

# ENERGY EFFICIENCY LIGHTING

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## HEARING BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE ONE HUNDRED TENTH CONGRESS

FIRST SESSION

TO

RECEIVE TESTIMONY ON THE STATUS OF ENERGY EFFICIENT LIGHTING TECHNOLOGIES AND ON S. 2017, THE ENERGY EFFICIENT LIGHTING FOR A BRIGHTER TOMORROW ACT

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SEPTEMBER 12, 2007



Printed for the use of the  
Committee on Energy and Natural Resources

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U.S. GOVERNMENT PRINTING OFFICE

39-385 PDF

WASHINGTON : 2007

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For sale by the Superintendent of Documents, U.S. Government Printing Office  
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800  
Fax: (202) 512-2104 Mail: Stop IDCC, Washington, DC 20402-0001

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## **ENERGY EFFICIENCY LIGHTING**

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**WEDNESDAY, SEPTEMBER 12, 2007**

U.S. SENATE,  
COMMITTEE ON ENERGY AND NATURAL RESOURCES,  
*Washington, DC.*

The committee met, pursuant to notice, at 10:32 a.m. in room SD-366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

### **OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO**

The CHAIRMAN. Let's go ahead and start the hearing. I apologize to everybody for the lateness of our beginning time. The Senate was having votes. I understand Senator Domenici and Senator Murkowski are on their way, but in order to expedite things, let me very briefly give a statement, and then call on our two Members of Congress to make their statements. They represent our first panel today.

This is a hearing to take testimony of S. 2017, the Energy Efficient Lighting for a Brighter Tomorrow Act, and to review the status of emerging energy efficiency lighting technologies.

S. 2017 establishes a process to begin the transformation of the U.S. lighting market by phasing out inefficient incandescent lamps and replacing them with more efficient technologies. In June, the Senate passed an energy bill. We included in there a sense of the Senate, Section 214, that said, "a provision that the Senate should pass a set of mandatory technology-neutral standards to establish energy efficient performance targets for lighting products, ensuring that the standards become effective within the next 10 years, ensure that replacement lamps will provide consumers with the same quantity of light, while using significantly less energy, ensuring that consumers will continue to have multiple product choice, and work on measures that can assist consumers and businesses in making the transition to more efficient lighting."

S. 2017 was introduced last week with Senator Stevens, Carper, Snowe, Landrieu, and myself. It's intended to meet the requirements of that sense of the Senate provision. It was developed with the active participation of energy efficiency advocates and lighting manufactures. The House energy bill, S. 3221, includes a lighting provision with similar goals. These are complex provisions and I believe the witnesses are well-equipped to talk to us about some of the details of them.

This morning, we will first hear from Representative Jane Harman and from Representative Fred Upton, who are the authors of the House provision. Following the House members, Assistant Secretary Karsner will provide the Administration's view on the legislation and the status of the new energy efficient lighting technologies.

Finally we'll hear from a panel of experts on lighting efficiency. I'm very pleased that Dr. Paul Waide is able to join us from the IEA in Paris. He is the resident expert on lighting for the OECD and he can place our efforts within the global context. Kyle Pitsor of NEMA, will represent the views of the U.S. lighting manufacturers. Steve Nadel of ACEEE will testify on behalf of several energy efficiency advocacy groups.

[The prepared statement of Senator Salazar follows:]

PREPARED STATEMENT OF HON. KEN SALAZAR, U.S. SENATOR FROM COLORADO

Thank you Mr. Chairman and Ranking Member Domenici for holding today's hearing on S. 2107, the Energy Efficient Lighting for a Brighter Tomorrow Act. I want to thank Chairman Bingaman for the work he and his staff did to introduce S. 2107. I also want to thank our witnesses for their time today, and our international expert who traveled so far to be with us.

The lighting we use in our homes today has changed little since the early 1900s. Most residential lighting is from inefficient incandescent light bulbs. It is estimated there are over 3 billion incandescent light bulbs in use in homes across our country today, and almost a billion incandescent light bulbs used in businesses. Incandescent light bulbs are energy inefficient because only about 10% of the power used by an incandescent light bulb goes to producing light, and the remaining 90% of the power is given off as heat.

Improved lighting technology exists today that allows us to get the same amount of light using far less energy. By simply switching to a more energy-efficient compact fluorescent light bulb, we can use almost 75 percent less energy, and the light bulb will last ten times longer than the traditional incandescent light bulb.

