to repeat those here.

So first of all, as I think we're all aware, there's an urgent need to reduce emissions of greenhouse gases. And electricity generation is in transition to renewable sources in California, nationally and globally, and limiting the growth of electricity consumption from plug loads will help to maximize emissions reductions from other California environmental regulation and policies, as well as national policies, like the Clean Power Plan. So, it's important to take that all in context.

And also, that continuing the business as usual for computers and displays -- I just have misplaced my notes, excuse me -- will not necessarily get us to the efficiency that we need for these technologies.

There has been general progress on computer and display efficiency over the last decade, but new features are generally provided without consideration of energy or efficiency, per se. And sometimes can result in increases in energy consumption.

The proposed standards will move energy efficiency higher in the priority order for design criteria and drive innovation toward energy efficiency.

Efficiency standards that have been proposed by the CEC are reasonable and well-designed, we believe. They're based on proven performance of a significant number of currently available products and they're performance based and allow a manufacturer flexibility.

And this is talking in the broader scope of the art and science of standard development, these are the kinds of standards and the approaches to standard design that seem to have long-term success.

Now, the computer and display industry really exemplifies innovation and the ability -- and we believe is very well positioned to be able to meet the technical challenges that are in the standards.

We really have no doubt that the industry will be able to comply with the proposed standards by the proposed deadlines. Previous CEC standards for electronic products, like external power supplies, TVs, battery chargers, were met more cost effectively than expected, and ahead of schedule and without negative impacts on their markets.

And if anything, we think that the computers, monitors and displays industry is even better equipped to meet the challenges that we're talking about today.

Now, taking a step back, it's important to understand that computers and monitors are really kind of difficult to regulate at the Federal level. DOE's regulatory cycle is longer than the product innovation cycle for these products and longer than the California State regulatory cycle.

It normally takes a minimum of five years for DOE to develop and implement a new efficiency standard for any kind of appliance. And that means that by the time that a Federal standard could come into effect, the computer and display markets will change substantially from what they were the standard was designed, and that can end up meaning that the standard doesn't function -- may not function well for the industry.

So, we think that California is really the right

context to design the standard and also the fact that a good percentage of the market is concentrated here, and manufacturing is concentrated here. It's the right context to do that standard design in.

And finally, I'd like to conclude just by saying that ASAP is really looking to California to lead the way for computers, monitors and displays, and to adopt efficiency standards that can be updated on a timely fashion, so that they remain relevant to the U.S. market for these products.

And we will also work with other states, who are interested in following California's lead. Thank you.

MR. RIDER: Thank you.

Paul, if you're here? Great.

MR. FORD: Hello, my name's Paul Ford. I'm presenting today on behalf of ITI and TechNet. My employer is HP, Incorporated.

I'd like to preface my comments today, before I begin, by saying that everyone in the room would like to lower the total energy consumption of computers. Manufacturers can substantiate that by, since 2007, we've reduced the total energy consumption of computers by 50 percent. This has been done by consumer demand, without legislation, and also by the Energy Star Version 4.

Before Energy Star Version 4, computers were required to have a power management capability. And for a variety of reasons, consumers chose not to turn their computers off when they weren't using them or they chose not to utilize the power management functions available.

At Version 4, the Energy Star Program determined that they would have to require manufacturers to limit the idle power for a computer. At that point, the manufacturers, all manufacturers, OS, components, processors, graphics cards, different parts of the system, voltage regulators, the bios that contained everything, component drivers, hardware drivers, all of those things began to improve the efficiency.

And that didn't happen overnight. It didn't happen by the time that the Energy Star Program went into effect. But over a period of time, indeed our idle power, which is the main part of the total energy consumption equation, has dropped significantly.

So, the EPA, along with manufacturers and other key stakeholders decided to divide the wide range of types of computers on the market into categories. And these categories were each assigned a different total energy consumption limit.

And that's what brings us to where we're at today, with the CEC. We are proposing, manufacturers

are proposing that we use a category framework, like the EPA has adopted. And there are various reasons for wanting that. The EPA has become the benchmark for the world in terms of energy regulations. The EEU and their energy-related products legislations uses a category framework. The China Energy Label and the China Energy Conservation Program use a category framework. And other jurisdictions around the world, New Zealand, Australia.

So, from a manufacturer's stand point, it is useful for us to be able to have the same type of framework so that we can optimize on certain limits and not have different approaches and different regulations.

So a year ago, after the first draft of the Colorado -- Colorado, that's where I'm from -- the California Energy Commission was published, we were asked, manufacturers and key stakeholders, to think about what category definitions would be appropriate.

And in that time we've looked at those definitions and we've proposed some of them, that I'll go over here in a second.

Also, there was already a workstation definition in the CEC staff draft and we went off and we updated that definition, and even had it vetted by the EPA. So, we'll go over that in detail.

So, these are the different definitions. If you look at all the different types of computers, there's some that are in scope, and Ken went over what products would be in scope. And there are also some that are out of scope.

We propose that there are some other definitions that are in scope, but with alternative requirements, other than total energy consumption requirements. And those are professional desktops, gaming notebooks, gaming desktops, and also mobile workstations and desktop workstations.

So, it's desirable for us, as I've said, to harmonize these different regulations across different jurisdictions. It's not advantageous to have unique regulations that have totally different frameworks, either for customers, or economies, or for manufacturers, or in the case of energy efficiency, or energy reduction.

Our request is that the CEC utilize the workstation definition that was proposed by industry, as it was, with few changes. And we've had some feedback that there were some typographical errors, or some misunderstanding, or in the drafting of the language that it wasn't quite right. And I think that we can get that piece corrected.

We'd request that the CEC, in the interest of time, would align with other regulations and use the category framework. And we can go over that in detail in presentations that will follow mine.

And then, adopt the proposed requirements, compliance requirements for professional desktops, and gaming notebooks, and gaming desktops, and mobile workstations, and have those alternative compliance limits, other than the total energy consumption.

So, let's go into detail on the workstation piece. For a variety of reasons, workstations are -- desktop workstations are distinguished from other desktops primary by the function of error-correcting code. Error-correcting code is something that the memory supports. They can detect bits in the memory storage, communicate that to processor, make the correction.

Most of us, in looking at a display, in a day's time, we would never notice a bit error in the memory. However, if you're controlling a spacecraft, or an airplane, or viewing the image of an MRI, or some sort of medical image, you want all the bits to be correct.

So, a workstation is a device that helps to make sure that that customer set, that commercial customer set has the capability that they need. Error-correcting

code is difficult to implement. It requires special hardware, special design, extra money. It actually is a bit of a hindrance to the performance of the computer because there's this extra process going on.

So, we would definitely propose that the workstation definition remains clear around error-correcting code and that not to gray the area by saying, if there's any other computer that has an expandability score of greater than some amount that it be treated as a workstation. From a worldwide stand point, that doesn't make sense. We need to keep that category of computer separate and clear on what that is.

And then, if the CEC would like to have another category for a high end, professional desktop that exceeds a certain expandability score, then call it something else and have limits that whatever the CEC decides to specify.

So, I think we're in agreement on that. I put it in the page numbers there, and the paragraphs, just so we're on record that this is something we noticed and it's not exactly what we understood the second staff draft was going to be.

The other things, regarding workstations, the other part of a workstation, other than ECC memory, is that it's configurability, the amount of memory that can

be put into the system, the amount of storage, the number of processors, the number of graphics cards, discrete graphics cards. So, there are some, in addition to having ECC memory, the definition says that you have to have three or more of the following characteristics.

It seems like there were some typos there with greater than and equal signs that I believe can be corrected. And again, here's the record for that definition.

And then, finally, each of these in-scope items, in-scope categories that we believe should be excluded from the total energy consumption requirements, in exchange for having a high efficiency power supply requirement, a 90-percent efficient power supply, either for an internal power or, in the case of a mobile product, like a mobile workstation, it would have a DOE grade Level 6 or above for an external power supply.

All of these in-scope products that we would ask to have special treatment would also have power management enabled, as shipped. And in the case of mobile products, with batteries, they would have an efficient energy charging battery circuit.

That concludes what I have to present. I think the next presentation has to do with categories versus

framework. And, hopefully, questions that you might have, Stephen and his crew will be able to answer.

MR. EASTMAN: Hello, my name is Stephen Eastman. I'm from Intel. And I'll be covering some of our category proposal here, that we're talking about here.

So, Paul was very good of talking about how, you know, not all the computers are the same. We definitely need a category approach to computers. And we talked about that last year, when we were here, and we've demonstrated that in a few of the workshops that we've had with both CEC and some other stakeholders.

And in coming up with a new category to show that, you know, we're working with other things that we proposed in October, a new category proposal for computers. And so, and along those lines, us in the industry, and the ITI, and the TechNet community pulled together a large database of power data to see if these categories that we came up with actually hold water.

You know, does these categories that we've proposed, do they mean something and do they actually fit with data? Does the data actually speak out and s how that the category system works?

So, we, in the industry, has actually come up with the different -- a large database. In the desktop area, there's about 170 different systems that we've put

into this database. And it actually came from data of not just the computers or the manufacturers that are represented in this room, but there's actually over 20 different manufacturers that has data represented in this. So, it's a very wide range of data that we are looking at to see does these categories -- do they work.

So, this is the data site here and it's a little busy on the data thing, and hope everybody can see it. But what we're trying to show here is there's four different categories, however you want to call them, whether you category them one, two, three, four. Or, as we proposed in the ITA category system, DT-01, 2B, and then kind of our exempt, which is either that professional desktop or gaming desktop that Paul just talked about. So, I classified them together in the exempt. And they're exempt, again, just from the TEC formula, not from the other stuff that Ken talked about earlier.

But we have definitely different segmentations of computers. There definitely is the small, medium, or the mini-PCs. Those mini-PCs are the category, the one near the first one there.

The second category is the mainstream desktop. The next category is your tower performance desktop. And then, you have your really high end systems over to

the far right.

This is a box and whisker plot. If you're familiar with that, the idea behind this one is it shows inside the boxes here -- and if I move my mouse around so people online can see, inside the boxes show where the majority of the data is. So, that is the second -- or, the first quartile, so 25 percent to 75 percent of the systems are inside this box. And then the middle line, across the middle there, is the median. So, it's the average of the database.

And you can see there is a drastic jump going from the mini-PCs up to mainstream desktops. And then going over to the towers, there's a lesser jump, but there still is a jump of the systems going up. And these exempt systems have definitely a higher, a way higher performance in the systems. And this is following the category definitions that we proposed back in October, from ITI.

Since today we're mainly talking about desktops, we do actually have this information on notebooks. It does show similar results. There was only two categories in the proposal we showed for that, but there is a difference in the notebook categories, as well.

Let's see, is there anything else I missed on the slide here? So, these are the differences that

we're showing and there definitely is a huge difference into it.

What CEC proposed, the category for the expandability adder that they talked about and proposed in their staff draft, latest staff draft, talks about expandability score. Which is very similar to what the IOUs proposed. So, when we collected this database, we collected this database with all the system attributes, that we could do a look at both the IOU proposal, which is very similar to the CEC proposal, and our own I/O bandwidth scalability.

So, to look at that data and see how that data actually fits with it so it could expandability score to create a category system, and we think there's a possibility for that, so we'll look at that here.

So, this is just a scatter plot of all the data points that you saw before, in the groups and the boxes. This is a scatter plot of, hey, how does it go. In the bottom number is base TEC versus CEC expandability score. Just for clarification purposes, base TEC was calculated as you take the measured TEC, the measure of the actual system. So, TEC incorporates all of the short, long, sleep and off. You subtract out all -- we used the CEC adders that were proposed, so you subtract out all of those adders and you come up with what would

be the base TEC of that system. And on the Y axis it shows the CEC expandability score for each of those systems.

Again, it definitely shows a definite difference of the same categories that we had before. There definitely is a different between a -- there's a good grouping of four different categories to systems.

If you look down here at these orange systems, this is what we considered many PCs, and there's definitely a grouping difference down there.

As you move up into the next category of systems here, hopefully, you call can see my mouse here, trying to point out where we're talking about here, there definitely is a group, kind of a box of systems here that show all the different data points up here.

And then as you go above that line, about 425, it's actually around 410 or something like that, somewhere in the range you jump up and the power is definitely a big jump from these systems up here to these systems over here. There definitely is a significant jump in data. The data does show that the categories do work, there is a difference to the systems.

And then, these few data points over here are these exempt and it kind of helps show that there is

less of the market is up there, but definitely these systems are a way higher performance, way up there.

The limits that we have proposed for the different categories are example. ITI will be looking over these in the next few months -- or, the next few weeks, I guess we only have like three weeks to get the comments in. In the next couple of weeks to see, these are just an example, we might slightly change our category proposal when we get there, to written comments. But this is an example showing that the category system does work. It will probably be something similar, but we might have slightly different recommendations for categories.

It does show that the expandability area, they show at about 750. When you get to the exempt systems, there's kind of a big gap between 650 to 750. So, there is definitely a jump there and we feel that 650 would be the line. But again, we might slightly change our comments as we look into the future. This is based on the dataset of systems shipping today.

The last thing we want to show here is the expandability adder, we feel, does not scale adequately to what actual systems do. So, I don't know, the CEC has not told us how they came up with that adder. But we feel, if you look at this large database of systems,

the exempt expandability adder does not scale. As you increase the capability of the system, the adder does not scale.

So, if you look at there, we have the CEC expandability score in one column. The middle one is the CEC expandability adder. So, converting the score into the adder, I know that the lower systems we looked into, technically don't get an adder. But to show the differences, I went ahead and calculated it anyway. So, that's why you get a negative in one of the categories or the top one there.

And then what would happen to the base TEC spread, from all of the different categories that we have. So, we're using the ITI category proposal that, as you can see from both the CEC expandability score and the ITI, it's a very similar adder -- or different category system.

And you can see that the adder capability is a way different scale than what the systems actually adder. It's on, you know, the base system, to a DT-1 system is a factor of, you know, 10 difference.

And then if you compare the green to the green, if you compare the red to the red, you've got a difference of about 18 in the expandability adder. So, it's a huge difference in scale that we don't think is

being incorporated as these systems expand. The adder does not do a good job of reflecting the capability of what real-live systems do.

And again, we're using base TECs in the calculation there.

So, that's all I have for today. And it's Shahid is next up. Thank you for the time.