Energy efficiency is the quickest, cheapest, and cleanest way to extend our country's energy supplies. To date, most of our country's efforts to encourage people to switch to more energy efficient lighting have been through voluntary programs like the Change a Light, Change the World campaign lead by the Environmental Protection Agency.

However, we can and must do more to speed the transition to more energy-efficient lighting technology. Based on Department of Energy data, 765 billion kWh of energy is used annually in the U.S. by lighting systems. Approximately 30% of the energy consumed in an office building is from lighting use, and 5–10% of residential energy use is for lighting. It is estimated that consumers and businesses spend approximately \$58 billion annually for lighting. Far too much energy is consumed today for lighting, especially in light of the fact that much more energy-efficient lighting exists today.

While we do have the know-how to transition to more efficient lighting, there will be challenges for industry. I look forward to hearing from our witnesses today to learn how we can best make this transition to more efficient lighting.

Changing the world does start with simple actions. I want to thank again Chairman Bingaman and Ranking Member Domenici for holding today's hearing on this important bill to change the way our nation lights its homes and businesses.

[The prepared statement of Senator Sanders follows:]

PREPARED STATEMENT OF HON. BERNARD SANDERS, U.S. SENATOR FROM VERMONT

Chairman Bingaman, Ranking Member Domenici, efficiency is the lowest of the low-hanging fruit. Vermont is a leader in energy efficiency and is the only state with its own Efficiency Utility, but my state and our country still need to do more.

I believe that we must be bold and aggressive in making every aspect of our country more efficient in its energy use and not just take baby steps. That's why I am glad that we are having a hearing on S. 2017 today—this bill is historic and is huge. It will reduce energy use, energy costs and pollution more than all the Federal appliance standards issued in the 20th century. Why do we, the technology leaders of

the world, have to be led into the future by other countries, like Australia, Canada, Europe, and even Cuba? We should have done this long ago, but it is not too late to join these nations in leading the rest of the world.

Chairman Bingaman, I salute you for your role in brokering the agreement between the interested parties and I also salute those parties for working together to help fashion this legislation. However, as I understand it, there are some aspects of the House bill that we should consider including over here. On the issue of preemption of prior states standards, as Representatives Harman pointed out, the House was able to achieve a compromise on eliminating grandfathering of California and Nevada's standards because the standards are aggressive, at levels that California and Nevada could embrace. Our House colleagues exhorted us to stand firm on aggressive standards so that we can realize the energy and environmental improvements that this effort is designed to achieve.

I am also concerned about the issue raised by one of the witnesses, Mr. Nadel from the American Council for an Energy Efficient Economy, that issue being loopholes. If my understanding is correct that lighting manufacturers have avoided efficiency standards through design tricks, we must make sure that this does not happen again. If we allow such tricks in the future, we will undermine the good work of the responsible companies who are leading the way on efficiency. Therefore, I believe that all bulbs should be covered, with limited exceptions.

The hearing was an excellent opportunity to learn more about this very important topic and I hope that the lessons learned will be incorporated into energy legislation pending in Congress.

Let me just, with that, call on Congresswoman Harman and Congressman Upton to describe what their efforts have been in the House bill and any views they have on what the Senate bill provides.

Representative Harman, go right ahead.

**STATEMENT OF HON. JANE HARMAN, U.S. REPRESENTATIVE  
FROM CALIFORNIA**

Ms. HARMAN. Thank you, Mr. Chairman. It's a rare opportunity to be invited to come over to the Senate and testify on behalf of legislation that is very similar to House legislation and I appreciate the invitation. I know my partner in all things light bulbs, Representative Upton appreciates it as well. Hopefully we can shed some light, not just some heat, on this subject.

As you said, lighting efficiency is a complicated and esoteric field. I'm not sure I've mastered all of its intricacies, but I am now fairly up to speed on the deals we struck in our bill, which we did get out of the House Commerce Committee on a bipartisan basis and which was part of the bipartisan legislation that the House passed before we recessed for August.

There is a point of view that the House hasn't done much in the last year. I might agree with that point of view, but the energy legislation that we passed, I would say, is very strong. I do appreciate the fact that you are introducing legislation that substantially mirrors the light bulb provisions in our bill. I think that that will be very helpful to the effort to get them enacted into law.

Congressman Upton and I have lived and breathed lighting issues for a while now. Our spouses complain that we've started to glow in the dark. But we are the co-authors, along with Representatives Hastert and Wynn, a bipartisan duo, of the amendment to the House Energy Bill, that sets out new efficiency standards for light bulbs. We also worked with Representatives Lipinski and English, again, on a bipartisan basis, to add a provision to every Appropriations bill that passed the House, requiring the Federal Government to purchase more energy efficient light bulbs.