MR. SHEIKH: Okay, just to follow up. Okay, I'm going to focus more on comparing expandability and characterization. So, this is Shahid Sheikh, from Intel Corporation.

So, we're trying to look at side-by-side comparison of expandability and characterization. If you look at expandability, the pros, it does recognize power supply provision based on higher capability configurations by providing scalability to the TEC requirement. It has a potential to move from multiple categories to a single desktop category. I think that's the intent here, with one base TEC.

And it allows the expandability from one category to another, it's sort of intended to mimic that.

It's easier to verify from market surveillance, you just need to look at the spec sheet. But there's also a con that I want to address pertaining to testing.

On the categorization, the pros are it's our target setting based on comparing like products within each category. So, the three categories that Stephen was talking to, you can look at how we want to compare similar products. It's internationally adopted systems, allows global conversions on the approach.

The reason that's important is because manufacturers are designing and shipping systems to global markets, not specifically to individual markets.

It enables industry design and manufacture, as I said, for the global markets. It reduces the number of adders to a manageable number. Because if you have an expandability score, then you have to look for all-inclusive score or have a large number of adders to accommodate some of the things that are not going to be addressed as part of expandability score.

So, scalable category criteria provides implementation flexibility, headroom for a configuration variation, and allows for a future innovation based on future I/O bandwidth.

I think part of the -- you know, part of the benefit of a category system is that it gives you a little bit of a flexibility in a headroom so that you can have fewer of the other adders, okay. And that is also listed as one of the cons that I'm going to address

a little bit later.

On the expandability, some of the issues are the current proposal is still very preliminary. It does not fully account for current form factor, differentiations. It does not consider soldered-on components of the same capability, example PCI by 16, soldered-down without a physical slot. It's essentially looking at a number of ports and slots that are present.

In fact, there is a little bit of a -- if you look at the expandability score definition, it's intended to mimic the power supply capacity expansion. And with an intention that all the ports and slots are occupied with devices. But when you actually look at the performance score, it simply says port or a slot present, not necessarily occupied.

So we really need to understand is how the testing works. If the score is based on occupied devices, then we think the score is not sufficient. And if the score is not based on occupied devices, then we need to agree on what the adders would be for those additional add-in costs, et cetera.

So, it does not scale. The expandability score acknowledges the presence of additional motherboard components by accounting for it in PCI sizing. But the expandability score, itself, does not sufficiently scale

to code the additional power required for components, itself. You know, and this again, this issue that we brought up is, you know, discrete status controllers, discrete USB controllers, PCIs such as premium module.

Some of the cons of the categorization that were brought up, the current category criteria based on performance score is no longer scalable. I think we addressed that by proposing an alternative category proposal based on I/O bandwidth. This is something we had proposed in, you know, our response to the first draft, as well.

And then, there's a perception of loopholes and overly-generous headroom that, you know, that category allows a lot of flexibility for manufacturers, and there's a perception that this creates a lot of loopholes.

This can be managed based on data and accounting for form factor differentiation, technology feasibility and cost. In fact, Stephen was just mentioning that maybe if we can look at a potential compromise, having an expandability score to set the category criteria, that could be one way to perhaps look at that.

So, additional cons on expandability. Desktop configuration complexity makes it challenging to develop an all-inclusive expandability score. There's no

mechanism to adopt future power delivery requirements into expandability. Example, adding wireless charging dock into an all-in-one base, with factor in the PSU sizing, but there's nothing in that expandability score that would tell us how to do this.

So, there's a lot of the future evolution in the form factor that is very difficult to make it all-inclusive right now.

Implementation is more difficult to test and verify the expandability score for a given system and to correctly identify and control the distribution of configurations that may not comply with the limits. So, the definition implies the populated slots and ports versus scoring it for if the slots and ports are present, but not necessarily populated.

So, there is -- this becomes an issue on if half the slots are populated, other half are not. In some cases, you just have the ports present, but not populated, how do you actually come up with the right compliance criteria.

On the adoption, you know, what regulators may not accept expansionary score and stay with the category approach. What they now is us different energy compliance methods for different regions' increased cost and risk.

One of the issues that was addressed by CEC was that the I/O bandwidth is not easy to figure out from a market surveillance perspective. But this could be easily mitigated by manufacturers providing information, by declaring what the I/O bandwidth is as part of the reporting requirement.

Okay, so the bottom line is expandability score is a good start. We think it's a good idea, but we don't think it's ready for regulatory approach. Given that the CEC plans to wrap things up in the next six months, and having a final rulemaking, it needs a lot more work to get to the point where it's all-inclusive and can again, essentially, can last for the next five to seven years.

Okay, so in terms of draft proposal and concerns and opportunities. Our categories, one-size-fits-all approach not reflective of international standards and globally accepted PC category approach, comparing like products within a product category, freezing expandability criteria for the next five to seven years will likely stifle form factor innovation.

Scalable product category approach is designed to account for innovation.

So the opportunity, as I mentioned briefly, earlier, was possible compromise on the expandability

score proposal and industry I/O bandwidth approach to agree on a product category criteria that's scalable.

On the TEC, target setting and energy setting, CEC's target-setting approach is still based on cost effectiveness assumptions, $18 bond cost adder as part of the second test staff report. It has moved up from $2 to $18. And technically feasible assessment not realistic without impacting user experience.

We don't fully understand if all the user experience issues have been addressed as part of the bond cost, where you're trying to look at increasing latencies and what the user experience impact is.

Industry projections are, and we're going to talk a little bit more in detail, in Robert's presentation, are about $125 bond matter, which is a basket. So, a combination of the measures, hard drive, parts supplies, VR, motherboard, et cetera, to achieve 50-killowatt hour target, without compromising the user experience.

In addition to costs, there are lead time issues. Most hardware changes and redesign requires greater than 24 months to enable the new solutions in the market after the final rule is adopted. So, we're looking at implementation timelines, once we know what the final ruling is.

So, the opportunity here, is industry purports targets based on category approach in written comments. We will propose what that means in terms of energy savings in California and once we have the targets, and based on current situation where the targets are, and what that means.

Entry level systems category targets will likely be lower than one-size-fits-all 50-kilowatt hour. So, we're saying, you know, some of the category zero systems could actually be lower than 50-kilowatt hour. So for those, we may not need a 50-kilowatt hour. So, category approach actually allows you to toggle that.

Allowances for additional capabilities. Industry agrees with CEC's approval to right size additional storage adders based on the storage type. Industry appreciates CEC's intent to simplify a memory adder based on module approach. However, this is not workable given that the memory's not always attached to the module. It limits form factor implementation, it limits the Z-height in mobile systems, and may create a wrong incentive to use lower density dims.

Here's an example that staff report two proposed, approaching the currently used or lower capacity dims. This may actually end up in a negative behavior where you consume more energy, but since you

get higher adders for the low capacity dims then, you know, that may create a loophole, instead of the focus should be to incentivize higher capacity dims, which consumes less energy.

So, industry believes adders should be based on capability and not physicals implementations. CEC did not address industry's proposal for the 12-system memory bandwidth proposal to account for future innovations and resulting higher bandwidth in integrated graphic systems.

We had a full proposal on that. And just to show you what that is, most of the products that you see are over here, so there's not much need for us to get an adder on the current products. But, you know, over time and since we're looking at a CEC regulation that's going to be there for the next five to seven years, we expect the 12-system memory bandwidth would grow. And we would expect at some point where around 140 to 150 system memory bandwidth is when we would need an adder.

So, we would propose what those numbers are in our response. But we were a bit surprised that CEC did not address this at all, looking at the future products.

We agree that there's no need for an adder today, but we would want to have something that accounts for that innovation in the future.

And CEC has not addressed any popular slots beyond discrete graphics. Examples, wireless and higher speed Ethernet, Network and RAID, Video Capture, Net Acquisitions, Thunderbolt. And we've seen power range anywhere from 2 to 10 watts on those cards.

CEC proposed incentives, which we'll address a little bit later in more detail. TEC-motivating incentive to remove end user capability to disable power management will likely concern the end user and impact usage experience, and details to follow.

So, the bottom line, you know, the industry is committed to working with CEC and stakeholders. We still have a lot of work to do in the next several months, leading up to the final rule.

So, just to summarize, this is something that we have shared before. Industry designs and manufactures computers for global markets, key focus is innovation, energy efficiency and customer choice. These are complex, with hundreds of configurations across many consumers and corporate segments, different applications, capabilities and power profiles.

And we work with global regulators to drive convergence on voluntary and mandatory programs. We keep bringing this up because products that industry designed is for the global markets, and we want to make

sure that we can get California to harmonize and converge on, you know, global standards, if possible.

MEPs, Focus, data collection, categorization and TEC framework, international standards, and exemptions. And the key consideration is technical cost barriers, lead time, regulatory impact, energy savings innovation is cost, economics and product exclusions.

So, our goal remains driving global convergence on energy efficiency frameworks and standards.

So, I just want to leave you with one chart here to just show that -- and this is something Paul had mentioned, how categorization is used globally. Right now, CEC is the only regulation that's moving away from that approach.

And I think we have a way to compromise on category approach by looking at either scalable I/O bandwidth or expandability score. We just need to figure out, working with CEC and other stakeholders, how to come to an agreement on that.

So with that, I will thank you very much. I think I've covered my ten minutes here.

MR. RIDER: So, next we have Robert White, with Dell.

MR. WHITE: I'll reintroduce myself. I'm Robert White, I work for Dell, Inc.

I wanted to touch on the technical feasibility, cost effectiveness, and some of the schedule impacts we see as global manufacturers of these products.

In the PC space, our product cycles, we look at a couple of years. Typically, we don't start redesign products to meet new efficiency, either voluntary or mandatory requirements, until there is a locked final standard on the market. We have so many other items competing for attention and to get into our design cycles, that we need a fixed regulation in order to take those limits in, and incorporate them into our development cycle.

On average, that's about 24-month period. And again, I think that would align better with a 2019 effective date, instead of 2018.

A 50-kilowatt hour limit, without taking into account all of the different expandabilities and capabilities of our products we think is very limiting at this point. It's almost 20 watts lower than an entry level category zero system and Energy Star 6, today.

As Stephen touched on, we've collected power data for over 170 desktops. And applying the 50-kilowatt hour in this approach, we have a less than 10 percent pass rate. And again, most of those are those micro chassis, with very limited expandability options.

And here is just a graph. The ones on the left of the bar, those are the systems that pass. But as we go to the right, you'll see that most of our systems fail the 50-kilowatt hour tech limit by 50 to almost 200 percent.

And we worked together to compare the power cost adders for our products. The CEC came up with a figure of $21. We did analysis, ourselves, and we were closer to $110 to $125. And the CEC and industry, we want to work close together with you to use the same measuring stick when we come to cost and efficiency, to make sure we're comparing apples to apples.

The one thing I wanted to point out here is in Table 2 we have reference to a 300-watt power supply. Where on the mid-range systems, that's changed to a 350-watt power supply. So, we weren't sure if that was a change or if that was a typo. Are we referencing the same power supply and the cost impacts for that?

And again, as industry, we can't have a single vendor for any one component. We'll have multiple vendors to support schedules, to support us in case there's a major issue or emergency in one region, or supplies constrained. So, we have to take these limits and have multiple vendors and multiple geographies.

And then we have to account for all of the

variability in the manufacturing process. So, if you say it's 50 watts, we have to set a 49-watt limit, and then all the different components that go in there have to be lower than that. And that's quite a bit of work and takes quite a bit of time.

So just, I'm going to go over these quickly. These were covered in comments that we've previously submitted and we just want to better understand why these weren't considered.

Gary Verdon, my colleague from Dell, one way to address this, we looked at integrating notebook components into a desktop chassis. We researched and found about a $40 to a $120 cost increase if we wanted to take that route.

Hard drive capabilities, our colleagues from the hard drive manufacturers came and presented, you know, we're going to have some issues. If you back-calculate out the amount of power that can be consumed in idle mode, we really have to be around 10 watts when we're in idle mode to meet these limits. And that's difficult today with some of the 3 and a half inch drives. And as we go down to the smaller size, the 2 and a half, and to SSDs, you see a big multiplier in the cost of these systems and technologies. And again, that's just further illustrated on this slide here.

We also commented on the challenges that we saw on the power supply design. You know, by chance we may have some power supplies that are more efficient down below, you know. As Ken has talked about, the 80 Plus Program today focuses on 20 percent load, 50 percent, 100 percent load.

As we look at a 50-kilowatt hour limit, we're really -- depending on the size of the power supply, we're at 10 percent load, 5 percent load, or 2 and a half percent load. And we have multiple presentations that we've done, that we've discussed. And that Ken has even mentioned that, you know, as you get below the 20 percent load, the efficiency curve drops off sharply.

And I wanted to reference the document from EPRI and Ecova, published on December 16th. It highlighted some issues that we've seen as working with our power supply vendors. You know, lower leakage, switching losses, as well as new techniques for addressing emissions through better filter designs or switching algorithms would be required.

And again, you have to look at what is the limit. If we're at a 10-watt at a limit, I have one system that has a 200-watt power supply, I have another system that has a 400-watt power supply, that loading percentage is going to vary based upon the output of

that power supply.

So, it's really like I have to focus in, okay, I want to know what a 5-watt load is and a 10-watt load, because of the variability in the loading based upon the capabilities of that system.

And industry would like time to work with EPRI and Ecova to investigate a global standard. We'd like them to update the Data Plus Program, possibly create a new category that looks at the challenges that we face as we increase efficiency down below the 20 percent load.

There may be tradeoffs that we need to make. And that's maybe drop the 100 percent load point. But if you look at a computer today, with an internal power supply, how much time do you spend at 100 percent? .00001, maybe, in a rush when you turn it on. You know, that's not realistic.

Let's look at where we're going, what we're driving through to save, you know, power, reduce auto mode. And to do that, we need to go down and look below 20 percent, and we need to create a standard that recognizes what it's going to take. And we, as industry, are willing to do that.

Again, this is kind of rehashing what I've said before. The one year between publication and effective

date, for us to intersect that is really unachievable. You know, we will have systems today, our micro chassis that meet it, that we won't have to do anything. And that might be the only product we have available for the next couple of years.

We can't intersect design changes without recertifying to all the product safety, EMI, and other environmental certifications that we have to qualify our products to for the global marketplace.