There is a reason that this issue has become so important. Most Americans, as you pointed out, still use essentially the same incandescent light bulbs invented by Thomas Edison more than 120 years ago. These bulbs are famously inefficient, only 10 percent of the energy that they generate becomes light. The remaining 90 percent is wasted as heat. I would observe that that sounds like Congress.

But lighting technology has changed. There are alternatives on the market now that are far more energy efficient. I see some of them right next to me at this table. There are alternatives right around the corner, such as advanced halogen bulbs and light emitting diodes, so called LEDs, that will fundamentally change the way we light our homes and businesses.

The energy that could be gained by switching to these more efficient alternatives is staggering. The energy that could be saved is staggering. The Lighting Efficiency Advocacy Group, 18seconds.org, estimates that if every American swapped just one incandescent bulb, which takes approximately 18 seconds, for a compact fluorescent, we would save more than \$8 billion in energy costs, prevent burning 30 billion pounds of coal, and prevent 2 million cars-worth of greenhouse gas emissions from entering our atmosphere. These potential savings served as the inspiration for our legislative efforts. As I mentioned, these efforts were bipartisan, something again, rare in Congress these years.

Our amendment also was the result of months of negotiations with the lighting industry and environmental groups. I know that the lighting industry is here and they will testify, but they were part of a dramatic, 11th-hour, negotiating session on the morning of our full committee mark-up. The resulting amendment was supported, both by the industry and the environmental community, including the Natural Resources Defense Council, the NRDC. I think it was that combined support that generated the member support we got.

Our amendment bans the outdated 100-watt incandescent light bulb by 2012, phases out all inefficient lighting by 2014, and requires that light bulbs sold in the United States be at 300 percent as efficient as today's 100-watt incandescence by 2020. I know all of those things are in a slightly different format in your bill. The amendment also requires the study of ways to prevent the release of mercury in the production or sale of light bulbs, and to encourage the lighting industry to manufacture these new, efficient light bulbs in the United States.

We are aware that there is a work force now in the United States, in a variety of companies, that produces lighting appliances, and we want that work force to stay productively employed. Our goal, however, is to make sure that it is making products that are also energy efficient.

My time has expired, so let me just summarize about one provision and that is the Preemption Provision in our legislation. Preemption is something that Californians don't like. We think we do everything better and usually we're right. But we did agreement, from the environmental community in California, to include a preemption provision, which I support. The reason we included it is two-fold. No. 1, it seemed to us really burdensome to have different



requirements for light bulbs in different States. But No. 2, the standards in our bill are high enough to justify a national preemption clause.

So, let me just close by saying that I think this is sound legislation, the House on a bipartisan basis supports it. I think you, on a bipartisan basis in your committee, you're doing the right thing. I urge the inclusion of your legislation, in whatever package emerges on energy, hopefully this fall.

Thank you.

[The prepared statement of Ms. Harman follows:]

PREPARED STATEMENT OF HON. JANE HARMAN, U.S. REPRESENTATIVE  
FROM CALIFORNIA

Thank you for inviting us to testify before the Committee.

Lighting efficiency is a complicated and esoteric field, and I congratulate you, Chairman, for crafting a solid piece of legislation—the Energy Efficient Light for a Brighter Tomorrow Act (S. 2017).

I'd also like to recognize my colleague on the Energy & Commerce Committee and partner in all things light bulbs, Congressman Fred Upton.

Congressman Upton and I have lived and breathed lighting issues for several months now—our spouses complain that we glow in the dark at this point. We are the co-authors—along with Representatives Hastert and Wynn—of an amendment to the House's Energy Bill that sets out new efficiency standards for light bulbs. That bill passed the House just before the August recess.

We also worked with Reps. Lipinski and Inglis to add a provision to every appropriations bill requiring the federal government to purchase more energy efficient light bulbs.

There is a reason this issue has become so important to us. Most Americans still use essentially the same incandescent light bulbs invented by Thomas Edison more than 120 years ago.

These bulbs are famously inefficient. Only 10% of the energy these bulbs consume becomes light. The remaining 90% is wasted as heat. Sounds like Congress . . . .

But lighting technology has changed. There are alternatives on the market now that are far more energy efficient. And there are alternatives right around the corner—such as advanced halogen bulbs and light emitting diodes—that will fundamentally change the way we light our homes and businesses.

The energy that could be gained by switching to these more efficient alternatives is staggering.

The lighting efficiency advocacy group 18seconds.org estimates that if every American swapped one incandescent bulb for a compact fluorescent, we would save more than \$8 billion in energy costs, prevent burning 30 billion pounds of coal, and prevent 2 million cars worth of greenhouse gas emissions from entering our atmosphere.

These potential savings served as the inspiration for our legislative efforts.

And I am proud to say that these efforts were bipartisan. Rep. Upton and I worked side by side in crafting our amendment, which was widely supported by Members of both parties.

Our amendment was also the result of months of negotiations with the lighting industry and environmental groups. We actually finalized the language in a dramatic 11th hour negotiating session on the morning of the full committee markup. The resulting amendment was supported by both the lighting industry and the environmental community, including the NRDC.

Our amendment bans the outdated 100-watt incandescent light bulb, phases out all inefficient lighting by 2014, and requires that light bulbs sold in the United States be at least 300% as efficient as today's 100-watt incandescents by 2020.

The amendment also requires the study of ways to prevent the release of mercury in the production or sale of light bulbs, and to encourage the lighting industry to manufacture these new, efficient bulbs here in the United States.

S. 2017 generally reflects this consensus forged on the House side.

I would like to emphasize one important issue—preemption.

I am from California and—as this Committee is no doubt aware—California, ahead of the national curve on emissions standards, zealously guards its prerogative to set its own regulations on a range of issues.

The preemption provisions in our bill were not a concession that I—or members of the environmental community—were willing to agree to easily.

But we did so for two reasons. Appliance efficiency standards have traditionally been treated differently than other regulatory areas. Inclusion of preemption for light bulb standards should not be considered a sign that the State or its representatives in Congress will relent on preemption in other areas.

Second, in exchange for preemption, our language requires that the lighting industry meet very tough efficiency standards—approximately 45–50 lumens per watt by 2020, which is roughly the efficiency of today’s compact fluorescent bulbs.

S. 2017 includes a comparable provision, and I commend Chairman Bingaman for including an aggressive standard. I urge the Senate to keep the bar high. It is worth preemption; a lesser standard is not.

The preemption language in the House version also grandfathers-in states that adopt tougher standards before the effective date of the bill.

Several western states such as California and Nevada have adopted or are considering lighting standards that go slightly further than the new federal standards proposed in both bills. The House language would allow these standards to remain in place, even after the new federal standards are effective. I understand that S. 2017 would not.

The House grandfather clause was well understood by the parties to our consensus, and was crucial to building support for our bill. I urge the Senate to adopt a similar provision as this bill moves forward.

With that, let me thank you again for inviting me here today. I look forward to working with all of you on these issues in the coming months.

The CHAIRMAN. Thank you very much.

Senator Domenici has come in since we started and these are, of course, Representative Harman and Representative Upton are the two main sponsors of the provision that the House passed on lighting. Did you wish to make your opening statement now, and then we’ll hear from Representative Upton?

**STATEMENT OF HON. PETE V. DOMENICI, U.S. SENATOR FROM NEW MEXICO**

Senator DOMENICI. Mr. Chairman, I think we’ve all been sort of the cause of some delay. I’ve been part of that so I don’t want to make a very long statement. I first would ask that the statement I have made be a part of the record.

The CHAIRMAN. It will be included.

[The prepared statement of Senator Domenici follows:]

PREPARED STATEMENT OF HON. PETE V. DOMENICI, U.S. SENATOR FROM NEW MEXICO

Good Morning. I’d like to thank Senator Bingaman for holding this hearing. I’d also like to add my thanks to our witnesses for being with us today.

The purpose of today’s hearing is to receive testimony on S. 2017, a bill recently introduced by Senator Bingaman to phase-out the use of incandescent lighting in this country. I commend the lighting industry for working with efficiency advocates to craft this proposal. If adopted, it would transform the nation’s lighting market by calling for the replacement of 4 billion general service light bulbs currently installed in the United States.

The potential energy savings from this proposal are indeed impressive. The Alliance to Save Energy estimates that new light bulb standards would save 88 billion kilowatt hours per year.

That being said, however, during my initial evaluation of this legislation a number of concerns have come to mind that I hope will be addressed during today’s hearing.

- I believe that consumers must continue to have multiple product choices, including energy-saving halogen, efficient incandescent, compact fluorescent, and LED light bulbs.
- A phase-out period of only two years, as suggested in the bill, appears unnecessarily onerous. In my opinion, if such a phase-out is to occur, it must be done in a responsible manner that provides lighting manufacturers with enough time to complete the market transformation, while ensuring multiple product choices for the consumer.