We would like, if you're going to stay with the 2018 effective date, we'd like to request that models that are already finished certification and on the market be grandfathered through the life and that the 50-watt kilowatt power limit only apply to new models that are introduced to the market after the effective date, not that continue shipping until their end of life.

Again, to achieve the 10-watt auto mode, or the 50-kilowatt hour limit, we need new power supplies. We need new CPUs, chips, motherboards. We need to possibly move away from 3 and a half inch, and look at 2 and a half inch, or SSD drives. We need the discrete graphics manufacturers to reduce auto mode power on theirs. We need expendability cards. As Shahid alluded to, it's looking at unpopulated slots, but sometimes these slots

are populated with different devices, and we need the expandability score to comprehend that.

And another important thing is operating systems. So many times you're OS will have tasks that it needs to complete, but if you're doing something that's very intensive, it will delay that until the system is not being used. And guess what, that is idle mode. So, it will put off that task until, you know, so it won't affect your performance or your user experience.

So, the operating system has to coalesce and we have to make it agreements that, you know, depending on when the system goes into the long idle or short idle, we need the OS to stay there and not do anything. And so, it's going to take a lot of work. As well as NRV Spyware, and other security enhancements.

And again, with all the re-certifications that we would have to do, we're really looking at a 24- to a 36-month process from publication of the final spec until we can get new products to the market.

And that's it.

MR. RIDER: I think we have Mark next.

MR. HOLLENBECK: Okay, Mark Hollenbeck, HP, speaking on behalf of ITI and TechNet.

What I'm going to cover here are some issues

that we've found with the current regulatory language involving power management. We have some specific examples that I'm going to cover here, in a few minutes, that we'd like CEC to reconsider.

And then, we also looked at the regulatory language for the incentives, as well. And really, there, have some questions about what CEC's intent is and would really like to work to eliminate uncertainty and ambiguity.

So, before I get into this too deeply, maybe some background here is appropriate. We have experience with working with regulators that want to implement requirements imposing power management.

And so, some of this we've worked with regulators in the past to help write language that would address some unique cases where computers are shipped with a power management scheme that's not what you would typically expect to see in what's currently specified in the regulation.

Most specifically, the computer going into a sleep mode after 30 minutes of user inactivity is probably the biggest one. And we'll get into those details.

So, we talked about this probably for the first time, when we got together in Folsom for that workshop.

Went through most of those examples that we were concerned with at the time, that we'll cover in a minute. And conceptually agreed, I think with CEC, and some of the IOUs that it was appropriate to put something in the regulatory language that would address those.

We then agreed at that time to go work with the IOUs, Peter May-Ostendorp -- I probably mispronounced that. Okay, thank you. And I went and worked offline together to try and frame some regulatory language. A little bit it was based on my past experience, to address the issues we were seeing with the proposed power management requirements.

Sent that to CEC and thought we all had agreement that we had solved that problem.

I think what happened is some of the legal people took a look at the language that we had drafted, had concerns with the way it was drafted that there was ambiguity in the language.

So as a result, what happened is we've got the same power management requirements specified in the regulation, with one exception. And Ken talked about this earlier, and that is that the one change that we had discussed making was that if someone buys a computer, typically a commercial customer, wants to buy

it without an operating system, so they don't have to pay for it twice, and install their own customized image on it which will -- in our case, will likely have a Windows operating system. They pay Microsoft one time and it's an integrated system that has all of their software integrated with the operating system.

So, that was addressed in the regulation and that's good. But we have a number of different cases that still need to be addressed.

So, what I'm going to do here is just talk about this table. This table is intended, really, to be a took and a reference for CEC and us, as we talk with CEC in the future to address some very specific issues.

On the left here, we're just giving you the regulatory reference where we found the issue. This column right here just describes the issue that we see. It's typically a computer shipping with an operating system that doesn't fit the traditional power management model that's currently specified.

The middle column here, we identify the scope of products that are impacted. There are power management requirements that have been applied to, as Ken had said earlier, basically, all of the computers. Each situation may or may not apply to all the types, so it's important to look at that and be aware of the different

types of products that have been impacted. And then some additional information about the typical use, et cetera.

And so, what I'm going to do here, you don't have to worry about the fine print, I know it's a bit of an eye chart, I'll cover these unique situations. I won't even get into the product types impacted.

I want to make folks aware of each type of computer and situation that we're currently shipping. And then, really, what we'd like CEC to do at some point is go through each of these individually, drop back to square one, and really ask yourself whether or not you want to make these particular computer operating system combinations illegal for sale when the regulation goes into effect.

These are current things that we do in response to customer needs, now, and that's what's at stake, whether or not they're permitted or prohibited in the future, when the regulation goes into effect.

Okay, the first one is similar to what was addressed in the regulation, where the regulation did allow shipping a system, without an operating system installed. And, of course, in that situation you don't have to meet the power management requirements.

This one, are computers that are sold

traditionally to commercial customers, that have a free DOS operating system installed. And the reason we do that is so that, basically, customers can boot the computer up one time. It's typically the IT department. And then they can download their software with an operating system that they've typically paid for.

So, this is very similar. Obviously, free DOS that's going to be used one time is not going to have traditional power management that's specified in the regulation. But the point is, is that the customers are going to install an operating system, in our case, that would often be a Windows OS, that has power management capability enabled.

So, that's the one issue that you really just have to look at and decide whether or not you want to continue permitting it.

The next one are computers sold or configured with the Linux operating systems. And there's a number of them. I can't remember them all. I know Red Hat is one. There are others that I put in the speaker notes. But these are basically a series of open source software operating systems that some customers typically want.

And again, this would be primarily commercial customers. And they don't typically have software -- or excuse me, power management of the system unit on the

Linux operating system. And I'm sure the volume of these systems that are shipped with the Linux OS are fairly low. But we want to honor our customers' desire, when they want to purchase a Linux OS-based operating system, to continue shipping those. And we don't want to be forced to attempt to layer on some sort of power management system on top of that OS.

Okay, the one at the bottom that I've got listed here are notebook computers. These are typically going to be your smaller notebooks, that are still in scope of this regulation, but not taken out of scope because they're a slate or a tablet that have a Google Chrome OS.

And the Google Chrome, and the next one that I'm going to talk about, so we might as well go to it, which are the Android-based operating systems, don't have, at least as far as I know and from what we've shipped within HP, a traditional power management scheme. They regulate or limit the power consumption of the product in more dynamically in the idle mode.

So, similar to what Energy Star recognizes, we would want something put in the regulatory language that recognizes that the smaller notebooks that are configured with a Chrome or Android OS are no longer -- or, are not going to be made illegal for sale in

California, just because they don't put the system unit to sleep after 30 minutes, in an S-3 sleep mode.

Okay, and so those are basically the scenarios that we know about right now, that don't fit the traditional power management mode, that we would like to continue offering to our customers.

The next one, really, is just to give a regulatory reference down here in the lower, left-hand corner, to the regulatory language that talks about using two different tech weightings, that Ken had talked about earlier, dependent upon whether or not power management is enabled as shipped and can't be turned off by the user.

And so, we've got a series of questions here. Some of which I put together and others in the industry group have. It's more a series of questions.

The one thing that I struggled with, when I looked at that language, was not knowing when the incentive would be available, such as in a situation where we shipped a computer without an operating system, or with a free DOS, Linux, or Android, or a Chrome OS because, certainly, you know, a system shipped without an operating system doesn't fit the existing language or scenario either way.

And so, we would just like to know what to do in

those cases, if we wanted to use the tech weighting.

And this second line down really gets to that same point, as well. When customers re-image the machine, so using the example I provided earlier, a customer buys the machine with a free DOS operating system for one-time use. Then, they're going to re-image the machine with, let's say, Windows operating system, that has power management.

Right now, and we think it's actually, at least some of us have concerns about customer usability issues. Right now, customers prefer to be able to use their power management settings and to change them when they want.

And I think the research that you guys looked at showed sometimes they might disable and other times they might actually want to make them more stringent.

So, the question here is just, you know, have you thought about what -- how to approach this when the customers are going to re-image their machine with their own custom operating system?

And the same basic question here is whether or not you can use the incentive when you've got an operating system, like Google Chrome, or an Android OS, that doesn't provide that traditional sleep mode after 30 minutes of user inactivity, but certainly manages

power consumption in the active mode, from short to long idle.

And I mentioned earlier, this second from the last bullet, and that is have you thought about situations where customers actually want to make the power management scheme more aggressive than the defaults that we might ship?

And lastly, have you thought about the consequences of forcing users to have power management enabled to ship, they can't change it. In instances where they might want to run modeling or different software activities that could operate and execute by themselves, unattended, but you certainly wouldn't want the thing to go into a little power sleep mode, and right in the middle of your modeling exercise, after 30 minutes.

And so, those are some more questions that we would like to discuss with CEC before the regulations are finalized on power management.

We'd also like to request that CEC consider a little bit more flexibility when a tech-based power consumption limits are met. In other words, if we meet the basic tech limit that has been developed with limiting power consumption in an idle mode, why would we have to also meet the power management limits? Again,

something to consider before these regulations are finalized.

So, what we would like to do would be to have CEC continue to work with us and actually go through -- I'm going to go back, just to the individual examples, look at those individually. Decide amongst yourselves, number one, if you need more information about each of these situations, we can provide it.

If you decide that you want to continue to allow us shipping computers configured with these nontraditional OS's, then we would like to work with you or your attorneys, when it's convenient, to come up with language that allows that, because we're quite a ways away from that point at this time.

Thank you.

MR. RIDER: Thanks. And I'd encourage folks, there are a lot of questions on the last couple slide decks, to come back up and -- because we're just trying to get through these presentations and I'm not going to try to answer all of these right now. But please, for the ones that you want on the record and you want to have a discussion, please come back up and ask these questions when we get to the discussion part of this meeting.

There were some in previous presentations, as

well. And, you know, I'd like a discussion and answer some of those.

So, next we have Mark Cooper. I need to unmute him. Just one second. Okay, Mark, can you say something for us? Hold on, let me get his presentation.

Okay, so Mark, I see you're online and I see you're logged in a few times. One of your phones is unmuted.

All right, so maybe what we'll do is move Mark in the agenda, and move on, and we'll come back to Mark. And I'll try to type to him to get that worked out.

So in that case, the next would be the IOUs, California IOUs. I'm okay with that, yeah.

MR. DEL FORGE: Click on the left button?

MR. RIDER: Page down.

MR. DEL FORGE: Oh, page down, okay. All right, thanks.

All right, Pierre Delforge, NRDC. I'm going to go from the more general -- we're going to go from the more general, in my presentation, to the more specific, which is why I'm going to go before the IOUs.

So again, I'd like to thank Commission and everybody for attending today and having this exchange of views and discussion.

I'm going to focus my comments on the need for

computer standards and technical feasibility and cost effectiveness. And I'll let the IOUs, and the consultants, and arguists talk about the more technical details and improvement opportunities.

So, first off, why does this matter? You know, the range of numbers on computer energy use in California, the Energy Commission's actually at the lower end of the range. EIA puts it about 50 percent higher. And neither of these numbers include active energy use.

So, when you actually include active use, real-world idle, we are typically between 20 and 30 percent higher than those numbers. So, whatever the numbers, they are very significantly and clearly a priority for helping the State achieve its energy and greenhouse gas goals. And this is, you know, probably the one of the top unregulated electric loads in the State.

So, the next question is, well, you know, how much of that can we save? And the thing is, we can save a lot. And the reason is because most of that energy is actually spent doing little or nothing when the computer is idle, or the user is performing light-intensity tasks and the computer doesn't need that amount of power to carry out the workload that it has to carry out.

So that means that we have a high potential,

particularly in desktops, I think it's not so much the case, less so in notebooks. But particularly in desktops we have a large opportunity to reduce energy use. And as we're going to see in a minute, I think we have a lot of technology opportunities to do so.

I've shown this slide before, but I think it's important to show it again, just to clearly illustrate the need for standards. What this slide shows is that the computers, desktop computers, and to some extent all-in-one computers, which do not have battery life constraints, are not as optimized as the mobile equivalents.

And some of it is due to performance, but let's remember these numbers are using the Energy Star idle mode, not active. So, which means that this is actually not doing any work. And when the computer's not doing any work, there's little reason that it should be using a lot more energy.

From a price perspective, if you actually -- and these are typical numbers. But if you actually take into account battery and display, these are also machines of similar prices. So the price, again, is not a factor here.

So, I think what this shows to me is that we clearly need standards to step in where the market,

itself, doesn't provide incentive for energy efficiency. And even when it does, for mobile devices, it's not sufficient to drive all cost-effective energy efficiency, which is why the market incentives need to be complemented by standards to ensure that we do achieve these cost-effective energy savings.

So, this is not just theoretical. If we look at -- we've got two proof forms, which I'm going to present a very high level and let my colleagues, from Aggios and Power Integration present in more detail.

But we have two proof forms showing the cost-effective energy reduction potential on desktops. The first one, these two machines you see, at the end of the room, for those who are in the room, and for those on the phone we have two computer demos that we'll go through later on. In red, you have a typical, not-optimized desktop, which uses about 100 kilowatt hours a year, you know, using the Energy Star test method.

And in green you have a very similar desktop which has been optimized for energy efficiency. So, same performance specification, but optimized from a settings, power management settings from a software perspective, and with some embedded components.

And I won't go into the details of the components. You know, Aggios and Power Integration will

do that. But I want to point to the results of this demo and this shows that we can, and if you confirm to what has been said before, we can reduce energy consumption from a typical non-optimized desktop by roughly 50 percent through optimization, and a lot of low cost, or sometimes zero cost energy efficiency measures.

And the optimized desktop is about 20 percent lower than the proposed CEC limits. And I would add, as well, that it doesn't actually include all of the optimization strategies that we have proposed and that are included in Ken's proposal.

The second proof point is actually on two products which are commercially available, that were put on the market in 2014, purchased and tested in 2015. And what we see on this slide, and this power, this is not in energy, this is power in short idle and long idle. And one of the products for Product B uses half the power in short idle and a third of the power in long idle.

And there are many reasons for these differences, some of them extremely simple. One of them ships with maximum brightness, the other one with auto brightness control. That makes a significant difference.

Others are, you know, software settings. We have an anti-virus running crazy on the -- by default, in the idle mode, on one of them. And there's other -- and we did a tear down of these two devices and we looked at component-by-component what is the power draw, to understand why they are making -- they are displaying such a difference. We will docket this information as part of our comments.

But, basically, we have a number of very simple, very local, zero cost strategies, and some which have slightly higher cost. You know, display efficiency, disk, et cetera. But actually, the Product B is actually higher performance, significantly higher performance on the benchmark than Product A with, you know, less than half of the energy use.

So, I want to show some of, you know, how do we do this? And this is not, you know, futuristic technology. Most of the technology, nearly all of the technology is available off the shelf and shipped, you know, and broadly used in the market today. Some of it is actually in most products, but not actually optimized and configured to be efficient. So, those are the C-states are not enabled or not fully enabled on most of the desktops. And C-states are the deep sleep states in the CPU.

So, optimizing this already makes a big difference. Optimizing the user settings, you know, like display brightness, screen dimming, off, sleep, that's another difference we saw in the two all-in-one products.

The power supply, so what you're going to see with the demonstration is a prototype of a high efficiency power supply at low load, at the idle load point.

We heard industry last year, and again this year, that this was one of the major issues in terms of meeting CEC's proposed effective date of 2018. And the team at Power Integration, working with Aggios, and Semiconductor, put together a reference design prototype that has much higher energy efficiency, at low idle load point for less than a dollar of material extra cost.

So, I think this -- you know, hopefully, this will help industry look at a -- or maybe revise its estimate of the cost and feasibility of moving forward with this proposal.

Others, the motherboard is -- you know, we have a commercial motherboard, which doesn't cost much more. There's many other opportunities to basically power off what's not being used in the motherboard which, you know, significantly reduces energy.

Displays, similar opportunities, as what was discussed this morning. I'm not going to come back on it.

And I think somebody mentioned disk and the cost of SSDs. There's a number of ways of meeting the standards. The demo here just uses a green HDD. You can also use hybrid configurations, with a very small amount of solid state drive, just for the operating system, which never goes to sleep and is always very responsive in high performance.

And then, a secondary hard disk drive that can be power managed in idle to reduce energy consumption, whether it's completely spun down in long idle or just in a lower active mode in short idle.

So, these are just some of the opportunities. There are many others that manufacturers can choose from to be able to meet the levels. And to us, it clearly shows that there's a wide number of tools in the toolkit that can be used to achieve these levels.

So, based on this, we think that the levels can be met cost effectively. I mentioned that, already, there's many solutions to do this. It's a performance-based approach. You know, the proposal is not dictating how to do this. It's not prescriptive. It's leaving the flexibility to meet them in the most cost effective

way. And that's a recipe for innovation that the, you know, standards will enable.

And I think the last point is, you know, what we're showing today as a demo, within our limited means, we're not manufacturers, we don't have all the design expertise and all the tools to design the lowest possible and the most cost-effective machines. But with our limited means we've shown that we can far exceed the levels with very little cost.

While we generally support the CEC's proposal, but there are a number of important points on which we'd like to see it improved.

The first one is, you know, this is a one-tier approach right now, and a one-level after one year. We actually think that we can achieve more savings in two years and have a two-tier approach, where the first tier is focused on the easy savings that, you know, things like settings, and simple software optimizations that can give savings very quickly, but do not re-engineering of the product.

And then in two years, we have the more, you know, the deeper, more technical improvements that require re-engineering. And we think this is a recipe that will yield more savings, while giving industry the flexibility it needs to be able to re-engineer some of

the products and put this through its supply chain.

The expandability adder, we support the concept, but we think there are important details that you finalized. And I think we heard something similar with industry, so I think we need to work together, with the Commission to finalize this ASAP.

But we don't think we're too far and we think we have, you know, and we agreed with some of the things that were presented by industry speakers on some of the assessment and possible solutions going forward.

On the allowances and levels, some of them are too generous, mainly on mainstream notebooks. On the display adder for high resolution displays, some of them are really, you know, two or three times higher than the entire -- the rest of the levels for the whole computer. And that's completely unwarranted.

And then on the disk adder, for the 3 and a half hard disk drive, we also think that this is probably about twice as much as current technology requires.

We'll put all these details in our comments, but we wanted to highlight some of the key things here.

Definitions, we agree with industry that some things need to be tightened and clarified.

Duty cycle, this is an important one because Energy Star 7 has different duty cycles, depending on

connectivity. But this not actually based on data. This is incentive in Energy Star. And while it makes sense on a voluntary standard, as an incentive, it doesn't make sense as a regulatory requirement because it's just an incentive. It's not based on actual data on what the actual duty cycle is with network connectivity. And that could lead to basically weakening the standard by 10 or 20 percent for those machines that have network connectivity without justifying it.

And last, the drive power supply requirements, we think the idle limits are not sufficient. They're important because the drive power supply efficiency at idle load. But there's also -- it's important to have efficient power supplies in active and inactive mode, especially for those computers, you know, gaming computers that will be running very often at much higher load point than idle.

And also, we think it's important to have power factor requirements because some of the power factor, it can be -- it can increase significantly energy use, both on the customer side of the meter, but also on the utility side of the meter, which adds up to power plants, and energy use and waste. So, it's something that should be also included in these requirements.

So in conclusion, we think that this proposal has not only important environmental benefits from the carbon and energy perspective, but also from an economic perspective. And I know Mark, hopefully, he will be able to speak later on, but he's going to highlight some of the economic. So, savings for customers, savings for businesses in California. And that means that, you know, it benefits California's economy if customers, consumers have higher disposable income and businesses have lower cost.

So, we encourage CEC to continue and finalize this rulemaking as soon as possible. And I would like to thank you.

MR. RIDER: Okay.

MR. COOPER: Hello?

MR. RIDER: Yes, Mark.

MR. COOPER: Can you hear me now?

MR. RIDER: I can hear you now. And I'm going to bring up your slides.

MR. COOPER: Can I control them or do you control them there?

MR. RIDER: I will. You just go ahead and tell me to advance the slide.

MR. COOPER: I'll tell you when to switch them. Okay, fair enough.

MR. RIDER: I just have to --

MR. COOPER: Sorry, I was doubly-muted and I didn't realize. I had muted myself and one of the hosts had also muted me so --

MR. RIDER: Okay.

MR. COOPER: Okay.

MR. RIDER: I just have to find your slides here. There we go. Okay.

MR. COOPER: Okay. Well, let's go on to the next slide then. All right, as we said last year, Consumer Federation focuses on the pocketbook issues. We focus on regulatory design and we participate in, I personally, an awful lot of these kinds of proceedings.

And we always start from basic questions. What's the problem that the proposed standard would address? How can this standard be designed to best achieve the goal? And where can the standard save money?

And when we looked at the products over the last couple of years, we think the answers are crystal clear. The markets of these digital devices are afflicted by significant and persistent market imperfections and failures with energy use. Performance standards are an ideal solution to the problem. And the proposed standards will deliver significant consumer savings in a

very short period of time.

According to industry, for the last 35 years, every energy efficiency rule has been too soon, too costly, and bad for consumers. And I've been in those rooms for over 35 years.

Once we get the standard in place, when they're well designed, we discover that they don't cost nearly as much as industry said. They get done very quickly. And they actually deliver very substantial benefits to consumers.

The next slide. And we think that's the case here. So, in this graph we have identified a series of market imperfections that afflict these products. And I actually left out a couple of underlines, I think translating from the document. We do think it's a severe bundling problem. Energy is a stranded asset.

Consumers look at a computer and they don't see energy consumptions. They see everything else.

And the manufacturer decides the bundle. So, we have an agency problem. I should have underlined that. The manufacturer knows what the computer does, how it uses energy. The consumer does not and can't see it. So, there some information should have been underlined.

With transaction costs, the consumer does not have good information. They don't get an energy bill

and have the meter running, showing them what their computer is spending. And then, they have a motivation and calculation on the behavioral end. So, this is a case where consumers need help. Their interests need to be advanced by the regulator because the market will not solve the problem.

So, let's go to the next slide. And on this slide we sort of elaborate on those things I've mentioned. Of course, you ended up with the externality issue of the public issue of reducing energy consumption. And I think that is sinking in globally, as we saw last week in New York, at the UN. There's a strong concern about this.

And then we have the classic market share imperfections. You have the building problem, you have the agency problem, the manufacturer decides the bundles. You have an access to capital problem. They have different interests than we do.

We think raising the standards helps create the market, it creates a flow in the market so that people who invest in innovation around energy efficiency are not in danger of being undercut by people who sell cheap, inefficient products.

And then you see the other problems that we've identified. There really is a significant market

failure here.

So, let's go on to the next slide. Well, that slide's a little bit off. But go to the next slide, I understand.

So, we've been looking hard at these standards and, in fact, I now talk about progressive capitalism. I talk about demand, but not control regulation. And where these high performance standards are exactly that, they create a threshold, a target that becomes binding, so that to establish a goal. But then they get out of the way. They really do allow the marketplace, the capitalists to do their thing. To innovate around that target, to do what they're best at.

And as Pierre mentioned, and if you look at the slides, there are, you know, a half a dozen ways to arrive at the goal outlined by the CEC. And different manufacturers will be better at different things. And so, they will maximize or utilize the things they're good at. And at the end of the day, we'll end up better off. They get at these costs, they advance approaches. Their competitors look at what they've done and realize that, hey, that was a really good approach. And you know what, we could deliver the same goal at a lower cost, if we really learn how to do that.

So, there's a dynamic full competitive process

that goes on when you develop technology neutral, product neutral standards, which is exactly why the costs are never as high as the industry says in advance, or even the regulators say because they get pushed by the industry to use higher numbers.

I think over time we clearly need to have a pathway towards improving these standards. I think if you look at these documents, the Commission has been responsive to industry concerns. I think there is certainly opportunity to work with industry continuing. I think the interesting difference between categorization and expandability is a bit of a red herring.

I mean, if you're worried about it, every manufacturer will know exactly which category the California compliant standards fit into. So, the rest of the world will know. I just don't think that's as difficult a problem.

No, maybe categorization is a better way to go for different reasons. But the notion that somehow or another you won't be able to sell computers overseas because you won't know which category they're in, no, that's not a significant problem. They will know. And the California Energy Commission could actually publish a list of what categories each representative set of

configurations fits into. That would be industry regulated cooperation. I think it is responsive to consumer needs.

They have made some changes to accommodate higher levels of us and so I just think at the end of the day, the proposal we have before us is better than the one we had last year and we fully supported the one we had last year.

And if we go to the next slide, you can see the economics, as we see it. Yeah, we tend to have a rule of thumb. We like for the rules to be intra-marginal. That is, we don't think that the regulators should be at the absolute edge of technology and that's certainly not the case here.

We like to have either the cash flows early on, and you can see the payback periods here are fairly short. We like to have a ratio that breaks even within half of the product life. And that's, again, you see that clearly here.

So, from our point of view, our series of consumer pocketbook tests, this is a very good standard. And so, I would conclude by saying it is really time for California to adopt a standard. We've been at it for a while. We've been back and forth. Delay, delay, delay doesn't get the consumer the savings that we need. It

doesn't get us on the road to an evolving and increasing level of efficiency.

This is an opportunity for California to lead, not only the nation, but the world. And we have seen that in the last 35 years, things that energy said couldn't possibly be done, be done in California, have become things that are done all around the globe.

So, we echo the question of the national benefits and the global benefits of having California move forward with this standard, to work with the industry to make it translatable into global standards, but also get it done. We need this standard in place. No more delay. Thank you.

MR. RIDER: Thank you.

We will have, Bach, if you're ready, come up.

MR. TSAN: All right, good afternoon. This is Bach Tsan, speaking on behalf of the California IOUs. I'd like to commend the Energy Commission for embarking on this standard.

So, why standards? So, despite the progress of computers, we acknowledge they've been significant energy savings, but we still think there's largely, quite a bit of wasted energy that can be accounted for.

Through our analysis, we have found cost effective and feasible solutions that we'll be talking

about later, from my team. We need to develop these standards to meet the State energy goals.

The IOUs generally support the CEC's proposals but, you know, we believe there are several areas for improvement.

So, we've been supporting the -- we've been doing some research since 2010, the California IOUs have been very active in this space, in appliance standards, specifically, and computers. We've had work done starting as early as 2010 and, since then, have conducted 12 plus research projects that we have docketed. And we have docketed many studies and analysis in our research, which have support our report in the response to the invitation to participate, since 2012.

So, we've been -- ever since last year, we've had several activities since 2015. The Desktop Demonstration, ongoing engagement that ITI has -- we've alluded to the Folsom meetings and a meeting at the Energy Solutions' office. We worked on joint submittals on definitions, shared proposals on framework. Additional analysis and submissions, addendums to proposes, including discrete graphics and security features. Reviewed and modified certain certification requirements. The second round of compliant desktop

demonstration and the administration and tear down project that Pierre mentioned.

I'd like to hand it over to Peter May-Ostendorp, from Xergy, and Nate Dewart to go over the technical details of our research.

MR. MAY-OSTENDORP: Peter May-Ostendorp, from Xergy Consulting, on behalf of the California IOUs. So, I'm going to touch on four areas where we have some detailed comments. Of course, there will be a lot more detail in our written comments to come.

First off, a big change in this proposal and one that we strongly support is the addition of the expandability adder. And we've heard a lot about this today. We support this as a framework to address a lot of the concerns that we've heard over the past year regarding systems with higher performance and higher expandability needs

And just to clear up a few things, because I think there's been some discussion about, you know, it's a choice between expandability and categorization. And the way that we see the current expandability framework, it effectively does create three classes of systems in this proposed standard.

Effectively, you have a class of minimally expandable systems. These would be similar to what the

industry is calling DT-0 systems, the mini PCs and so on. These receive, effectively, no expandability adder.

You have mainstream systems that are this DT-1, DT-2 in the industry presentation. These are receiving some form of a linear adder for their system expansion capabilities.

And then, you have these highly expandable systems, the really high performance stuff that receives no adder and, actually, gets exempted from TEC requirements altogether, and just has power supply requirements. So, really, we actually see a lot of similarities and a lot of common ground on this.

But there are a couple of key areas that we're looking for some refinements and we'll be proposing those in detail, in written comments. I think there's some work to be done on exactly how the expandability score would be calculated. And I think you heard in some of the earlier presentations, the issues around, you know, sort of future proofing those requirements so that we can make sure that technology down the road can take advantage of these.

In addition, I think probably some more work needed around the criteria for exemption from TEC requirements, which we heard, and it's a little bit intermingled with the workstation definition at the

moment. So, that's another area we would see some room for improvement and clarification, as well.

I think Pierre alluded to this earlier, in his presentation, the integrated display adder, and this takes into account the fact that we have received an addendum that reduced these values by 20 percent already. But we see the integrated display adder, in its current form, as still being overly generous.

And it's basically there are a couple of areas where it's problematic. It's for large, high resolution displays, in particular when the EPD factors are brought into account, which sort of amplifies the problem.

And just to illustrate, I think Pierre alluded to this chart. You can see, these are -- in the blue, this is what we've calculated as the integrated display adder for a number of high resolution, large, integrated displays in real systems. And then shown alongside is the TEC, not of the display, but of the entire integrated desktop.

And you can see, as you get far to the right with some very -- these are, you know, 5K displays, it's multiple times the TEC of the whole system. So, we know there's something amiss there and we'll be proposing some ways to resolve that in our written comments, as well.

The secondary storage adder, again, you know, supportive of the concept and we think there's some room for refinement, particularly when it comes to 3 and a half inch spinning hard drives -- the magnetic storage, rather. What we see in the red, on this chart, is the 26 kilowatt hours a year that CEC is requesting.

And what we find is that basically, you know, that allows the secondary drive, the 3 and a half inch drive to just spin all the time. And we think that with some very modest power management, those levels could be brought down to somewhere in the 12- to 17-kilowatt hour per year range. And this is not completely powering down the drive or anything, while it's in short idle. these are low-latency solutions that we think are pretty workable. So, we'll be discussing those in further detail, in our proposal.

And I guess another, this is more of a question that we can raise later. But there was some question around what is meant by the "other drive" category, as well. And we believe that that should reflect the adder levels for solid state drive technology, unless there's some additional clarification on that.

And finally, on power supply provisions in the current, proposed language. So, we're very supportive and have been of power supply requirements for all

systems. And in the current proposed language we have 80 Plus Gold requirements for workstations. And I should have put small-scale servers, as well.

And in addition, we've sort of split these out separately. We have this intended sort of category of high-expandability desktops, above the 750-watt expandability threshold that would receive 80 Plus Gold, as well.

And so, we just want to reiterate, you know, our support for that. And, in addition, we would like to see 80 Plus Gold with a 10 percent load requirement and power factor levels, as Pierre had mentioned.

Now, for consistency, we're going to be proposing that we continue to extend power supply requirements to all systems. Our proposal here is a slight modification on what we've been talking about originally. We're looking at 80 Plus Bronze as a baseline requirement for all systems, even those covered by the TEC. So, if you're not a workstation, or small-scale server, or a high-expandability desktop, you would be with 80 Plus Bronze, and power factor levels, et cetera.

A couple of reasons for that. The active mode is not addressed anywhere else in the standard, so we feel this is still an important issue.

Secondly, you know, why Bronze? We think that those levels are similar in stringency to what the European Union has in the ERP requirements, today. And those requirements, at least to our knowledge, have been implemented without significant trouble and have been in effect.

In addition, and I think maybe most importantly, this prevents backsliding on a market transformation that's really been going on for the past decade, on power supply efficiency. And we'll continue to kind of promote that momentum.

So, I'm going to turn it over to Nate Dewart, from Energy Solutions.

MR. DEWART: Great. Thanks, Pete. So, I would be remiss if I didn't thank Chris Hankin for the shout out to the Golden State Warriors and Oakland. And you're welcome to visit the confetti that I have in my office anytime, for the last years' parade.

(Laughter)

MR. DEWART: So, in terms of just two items that haven't gotten a whole lot of attention, but we think deserve this attention. So, we have a duty cycle, as Pierre mentioned, that there appears to be a loophole in this. And, of course, there's history behind the development of this from Energy Star. But from the

regulatory perspective, it seems that the conventional only is warranted. It's data informed, although in the past we've submitted comments about how this may be underestimating the amount of time in idle mode and active mode. But we think it's still sufficient to have one duty cycle.

On the contrary, for the full network connectivity, we're not clear on what's the data that has informed this. Moreover, even if there were data, it's not clear at this point how to assess, from a compliance perspective, how to determine the type of connectivity, whether it's base capability, remote way, full capability. That hasn't been sorted out and so, yet, another reason.

And then, finally, it could understate the TEC up to 10 percent, if you look at base capability compared to full capability. There's roughly 10 percent of wiggle room there which could be, on paper, be an easy way to comply without making any changes.

Another area of attention, where there's some significant savings available, looking at notebooks. And I think from the staff report, I think from the analysis, it showed 74 percent of products, of Energy Star 6.0 were compliant. And that was in November of 2014.

Looking at what ITI had put forth in an assessment, in some public slides, was 90 percent. And looking currently at the market of products, 2015 and 2016, roughly 97 percent are meeting Energy Star PPL. And it didn't appear that the levels have changed between 1 and 2, so that's just a matter of the market moving.

So, we recommend that the CEC take a closer look, that the staff take a closer look at the current data. We did the same. A quick assessment here shows a significant drop, yet a high pass rate. So, even looking at -- we recommend going as far as 11 for the base allowance, 16 still leaves 75 percent qualifying.

Moreover, looking at the display adder, just as Pete had suggested, we recommend that they take another look at the display adder, as well.

And we're open to looking at categorization for notebooks, as we've talked about. And the savings is significant. So, roughly, 290 gigawatt hours would result in, I think it's 54,000 homes in Sacramento County, which is not insignificant.

So, finally, as a summary, we have cost-effective and feasible standards. We are very supportive. We suggest some modifications. There are a few areas for improvement.

Definitions is another one where we haven't provided comments today, but we will on the record. And we look forward to submitting those and seeing the 45-day language come out. So, that's it, thanks.

MR. RIDER: So, for folks like me, who drank a lot of water during lunch, I think we're going to go ahead and take a 10-minute break. Please come back -- what is it? It is -- please be back here by 3:30, so don't wander far. And we'll reconvene at 3:30.

(Off the record at 3:21 p.m.)

(On the record at 3:38 p.m.)

MR. RIDER: Thank you, Jerome. That's our CEC IT there, at work.

Next up we have Aggios. Welcome back, everybody. We'll continue on. And then after Aggios and a demonstration and a word from Rich Fassler, we'll get to open public discussion.

MR. ZIVOJNOVIC: Thanks, Ken. My name is Vojin Zivojnovic, from the company Aggios and together, with my colleague, I will be presenting here about the demo.

So, Californians definitely hear about environmental protection, but California is also very much about innovation. And we, here, stand for innovation. We'll show you what we, as a company, have done, what our partners have done. And also what, you

know, the general industry we believe can do on this particular topic.

That said, we are Irvine, California based. Our focus is software defined power management. It's a way how software more and more takes the task of managing many components which are requiring power and energy, and how this is done in heterogeneous multi-core pictures, the type of pictures you see in the newest hand-held devices, but also in the plug-load devices.

So, why we are here is definitely to support Commission's energy efficiency activities. As we used to say, we smell innovation here. And wherever is innovation, we will be around. As now for decades, me and my team, and the colleagues from ARM, and Qualcomm, and Rockwell Semiconductor Systems, from Newport, really work hard to capture all these innovation trends. And this is an innovation trend and we're at the right place. It's California, it's year 2016, and we are very happy that we are here.

We're also here to promote a certain direction, which we're not saying that we should take mobile components. We just say, hey, take a look at mobile devices, they have really nice levels of energy efficiency. Why don't, you know, we learn from that field. And this is something that we are very proud to

be part of a group of companies and large institutions, here in California, who are collected through an EPIC project, by the California Energy Commission. And I'm using this opportunity to invite the industry to follow closely and join this research project, which is starting on 1st of May, in couple of days. And involves, among others, the Lawrence Berkeley Labs, University of California, Irvine, Aggios, and couple of companies who are very passionate about the energy consumption and reducing energy consumption of plug loads.

And then also, like once again to mention that there is an interesting IEEE standard coming up. It's a technical standard. It's not a regulatory standard as sometimes people may think of. It is a standard which will help everyone on this planet, not only here in this country, but everywhere to really make energy-efficient devices much easier, simpler, and with lower cost. And educate the new generation of engineers to think about energy from the first day they place a transistor or write a single like of C-code. Which is a long-term task, but I think we are coming close to that and we are very excited by the support we are receiving from industry, as well as from, you know, all the parties. And we're very proud to be part of this larger community

which is focused on energy consumption and reducing it.

As I've said, my name is Vojin Zivojnovic. I'm one of the co-founders of the company. And my colleague, Davorin Mista, he's our VP of Engineering, he also co-founded the company. He will be walking you through a demo after I give you a couple of additional remarks.

We met most of you a year ago, in April 2015, and we gave a demo of a couple of interesting designs. And we have shown that assembled computer, we could reduce the power consumption from 22 watts, to 8.6 watts in the long idle state, fully compliant to the Energy Star 6.1 measurements.

The main improvements at that time were coming from the software optimization, turning off the hard disk drives and using a niche market power supply. You know, appearing at such great industry with a niche component was not making everyone happy. So, we worked further on that. You will see the results in this demonstration.

And the short idle power, unfortunately, at that time, it was just a year ago, it was still at 18.7 watts. And you will see how fast technology moves forward and what we are showing you today.

So, as I said, one year later we built a new

desktop. This is a desktop you see on the table, on the left-hand side. And Davorin will walk you through that configuration.

It's higher performance than what we demonstrated last year, but significantly lower power. So, it's just 10.5 watts in long idle and 11.4 watts in short idle. What is really nice is how close short idle and long idle are coming together. And that would not be possible without really exciting innovation we are seeing pretty much every day from the leaders in the computer industry. And these leaders are sitting here.

So, these 40-percent reduction in short idle really happen even without turning off the hard disk drives. Which, obviously, in the regulatory language, will be done and actually not touching some additional points we normally touch like, you know, putting to sleep certain processes, or delaying their start, and so on. So, it came really, pretty much out of the box.

So, long idle power was similar to that what we achieved last year. But again, now, without these additional interventions, and we didn't have to use the niche market power supply. You'll see we developed a power supply which really can meet all these requirements.

Where are the improvements coming from? They're

coming from off-the-shelf components. So, you go to Fry's, you over New Egg, or you order over Amazon, they're readily available.

What is really nice are the new CPUs. This new generation of CPUs we are seeing make no difference between short and long idle. They have this famous C-8 state, which needs to be enabled. If it's not enabled, it won't work. But it's very easy to enable that state.

Improved motherboards. We are currently still using this line of MSI Eco Pro motherboards. Very, very amenable. Very powerful, but very amenable for energy optimizations.

Yes, the industry is shifting to DDR4 memory. So, you will see on this left system, the DDR4 memory in action.

And when you face the microcenter of Fry's, just look for the green color when you pick the drives. Don't use the other colors because the green will give you quite some advantages and price is not a big difference.

What is a big difference is the brand-new PSU reference design, on which we worked with our partners and definitely take a change to introduce them. Which gave us 300 watts, two-state, or I would say hybrid PSU with more than 70 percent efficiency at 8 watts, and 64

percent efficiency at 6 watts, which is significantly higher than what we have seen on the slides before.

And it's based on an idea and I'll explain about that after we finish the demo.

But load power is not guaranteed. It doesn't mean that the industry, and all of us, we have all done all our job, and we can now rest and enjoy just the low power. Many components in the market are much less efficient than the ones we selected. So, you can make quite big mistakes and you can end up building, or ordering, or making a system which is not going to be optimal from energy perspective. And it's really not obvious how to pick the components.

The consequence of that is the system on the right-hand side, and Davorin will talk about that system. Which, instead of idling at 11 watts, idles at 22 watts and has pretty much the same performance as the desktop A on the left side, which is much more efficient.

So, what are the source of additional power consumption. Definitely, motherboard design. If you are not careful how you design the motherboard, you may make a wrong step.

The DDR3, instead of DDR4, the right system uses the blue hard drive and it uses pretty much, although an

80 Plus power supply, still not able to meet the efficiency we are reaching with this new design.

So with this, I would like to hand over the mic to my colleague, Davorin Mista, who will walk you through the details of the system and provide you additional details.

MR. MISTA: Thank you, Vojin. Okay, so this is my hand-held mic here. So, let me switch over the WebEx so that we can -- I guess somebody has to make the presenter. You can do that over there.

So, the systems that we're looking at here, on the left-hand side, this here is one motherboard which is from the Eco line, from MSI. They're both using the same generation skylight CPUs. And so, both of these can reach 1.8 watts in the C-8 state, both in short idle and long idle. So, the CPU in idle is no longer a big contributor to the power consumption.

And the key here is that both systems that we selected started off with the same latest generation CPU, but they show how a typical system builder, since a lot of these power figures aren't really published, wouldn't really know what components are needed in order to put together the most efficient system.

The power supply, for example, over here that we picked is the smallest platinum power supply that is

available on the market. I think in Japan you can find 250- and 300-watt platinum power supplies. Here, this is the smallest one that's available, it's 400 watts.

But the user that thinks that picking a platinum power supply is actually mistaken that that helps him with power consumption in idle. Because the efficiency of that power supply in that power state is closer to 50 percent. So, he is not really getting anything for the platinum label that he has on there.

And the other example that makes a big difference is the hard drive. I think this blue hard drive consumes between 4 and 5 watts in idle, versus the green one that consumes less than 2 watts. So, this is a big contributor and price point wise, they're within $5 of each other, depending on where you buy it. It doesn't really make a difference.

And also, regarding price, this MSI motherboard is actually quite a bit cheaper than the motherboard we have over there, which performance wise actually beats the more expensive motherboard.

So, it's something that if a customer isn't really aware of what -- even if they're trying to build an energy efficient system, the point that we're trying to make is that it's pretty difficult to make a system, today, without buying multiple and measuring them out,

because this data is not being published.

So, here I have the presenter row, now. Okay, so now the instant that I shared the screen, the visualization software for the AC meter stopped. But I'll start with the video camera, for those who are online.

So, this here is the MSI motherboard, connected to the 300-watt PSU, which was built by Power Integrations. And this here is a PSU that's a single-voltage PSU, so it produces 12 volts at the output. It's rated at 300 watts, so it can support most mainstream applications.

And the second part is the DC to DC converter. In our lab and in the tests, we actually have a 300-watt capable DC conversion, which was developed by Rohm Semiconductor. But here, we weren't able to -- we had some problems establishing the connection here. So, the data that we published was for complete end-to-end, 300-watt solution.

What we're showing here, right now, is a 160-watt DC/DC converter. That's why the power consumption that we're now seeing is even lower than the numbers that Vojin mentioned in his slides.

So, the number at the time, that you're seeing here, this is 9 watts in long idle. And if I take it

out of long idle, you'll see that we're -- we should be at 10 and a half or so, in short idle. Right now it shows 11, but it ends up average at around 10 and a half. So, now, it's at that point.

And by comparison, the other system -- now, for some reason, it is showing 33 watts. You never know what Windows ends up deciding to do, so in long or short idle, Windows could start some kind of a background task.

And like Vojin indicated, we did not -- this time, we did not try even disabling these background process. A lot of -- so, this is basically a standard Windows installation, like anybody could have done it, and on both systems. So, we didn't go in and disable some of the processes, trying to lower it even further because as we were --

MR. ZIVOJNOCI: Sorry to interrupt, you see now short idle is at 22, so it went back.

MR. MISTA: This is short idle. Long idle is once the display turns off. But what often happens is that as soon as it goes into long idle, if there was a pending background task, that background task is then being started. So, maybe it's doing some virus checking or there's a lot of things that are going on in that state.

So, obviously, the definition of long idle, according to Energy Star, is that it's supposed to be 15 minutes after the user stopped using the computer. In order to achieve it faster, we simply said to turn off the display after one minute. It's the exact same state that is being reached, it's just easier for demonstration purposes. So, we just change it to one minute, so that's why the display turned off after one minute, after I moved the mouse.

And, yeah, so this is about it. I mean, we wanted to demonstrate that it is possible to take standard components, install Windows and beat the proposed TEC levels in this system. And at the same time, by just picking, even starting with the same latest generation processor, picking other components, not paying attention to power consumption, often due to lack of data, and you end up with double the power consumption in idle.

MR. SHEIKH: Okay, but the short idle power was 22.

MR. MISTA: The short idle and long idle is about 22 in the system on the right.

MR. SHEIKH: Okay, but we're not seeing 22 in the long idle, yet.

MR. MISTA: That's correct, we're seeing even

more. We're seeing even more.

MR. ZIVOJNOVIC: Yeah, we'll need to wait until -- so, here's the principle. So, as soon as the system detects long idle, it has realized that the user is not present, right? So, everything that was at the background task, waiting to start happening, starts happening. Sometimes yes, sometimes not, right.

So, at this moment, if we wait, maybe, additional couple of minutes during the presentation, we'll go to the real long idle.

But we have seen this, systematically, that the system says, okay, when I wake up, if he moves now the mouse -- can you mouse of the right system? It will very soon go to 22, meaning I'm now ready for activity.

So, basically, the system has understood that in long idle I am not occupied, user's not here, so I can launch some additional tasks. But they will never last for too long, they will die out. Especially if the system is not connected to the Ethernet, so it will basically finish that and it will be settling at approximately the same number, 22 watts in short and long idle.

MR. SHEIKH: Okay. The other system didn't have this glitch that you're having on this system.

MR. ZIVOJNOVIC: We have no glitch here.

MR. SHEIKH: On the other system, you didn't see the short and long idle transition issues.

MR. ZIVOJNOVIC: No, there are no issues. That's how, you know, probably colleagues from Microsoft and Intel can tell you that that's how the system works.

MR. SHEIKH: But this can happen on the other system as well.

MR. MISTA: We just didn't see it.

MR. SHEIKH: Just didn't see it, okay.

MR. MISTA: We didn't have the situation where this one didn't decide to do something, but that can happen on the lower power system, as well. That all of the sudden, some background task gets launched, and then the power is in the 20s and 30s, sometimes even higher depending on the task.

MR. ZIVOJNOVIC: Now, it's settled in long idle at 22. And it will ramp up, again back, as soon as it realizes there's no activity of the user, so I will use that opportunity.

But after this, we can open the system services. We can actually kill, intentionally, that with the system and you will end up at the 22. So, there's no glitch going on.

MR. SHEIKH: There's no glitch going on or --

MR. ZIVOJNOVIC: That's the feature. That's the

feature of the system, how it's built. We probably will not impact that, you k now, because the testing in long and short idle should be done according to the procedures as defined in Energy Star. When you do that way, you will see the right numbers.

MR. RIDER: Actually, Davorin, you might need to -- can you send us back?

MR. MISTA: Yeah.

MR. ZIVOJNOVIC: Okay, thank you very much. So, here's the summary, what we are showing here. So, the demo desktop 2015 was about short idle, what was it, 11 -- 18.7.

The new desktop is 2016 desktop, on the left-hand side, built in order to be efficient. It shows a 40 percent reduction in short idle power. Definitely meets the CEC proposed limits, with all the adders properly included.

And the right system, which was not that carefully chosen, effectively is crossing these limits by, say, a margin of say almost hundred percent compared to the desktop A.

So, the style of the night, however, of the day, is really the power supply. So, you probably remember the June 2015 meetings where we, you know, together discussed the sample of PSU efficiency versus load. I

think that was presented by one of the colleagues from Dell.

And the point was, hey, depending on how efficient we are at the very high loads, at the standard loads, when it comes to low loads where the systems spend most of the time, we are really inefficient.

And if you look at the previous slide, and I'm showing here just a glimpse of that, is you see that this inefficiency is going down, say, 45, to 54, or 50 plus percent, is this inefficiency of 6 watts.

So we, already in a discussion at these events, we had an idea that actually a hybrid approach could be very helpful. You know, having a two-stage PSU, and that's how the cards work, right. You have the electricity and you have the gas engine, and then you combine these two in the proper manner.

So, we worked with a power expert, who did a great job for other big companies in U.S., and also for the military, and he sketched very simply this idea, which you see on the right-hand side. Sorry, resolution is not best.

You see the green part is just the add-on circuitry which is turn on when you are in the lower power mode. And this basic, two-stage idea, we started working that in September 2015. And with the great help

from Power Integration and Rohm Semiconductors, a reputable company, with a strong name in industry, we have been able, on top of initial idea, to get the initial samples to do the testing integration measurements.

And thanks for Power Integration, who did the AC/DC stage, taking on solution implementation.

And then Rom Semi (phonetic), a person who worked before for Power Integration, very helpful to helping us on the DC/DC stage station, called Solution N Implementation.

This additional cost for the PSU improvement components are estimated less than $1. And you will hear more details about that.

So, where are we today? We are here, presenting the new, 300-watt power supply unit. A hybrid approach. We think it's quite original, but we know that on the market are very similar solutions sold today by great industry companies, from our industry.

And this power supply definitely is a reference design for everyone who really wants to meet the CEC proposed levels. It will help, very much efficient at the high load or high performance state, as well as at the low load states, which are the short idle and the long idle, which are effectively measured in the Energy

Star spec.

This is where the Energy Star and what the newest CEC proposal is really emphasizing. We would like to reduce the waste in these inactive states.

So, I'd like to use the opportunity to thank the power experts from power Integrations. And we have here in the room Ning Zhu. Thank you very much, Ning, for all your hard work. And Rich Fassler, who was spearheading this effort, as well as the people on his team, the VP of marketing.

And also, I have to thank to David New, from Rohm Semi, as well as Lia Lee, who really, out of the very faraway Taiwan, was working with us on a daily basis to get the DC/DC part.

As Davorin said, after testing in Irvine on Sunday, we had yesterday a glitch, so we are showing the 160-watt version, not the 300-watt version. But again, was a great collaboration. And, hopefully, the people will find a way how to make use of it.

Having said that, I'd like to invite Rich Fassler, from Power Integration, to give a couple of comments. He's definitely the right person to talk about many of the market issues and everything else that he wants to take care of.

MR. FASSLER: Hi, I'm Rich Fassler from Power

Integrations. I'm not sure I'm going to live up to that build up.

But we assisted Aggios in their development here, of their computer. Just, and I've got a few details about the power supply for this and for an earlier power supply that we had provided with them.

Power Integrations, based in San Jose, California, been around since '88. We made power conversion chips. So, all of our focus is on the AC/DC power conversion. WE have about 600 employees worldwide.

We sell, well, last year we sold well over a billion IC, integrated circuits, and each one of those goes into a power supply. And they go into applications that range anywhere from, you know, adapters for cell phones and tablets, to PCs, to TVs, to appliances. So, the changes are good that somewhere in your house, in everybody's house here, they have a product that has a PI chip in it.

But just one point, we're not a power supply manufacturer. We sell to power supply manufacturers. And we do reference designs that we offer, for free. Ning has -- we have a lot of application engineers who are ex-power supply designers. And they do reference designs, of course that use our chip.

And so, when we see trends going on around the world, we use that to build new power supply reference designs, and also to build new ICs that enable efficient power supplies.

So, we were first asked by the NRDC and Aggios to provide, if we would, a power supply design that had good efficiency at high power, and had good efficiency at low load. We were able to do that very quickly because we had a reference design that was based on a product that had been out for a couple of years, called Ling Switch HP. That was designed to do that. And the switching characteristics of this IC that, you know, that the power supply is built of, changes as you go from 100 percent load down through the -- you know, the 75, 50, 25 percent.

And this goes into some special verse modes to hold the efficiency up, even down below 10 percent, down below 5 percent.

And so, we provided a reference design, right off our website. Because it was a reference design, we also had a board that was built up. You know, we build up a couple of dozen boards to give to our potential customers.

So, this board actually, if you were to pull the design off our website, says it's designed to be in an

all-in-one computer. 150 watts output, 80 Plus Bronze efficiency, power factor greater than 9.5. And 85 percent efficiency at 10 percent load and greater than 80 percent efficiency at 3 percent load.

So, this thing really doesn't take a huge dip until you get below 3 percent.

Once again, it's all figured into the controller that's inside this IC. So, in our IC, there's a controller and there's the power switch, and it's a simple, you know, fly back converter.

So, one of the reasons, and like I said we sold -- last year we sold close to one and a half billion chips. Cost is everything. Because, as you can imagine, the people we sell to, the power supply manufacturers over in Asia, the cost is everything.

So, we've got to figure out how we get as much of that circuitry into silicon, because once it's into silicon, you know, and we keep the yield up, it's almost free.

So, that was really great. But then, we were asked to provide a power supply, a much higher power, 300 watts. Can't quite do that with a single-stage fly back. And so we went, as Vojin said, we went to an approach that utilized two different converters. One for low power and one for higher power. And the higher

power one, a resonant converter that's a design that's typically used, now, for very high powered power supplies.

You know, it took a little engineering work. But, you know, Ning's engineers did it. The supply switches between the outputs of those two power supplies. And so, it switches down to the smaller power supply when, you know, the computer load is low. And then, switches to the higher one when the computer calls for more power.

So, the power supply in today's demo, 300-watt max output, 80 Plus Silver compliant, a power factor of .98, is 80 percent efficient at an idle load around 10 watts. Which is, you know, roughly 3 percent of the output, the max output power.

Made entirely of off-the-shelf components. Now, granted, you have to wind your own transformers. But all of the other components are in production, available through the companies, representatives of distributors. Fits in an ATX box. Could be scalable to higher power.

Now, we estimate the bottom cost to be right in kind of the sweet spot of what -- and when I say bottom cost, that's the bill of materials cost. So, it's important because I know, you know, cost numbers are flying around that are costs to the consumer or cost to

the computer manufacturer. We don't know all that. But we do know how much components cost.

And so, this design has a bottom cost of around $14.70. Based on our dealings with a computer parts line manufacturers, for a 300-watt power supply, the bottom cost is anywhere from about $13 to $15. And that's a power supply that -- you know, the ones that are out there now, that don't necessarily have this kind of performance done at light load.

So, we feel that it's, you know, a reasonable bottom cost. It's in the ball park.

The only, the other additional piece of information that I'll throw out there is that we see, in production, at power supply manufacturers, at least one other power supply, not made with our parts, not the same design, that is just a little bit lower in power. It's not quite 300, maybe about 240 watts, that has almost the same performance as this one. And it's not a dual stage, it's a single stage.

So, the only reason I'm bringing that up is that's in production. The solution, we believe the solution is out there. Certainly, we've proven it. But, you know, this was a -- it's a prototype. It's a proof of concept. Still could be optimized.

So, you know, that's basically all I've got and

if anybody's interested, later on we'd certainly be able to give them some more information.

MR. ZIVOJNOVIC: Thanks, Rich.

UNIDENTIFIED SPEAKER: A clarifying questions. The transients to start the high current phase, when the computer goes from a low power stage can be very large. Are you able to turn on that quickly and depict, or did you have to change the coupling or something to --

MR. ZIVOJNOVIC: That's a good question for --

MR. RIDER: Can you go to the mic, please?

MR. MISTA: That's why I brought Ning, she's the one who knows.

MS. ZHU: Hello. Yeah, this one works, right. So, that's a good question. So then, overall, yes, we have to put out great concern for that low transient or in doing startup or doing the operation.

So then, we actually tested out, through our benches, with the low version works, and then they used this real diamond to test it out through how many days, I don't know. But, yeah, it is one thing we take care of so then at least it demonstrates it is capable of doing those low transient start up without, you know, hiccupping, or that stuff.

MR. ZIVOJNOVIC: I would say that it's a real design. As Ning remembers, a couple of months ago we

had some problems, you know, with exactly what Barnes (phonetic) was mentioning. But, obviously, they successfully solved that. And this is now running for days, uninterrupted, ramping up, everything what we could, even the tests. You know, so whether there is a corner case, I don't think so. But, you know, the caps are big enough, I think they can deal with this increase in demand for power properly.

But it's a nice design. What I would do on this design, the only things is you hear a little bit of ticking noise. It's not a bomb. You know, there's something ticking when it switches from high to low. And we already discussed that, probably with the next we have to remove that type of noise.

So, to conclude -- thanks, Rich, for your comments. To conclude this presentation, our side, we believe that it's possible to meet and exceed energy consumption levels proposed by the Commission. We have tried the best to demonstrate these computers.

We did a lot of testing on different processor chips, different hard disk drives. I can assure you, we have half-room full of components that we bought from the market, from different sources in order to test everything we could, in order to have, really, the extract of that information in these two small demos.

There was, undoubtedly, great technical progress in the last year. You know, the C-8 state is a small wonder. You know, whether you pick a very powerful core, a very simple core, a high price, low price, it idles so nicely in the short idle and long idle, and you could see the difference between these two is pretty much disappear.

So, the computers are now efficient by default and we still believe there's plenty of room for additional innovation. Power conversation, I think we're on a good path. But, obviously, industry will have to lead that into the real product.

Motherboard design, MSI surprised the whole market with this version. We thought they killed the line of Eco Pro. They came with four or five additional boards, with big announcements.

And we hear in the marketplace, you know, you ask the people who like these type of designs, it's really fitting their needs.

And then, on top of that, it's really the power management software. If you get that board out of the box, it will not idle at 10 watts. You will have to go into the buyers, you will need to make certain changes.

And what you just saw in these long idle states, very occasionally some processes start. We need a

better control of that part.

So, in summary, you know, I think it was an exciting 12 months after the last workshop. I think we will not have a next one. I think we will have a regulation in one year from now. But innovation has to move ahead. And as I said, we will continue innovating through the EPIC project and definitely inviting industry to join us, and give us their advice. And the guarantee for us is definitely this work, Lawrence Berkeley Lab's work on a couple of issues, UCI's works, and so on.

So, thank you very much for the opportunity to present here. Thank you.

MR. RIDER: So, that concludes the presentations that we had keyed up for today and moves us into the public discussion, and questions, and comments.

And I would invite people, who want to revisit some of those questions from the slides, I don't remember them all off the top of my head, but if you'd like to come up and ask a few of those again, I'd be happy to clarify the proposal.

And also, just as a reminder, to state your name and your affiliation when you do.

And for people online, if you want to say something, either write in the chat box and let us know

you want to talk, or use the hand raise button feature of WebEx.

MR. EASTMAN: Hello, Stephen Eastman, from Intel. I talked earlier. I had a few clarifying questions from some of the slides. And I think it's a good dialogue here. I think it, you know, gets us to where we're moving along and progressing with the spec here.

Peter, with your slides, you showed a difference of power between two different all-in-ones. You did not show the cost delta between the two slides. Do you know the cost delta between all-in-one A between the all-in-one B? I'm sure the cost delta is pretty huge. You have to come over here.

MR. DELFORGE: The cost delta is significant. But what part of it is down to energy efficiency and what isn't. I don't know, that's very -- I don't have the answer to that. A lot of it is in the design and, you know, you're getting product B versus product A, product brand B versus product brand A.

I think our point on this demo is that most of the energy difference can be minimized through no-cost or very low-cost solutions, settings and so on changes, without any --

MR. EASTMAN: And, Peter, you mentioned you were

going to docket a tear down of this, right? It's not docketed yet, but you're --

MR. DELFORGE: We'll docket this. It's roughly, I think one is about $900 something, the other one is about $1,200, so it's about 300 bucks difference. Again, how much of that is down to design and functionality versus energy.

MR. RIDER: Which is what a tear down would show so --

MR. EASTMAN: Yeah, yeah, but I just wanted to point out there is a huge difference in cost, even bigger than what the CEC's thinking the cost delta is going to be.

The one question I had for the power supply design, I think it's interesting. Some of the questions I had, and I don't know if they're willing to take these in a public forum. Maybe I should just ask the questions and maybe get offline with the power supply.

Because the design, it sounds like it's a power sensing, instead of a signal coming from the computer, that's switching from the high phase to the low phase. So, that was one question I had, but I think that question was answered.

What is the timing coming out of the high phase to the low phase. Again, that's pretty technical, so I

don't know if we really need an answer today.

MR. RIDER: Yeah, I mean, if you want to discuss it with them.

MR. EASTMAN: Yeah.

MR. RIDER: And what would be good is, as a result, you can formulate a written comment based on --

MR. EASTMAN: On some of those things, yeah.

MR. RIDER: Yeah.

MR. EASTMAN: And the question I had was, you know, does it meet all of the other power supply design guide stuff that we have listed. Anyway, those are some of the questions I had. Thank you.

MR. RIDER: Those are good questions.

And thank you, everyone, by the way for -- if you've been sitting here with a computer question since the beginning of today, I appreciate your patience.

One thing I would want to bring up is we had discussed expandability adders versus other ways to deal with categorization and a dataset was mentioned of 170 plus models. And I, certainly, don't have that as my fingertips. And so, as we start working through it, it would be good to -- I have data, a much smaller dataset than 170, though.

It's very difficult to get the level of information on a system, and so it's very time

consuming. And so, we've done an amount of work on that, but it would certainly be good to bolster that and that can help us talk through whatever the changes might be, or categorizations might be.

Yeah, so any data that you guys can provide is always useful. Okay.

All right, would you like me to go back through some of these? Mark, I remember you had some questions on a slide. Would you like me to go over some questions or --

MR. HOLLENBECK: Oh, on the power management?

MR. RIDER: Yeah.

MR. HOLLENBECK: Sure.

MR. RIDER: And then, I know someone else had them, too. So, if you -- go ahead and speak up, if I miss you. Let's see, here.

MR. HOLLENBECK: Actually, I had gone through all the ones that you had noted in the power management section.

MR. RIDER: Yeah, I'm trying to find your presentation. I don't remember which one it is. Is this it? It looks like it.

MR. HOLLENBECK: Keep going. Yeah, that's it.

MR. RIDER: Okay. Let's see --

MR. HOLLENBECK: So, it's the second bullet down

and there's just --

MR. RIDER: Yeah, so the question about -- you asked the question, what happens if the user re-images the --

MR. HOLLENBECK: (Inaudible) --

MR. RIDER: Oh, okay, I thought you just said the second point. Okay, so the top one -- I mean, the difficulty -- first of all, let me just say, imaging, what happens after you sell the computer, the customer does to the computer, that is outside of the scope of this regulation. So, you want to talk about anything to do with what happens after you've sold the computer, that isn't within the scope of what we -- you know, it's out of the scope of this regulation.

The regulation deals with what's sold and offered for sale. And what a user does is what the user does. And if it causes more energy, I guess that's a shame. If it saves more energy, yay. But that is not in the scope.

You guys mentioned a lot of stuff about, you know, alternative --

MR. HOLLENBECK: (Inaudible) --

MR. RIDER: Are you talking about the first bullet or the second?

MR. HOLLENBECK: The first bullet, the top one.

(inaudible) --

MR. RIDER: Right, that's a comment more than a -- yeah, it's not -- we have not -- this is not in the proposal. We do not propose anything along that.

MR. HOLLENBECK: (Inaudible) --

MR. RIDER: Understood. I'm just trying to make sure that we -- and again, so a lot of these questions are just what happens with the user. And again, like I said, we won't be touching that.

If you could just go to the mic and then we can get through these.

MR. HOLLENBECK: Sure. So, a lot of the questions that I had, had to do with -- like, if you consider an operating system like Chrome, or Android where, you know, obviously, it doesn't have the traditional power management to sleep mode, ACPI3 sleep mode, that's you've written into the regulation, you know, what do you do? I mean, which of the weightings do you use in that instance, was a good question.

MR. RIDER: Yeah, so I actually took a look in the analysis at Chrome. I didn't take a close look at an Android machine. But I don't know that we're calling out, necessarily, the specific sleep state that says you have to go to sleep.

But my understanding, in reading through the

capabilities of Chrome, is that it does have the display turn off feature and it does have some sort of sleep feature. So, I am not -- so, maybe there's a little bit of disconnect there on that specific one.

MR. HOLLENBECK: Yeah, we should talk.

MR. RIDER: And the same with Linux. And I've tried to look at, you know, what are the capabilities of these alternate operating systems?

And I'd like to put, also, another challenge when we looked at this, we really try to be technology neutral in our standards. And when you say one set of operating systems, you have to do this, and then another set you have to do something different, and they're treated different it's difficult. And we want to make sure things are fair.

And, essentially, you have -- we've got the black and white situation right now handled. If you have no -- if you have no OS, don't worry about power management. If you have an OS, have power management.

But then there's this kind of gray area of these alternative OS's. And just to define what that is, what should be in that gray -- what should not be subject, in a technology neutral way, I mean we could call out Chrome, we could call out -- and we should work together. I don't think we're going to solve it in

dialogue here.

MR. HOLLENBECK: Right.

MR. RIDER: But to call out specific OS's and not other OS's is difficult.

MR. HOLLENBECK: Yeah, I think you're --

MR. RIDER: And in the regulation, we need to figure out how to define this medium in a way that's fair and technology neutral.

MR. HOLLENBECK: Yeah, I think the big problem with "nontraditional OS's", and mainly talking about putting the computer, the system unit in a low power "sleep mode", is that if an Android or a Chrome system doesn't have a traditional S-3 type sleep mode, but it goes into a long idle state more actively, then we would want that as an acceptable means of complying with the power management requirements. And that's consistent with the Energy Star.

So, that's at the root of a lot of it and we can talk about that some more.

And then the other thing was, just the other questions that were actually from another manufacturer have to do with not mandating, you know, instances where the power management can't be disabled. When there are sometimes that, you know, you wouldn't want that situation to exist.

MR. RIDER: And I think the proposal agrees with that. We're not, in this proposal, trying to mandate that power management is not disabled. What we're trying to do is provide -- for example, your Android phone or i-Phone, there's some form factors where manufacturers have been able to cross the boundary of not having disabled power management.

So, there's no phone out there, that's been made in the last year, that I'm aware of, that you can disable the screen to turn off and you can disable the -- now, you know, that's a mobile situation. But they've worked through the user problems of that.

And there are applications where maybe that's palatable. I don't know. But I wanted to put the opportunity there. Not to mandate it, but to create the opportunity if there are applications, that instead of, perhaps, investing in more expensive hardware, that you could pursue that kind of avenue of what the phones and some tablets do. Maybe you could find a way to make that connection in the desktop or, especially, notebook space.

MR. HOLLENBECK: Yeah, I don't know at this point. But I agree with you that that particular question is more involving the tech weightings, which is optional, if you want to.

MR. RIDER: Yeah, that's the only -- the disabling power management or requiring that power management cannot be disabled, that was the intent in that.

MR. HOLLENBECK: In saying that, yeah.

MR. RIDER: Yeah.

MR. HOLLENBECK: Okay, great.

MR. RIDER: Your name, please?

MR. SOLOMON: I'm Meshach Solomon, from Microsoft.

MR. RIDER: Thank you.

MR. SOLOMON: This seems like a difference in strategy than your stance on the imaging, for example.

MR. RIDER: Well, it depends on the --

MR. SOLOMON: So, you're saying after the machine ships, you said the user can do what the user wants?

MR. RIDER: Yes.

MR. SOLOMON: Yet, this is an incentive to prevent the user from doing something that he might want to do. This seems like a different tact, I'm just curious --

MR. RIDER: Well, the theory --

MR. SOLOMON: -- like how do you reconcile the two?

MR. RIDER: So the theory is, again just going back to my example, is that manufacturers of machines can anticipate these things and have contextual -- for example, today, when I buy a computer and I watch a movie, the display is smart enough to know -- sorry, the computer is smart enough to know not to turn off my display in the middle of the movie. And sometimes that does happen.

But if you sought this kind of thing, I don't think you'd do very well in the market if the consumers didn't like your product. So, the idea is to create an incentive for a system maker, or software designer, whatever, to come up with a way that it actually works. Because I don't think the situation you're talking about is one where you do it to comply, and the user hates it, I don't think -- I think the market will take care of that by itself. I don't think people would buy that product, but I don't know.

MR. SOLOMON: Well, okay, I think that's interesting. But that will probably even bring up a lot more questions around what is the meaning of disabled.

MR. RIDER: Yeah, so --

MR. SOLOMON: What is the meaning of allowing the user to disable power management? Is this like saying it never goes to sleep or making it like an hour,

instead of 15 minutes?

MR. RIDER: And I think in a side discussion, we discussed that. Maybe there is a time limit that needs to be specific. Like a day might be a good setting, or something like that, so it doesn't go beyond a certain limit.

Right now what it means, as it's written in the text is you can't say never. Never would not be an option, which is currently an option in most machines.

MR. SOLOMON: Okay, thanks.

MR. RIDER: Yeah.

MR. HOLLENBECK: So, Ken, we don't need to go over it now, but on the table we've got in the earlier section, I would like to have some feedback, I'm sure we would all like to have some feedback on each of those currently shipping systems, just as a starting point to know if you want to prohibit or allow computers to be shipped in those situations.

And then, if you do, we'd be happy to work on it with you, or whoever else you want us to, on the language to make that happen.

MR. RIDER: That's fair.

MR. HOLLENBECK: Thanks.

MR. RIDER: Thank you for your comment.

Anything on the phone?

MR. CLINGER: Hi, can you all hear me?

MR. RIDER: Yeah, John. Go ahead.

MR. CLINGER: Hi, this is John Clinger at ICS, Energy Star. Just a quick question on notebooks, in particular. I apologize if I missed this, it's been a long day on the phone.

But with the notebooks, in particular, you know, there's an expandability score for desktops, that makes some sense. With the notebooks, though, how are we differentiating with one notebook, with just this latest gen chip set? Just as an example, you know, low-end I3 versus high-end I7s, you're going to see a max TDP which is basically double.

And in sleep and off, those might be pretty close to the same, but in short idle, they might differ a good bit.

So, I guess the question is just how does this approach, differentiating those product types in a way that it's not providing an unfair advantage to the less powerful machines? And any additional power being consumed by the chip sets as opposed to the lower-end processor, or it's too stringent for the higher-end products. There seems to be a sufficient separation of the desktops, but it's not immediately clear how it's being done for the notebooks.

MR. RIDER: Thanks, John. First of all, one change that we did make is to add graphics cards adders for notebooks, which didn't exist. So, that helps gaming notebooks.

But in terms of the differentiation is still 130 kilowatt hour target for notebooks.

Now, the compliance rate is really high. So, I think what you're talking about would be something you'd want to look into if you were, I mean, at NRDC. When I originally did the analysis on that segment, a year and a half ago, it was 75 percent and NRDC just said 92 percent, or something in the nineties.

There's a high amount of high performance -- there are a large number of high performance notebooks that comply, already. So, the need to adjust the notebook for an expandability adder isn't really necessary due to the high compliance rate.

But if -- you know, I think your concern makes a lot of sense, perhaps if we were to lower that base TEC to something where, you know, we don't have a lot of high performing PCs already -- or I mean, notebooks complying today.

MR. CLINGER: Right. It was really another issue, you know, could you go lower then, as well. But also taking into account the fact that those compliance

rates, I believe, are based off qualified systems and there are non-qualified systems that we don't have data on. So, just, you know --

MR. RIDER: Noted.

MR. MISTA: Can I just comment on the issue regarding the I-7 versus I-3s. From our measurements, all of the fastest I see -- the fastest I-7 consumes the same amount of power in the long and short idle, as the entry level Pentium that we have tested. So, that does not seem to make a difference in power.

MR. RIDER: Yeah, one very early divergence we took from Energy Star was to walk away from the P scores. Because we weren't seeing the processors driving a lot of the idle mode power, especially with C-7s and now C-8 states. You know, in C-7 you can see some small differences. But it's definitely not what's driving the system idle. You k now, the differences are in the order of less than a watt between the most powerful and the least powerful in C-7. And I don't know what it is in C-8, but probably even less.

MR. CLINGER: Okay. Well, that's great news, especially if that applies to (inaudible) -- that's great for everyone.

MR. EASTMAN: I'd like to comment on that, Ken, if I could?

MR. RIDER: Okay.

MR. EASTMAN: This is Stephen Eastman from Intel. So, I think it's a great question. And I think even in the ITI, it's real easy to get data collection on those models that we already have in the Energy Star database. But the Energy Star database is voluntary. It does not include all of the high end models that are not intended for Energy Star. And I think there's a fair number of those. And I think, even in our ITI database, it does not include all those.

We are actively seeking, trying to get those systems. But there are, you know, high expensive ones. It's not like we're going to go out and buy a whole bunch of those. But we are actively seeking, trying to get data on those. That, you know, there is high end ones and we do feel that there might be a problem there. Especially in the gaming notebook, or the really high end professional notebooks, which is why we have a definition to possibly give them exemptions. They're probably low in the market share, but there's possibly a problem there, so we're actively trying to get that done so we can put that in our comments.

So, his point, I think, is very valid. And I think the P score is actually, probably a better validation on notebooks for an I-3 versus I-7 example,

that he gave there, the guy from ICF, that is actually a better differentiator on notebooks than it is on desktops.

MR. RIDER: Sure, but even then it won't give you whether it's a high end gaming notebook or not, right.

MR. EASTMAN: Sure, that's not the only thing.

MR. RIDER: Yeah.

MR. EASTMAN: So that's why we had a different definition in our proposal. But it is a better proxy for performance on notebooks.

MR. CLINGER: Ken, if I could, I had one other real quick question.

MR. RIDER: Sure.

MR. CLINGER: Regarding what's an exclusion from scope, you know, is the main reasoning for that just the size of the market for them?

The only reason we ask is, you know, a majority of the tablets don't use a lot of energy and that's great. But there are professional tablets that end up using as much or more energy than some of the, you know, mid to high end notebooks that we have in the dataset. They do exist. They're usually used in commercial settings.

Are those intended to be excluded just because

the market's small or was that considered?

MR. RIDER: Yeah, so for the majority of the tablets, I think it's exactly what you said, that they don't use a lot of energy. In fact, it's a great substitution if someone buys a tablet. So, you know, it would consume a lot less. So, that was the main consideration.

In terms of these professional, high-consuming tablets, that's the first I've ever heard of those, so that's news.

MR. CLINGER: Yeah, they're made by several manufacturers. Even the i-Pad -- or the i-Pad Air Pro is creeping up there. But many of them have traditional notebook internal hardware. And the battery life's not great, but they do consume a good amount of energy.

MR. RIDER: Noted. Thank you, John.

Okay, I don't see any more questions on the phone? If there are any left in the room, this is your -- okay.

MR. FORD: I wanted to comment on the exemption or exclusion of industrial equipment. Appreciate that. I don't think it provides computer manufacturers much relief, though. We make computers. We don't make industrial equipment, even though our computer might have a destination to be in the cabinet of some

industrial piece of equipment.

It's unlikely that industry would be manufacturing their own compu8ter to drive that piece of equipment, whether it's an MRI scanner, a CAT scan, or a big milling machine. According to the regulation, when we sell the computer, it has to comply with the regulation, even if it's going into a piece of industrial equipment.

Don't know how you accommodate such things, but it really doesn't provide -- it provides relief to the very small number of manufacturers that make their own computers to control their own machinery.

MR. RIDER: Yeah. You know, it would be good to work together to see if there is maybe a possible -- like you said, we deal with sell or offer for sale. Maybe you sell it without chassis, or maybe you don't sell it with a typical chassis. Maybe there's a type of chassis you sell things that are intended to be integrated. Maybe you have passive cooling or I don't know what it is. Maybe there's something there that we can figure out to try to help out on this one.

So, we're intending to have those excluded, that's our intent.

MR. FORD: Right.

MR. RIDER: So, maybe there's some way we can

try to figure it out, without creating a loophole for general systems, which is probably -- I think it's doable. I mean, this is our first shot at a definition, so we're looking for feedback.

MR. RIDER: Well, if you succeeded at that, that might be something that other legislations, regulations around the world would adopt. Because we run into this pretty -- we have customers that say, well, wait a minute, we're excluded. Why are you foisting this regulation on us?

MR. RIDER: So, you're concerned about the sale that you make to the guy, who then takes it and puts it in the thing, and then that's sold again. So, the second sale would be exempted, but you're worried about the first sale of you, to the guy who's going to incorporate it into the machine, itself.

MR. FORD: Sorry, we can't sell it to you in California because it doesn't comply. And then his response is, well, I'm exempt from that. Sorry, I know you're exempt, but I'm not so --

MR. RIDER: Okay, that's a good, that's an interesting point.

MR. EASTMAN: I had one other question I had to ask about. So, you guys talked about the -- it was under the small volume manufacturers, and you talked

about 15 systems, and you said about the same size motherboards.

In Energy Star, they classify a product family as the same motherboard model number, not the same size motherboard. So, is there a reason why you changed --

MR. RIDER: I think that's what we mean.

MR. EASTMAN: You mean the same motherboard model?

MR. RIDER: The same motherboard, the same PSU, the same chassis.

MR. EASTMAN: Okay, okay. So, you're trying to go along with the Energy Star product family definitions?

MR. RIDER: I don't think we meant to be any different than that.

MR. EASTMAN: Okay, because it says different. So, as long as you meant that, then that's --

MR. RIDER: Yeah, and let's make sure to get that, obviously, right.

MR. EASTMAN: Okay.

MR. RIDER: But I think that's what we mean.

MR. EASTMAN: Cool, okay.

MR. MAY-OSTENDORP: Peter May-Ostendorp, Xergy Consulting, on behalf of California IOUs. This question actually, I think, relates to either Shahid or Steve,

your presentations. And there was an assertion that, in looking at your dataset of 170 systems, that only 10 percent complied. And I couldn't tell, when you did that analysis, was that looking at the straight 50-kilowatt hour? Was that looking at each of these systems fully loaded, with all the adders that they're entitled to? Or, how did that -- I'm just curious what that process looked like.

MR. EASTMAN: Yeah, no problem. Good question on the database. So, it is actually looking at each systems' adder, with all the full adders that that system would get.

MR. MAY-OSTENDORP: Okay.

MR. EASTMAN: So, yes. And to be clarifying on that, the database that we had showed many PCs, which are a very small part of the market, you know, would pass. Any mainstreams, there's basically zero mainstream, even with all the adders they don't meet.

MR. MAY-OSTENDORP: Yeah, I guess sort of as a follow up to that, you know, because I think there were some assertions that, you know, kind of heard the term one-size-fits-all come up a few times. And I think, you know, we just wanted to point out that there is -- we do see great variability in the allowances being granted to systems today. If you look at even a mainstream system,

you know, 50-kilowatt hours is not the target. You know, those numbers are going to be anywhere from 55 to 75 -- or, about 70 for most mainstream systems.

And if you're looking at the higher performance, the adders, with all of the adders, including expandability graphics, you're looking at probably 130 plus for many of those. And so, I just wanted to get a sense of that span, so that's clear. Thank you.

MR. RIDER: Yes. And as I mentioned earlier in my presentation, in one case, just as an example, the gap has closed by 108-kilowatt hours, without system designers having to do anything. So, or 104, I think.

Last chance for any -- oh, go ahead.

MR. FORD: Paul Ford. I'm going to take turns with Stephen here. Is it Rich?

MR. MAY-OSTENDORP: Yeah.

MR. FORD: Is that right? Good, I have a question for you. When -- it's good to hear that your company makes these chips that are capable of a two-stage power supply in the billions. That's encouraging to us.

When a power supply company comes to you and says we want to use your chip in a design, how long is it until they actually start -- how long is it for them to go through the design, the testing, the

certification, until they can actually start buying chips from you to put it -- to sell those power supplies? And I'm thinking of 200-, 300-, 400-watt power supplies, not the little cubes that go into the wall for cell phones.

MR. FASSLER: Yeah, that's a good question. I don't know.

MS. ZHU: Those guys probably know better.

MR. FASSLER: Yeah.

MR. FORD: Which ones?

MR. FASSLER: You know, it doesn't happen overnight. I mean, it takes an amount of time.

MR. FORD: Right.

MS. ZHU: It's a fairly longer time.

MR. FASSLER: But I'll tell you, we can get that data.

MR. FORD: Right, I think it would be useful for the whole group, just to be educated that it's not overnight. It takes a fair amount of time. I know you've done testing for the transients. I assure you, we'll do much, much more than you've done. Because we don't want the system hiccupping between the 3-watt load and the 800-watt load. It's a big gap and it was really fascinating to hear that you've thought about the problem, and we can compare it to how we would solve

this problem, too.

We don't solve on starting this problem until you pass the regulation. So, whatever time you have for us to meet such a requirement has to include what Rich is going to go off and research.

So, we haven't started to figure this out, yet.

MR. RIDER: You've started by coming here and bringing all these interesting pieces of information.

(Laughter)

MR. FORD: That's correct. We compete with one another. And one of us isn't going to get ahead of the game. We all start at the same time, when you pass the legislation.

MR. RIDER: And I believe Gary Verdun brought this up a while ago, too. There's differences in the timelines, whether the silicon is ready or whether the silicon has to be designed.

And so, I think the message we have here is that the silicon is ready and we're at least at that stage in terms of what's available in the market for purchase of silicon.

And then, there's a second discussion that he raised, and I'm referring back to the meeting I think we had in Oakland, back in September.

Then there's a second design cycle that he

discussed. And so, I think he characterized it, and I don't know that I'd disagree with that characterization, but he definitely tried to put together one. And so, I think we would consider, you know, the timelines in what we decide to do in that.

MR. FORD: Right. And the fact that there's a prototype sitting over on the desk doesn't constitute that it's available on the market.

MR. RIDER: Well, I mean, Rich did point to one that is available on the market. But that's just one and I don't know how many there actually are.

MR. FORD: Right. Well, let's scale up to the hundreds of millions that we need.

MR. RIDER: Good questions.

MR. FORD: The market needs. Because it wouldn't just be California's demand, it would probably be at least the U.S. demand, unless we were to have something special just for California.

MR. RIDER: Sure.

MR. FORD: That has extra costs involved in it, too, and is really undesirable from a manufacturer's stand point.

MR. FORD: Good, thank you.

MR. RIDER: Thank you.

MR. FASSLER: So, Rich Fassler, Power

Integration. So, that is a valid point. I mean, you know, we come out with products and we'd like people to design them and then go into production. And that's always the question, you know, when's the order coming, when's the order coming.

But just a couple of things. For the company, I attend energy efficiency regulations around the world. And the one thing that -- and then report back to our product marketing people, and the president of the company of, you know, what's going on.

The one thing that I've noticed is that it appears that a regulation doesn't have to be approved in order to have our customers ask us to come up with designs to meet it. And it's typically, after the first draft comes out and, you know, there's a requirement for system efficiency that the power supply can affect, or it's a requirement like an external power supply requirement.

It seems like, you know, the word spreads overnight and we get requests. And, you know, we start doing boards.

The other thing, the other point that I want to make here is that the silicon is available to achieve, you know, that kind of performance today. And that as I had mentioned, we became aware of a competitor of a

power supply being built, at a power supply manufacturer, using a competitors part, that to be perfectly honest, wasn't 300 watts. It was, you know, closer to 250 watts. But it would meet the efficiency requirements at low load.

And the necessity to improve efficiency at low load has been around for at least three or four years. So, it's really nothing new. People like us have been working on it. Our competitors have been working on it. Because the solution's in the controller, in the silicon. And that's what, you know -- but you're right, from the time we introduce something to the time we give somebody a board, there's a lot of time involved. You know, testing, and qual testing, and testing to certain situations, current levels. You know, depending on the industry, there's a certain amount of non-compressible time.

MR. FORD: Right.

MR. FASSLER: Yeah.

MR. RIDER: Any more, any other questions, comments? That's good because we're just about at 5:00. So, that's when the whistle blows.

So, thank you, everybody, for coming today and sharing these great comments and information. And we look forward to seeing written comments.

Again, the contact information is on this slide, if you want to call and ask further questions. If you don't know who to talk to, talk to Kristen. She's the Manager of the Appliances and her, I believe, contact is at the beginning of this whole presentation from the CEC.

And thank you everyone who traveled and have a safe trip home. Thank you.

(Thereupon, the Workshop was adjourned at 4:53 p.m.)

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REPORTER'S CERTIFICATE

I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were reported by me, a certified electronic court reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

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IN WITNESS WHEREOF, I have hereunto set my hand this 11th day of May, 2016.

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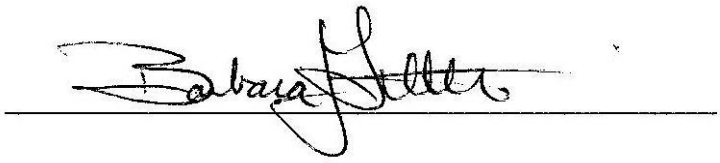

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