- Dictating a “back-stop” lighting standard for the year 2020—before the phase-out is even underway—is unreasonable. As most of you know, I believe wholeheartedly that we are a nation of innovation. Setting a lighting standard 13 years in advance based on today’s technology may not be a wise course of action.
- With regard to CFLs, consumers are concerned not only with the cost, but with the potential mercury release. With the increased use of CFLs called for in this bill, we will need to address the mercury disposal issue.

Unfortunately, I must attend a very important mark-up of the Defense Appropriations bill this morning, so I have to leave shortly. However, I look forward to reviewing today’s testimony and I will continue to work on lighting issues as Congress considers energy legislation. Thank you.

Senator DOMENICI. Then I just would like to say that, it is rather amazing that we have this bird in the hand, that it’s rather genuine and certainly, we are able to get this conversion to take place. It’s kind of an interesting thing—in the midst of a great and fantastic manufacturing movement, we’ve got this new light bulb that has to be manufactured by hand. I started reading about it and I said, you know, is somebody pulling my leg? No, it’s true. Of course, that presents some interesting problems that we haven’t thought of.

I mean, what it’s done is it’s presented the manufacturing world with new lighting source that’s legit. It causes us to take what we’ve been using and throw it away. It does also clearly provide for a new one to take it’s place, but in order to properly use it, we’ve to use thousands of hand workers to put it together. You know, almost like we’re getting taken. But no, we’re not. It’s pretty serious business. So I’m, for working with you Mr. Leader, Mr. Chairman, there’s no joke to any of this. This is a big, big event, right there in front of this, saying we can do this. If we want to fight about it, we can take 10 years. We want to just sit down with the smartest people we’ve got on our committees and say, “How do we get it done?” We might even, because its facts are all known, put them out on the table and maybe work together, both sides, and do something—since this is so different, just do it different. Maybe we can have a group from House and Senate meet together and figure out how to do it. As I say, we’re here to show that we can do it a different way than we’ve ever done it and save a lot of time and have one shot at it and not two, and get the thing done.

In any event, with my statement added to the statements that are here, there will be plenty of reading for those who wonder what we’re doing. I just added a little bit of some very good reading that I saw, that was already present.

With that, Mr. Chairman, I have nothing further, except to proceed. Thank you for proceeding with this hearing and I’m hoping that the very best will happen to this bill, it is this little bill that’s going to do something very big. Let’s hope we can do it together.

Thank you.

The CHAIRMAN. Thank you very much.

Representative Upton, why don’t you go right ahead.

**STATEMENT OF HON. FRED UPTON, U.S. REPRESENTATIVE  
FROM MICHIGAN**

Mr. UPTON. Thank you, Mr. Chairman. I intend just summarize my full statement.

First of all, I have to tell you it has been a real delight to work with my friend and colleague, Jane Harman. I think we came to the idea about at the same time. We were encouraged to move forward together as a team, by both Mr. Dingle, as well as Mr. Haster, former Speaker of the House. We worked very closely with all parties, particularly with the industry, and environmental crowd, as well.

Our idea shifted a little bit as we moved forward, in terms of the legislation that we ultimately presented before the House. Along the way, we made significant strides with the Government, as well, as Mrs. Harman indicated. We offered an amendment on every single one of the Appropriation bills, to mandate that beginning October 1st, a couple of weeks from now, that the Federal Government—the largest purchaser of light bulbs in the world—will only purchase Energy Star light bulbs. That standard, of course, dictated by the Department of Energy.

We know that it will save hundreds of millions of dollars to the taxpayers, beginning in just a couple of weeks, in lots of different ways. All of those amendments, but one, passed on a voice vote. We thought on one amendment we ought to actually see where the sense of the Congress is, as it related to that. We got nearly 400 votes in support of the amendment mandating that. And so as we look at the CR and Omnibus, in terms of what's going on, we hope that that provision will stick in each of the Appropriation bills.

We worked with industry, in terms of the standard. And I have to say, that one of the ideas, of course, that came from your sense of the Congress resolution over here, was to, in essence, make the 100-watt incandescent bulb go away, obsolete, by the year 2012. That actually didn't come from the two of us, it came from the industry, and because they're worried, I think, that some different, maybe fly by-night group, that will come in, ultimately, and have a cheaper light bulb at the, on the shelf at the store. But in fact, the cost to the consumer will be, who knows, 15 or 20 times more by buying that obsolete incandescent bulb versus the new standard that we're going to see.

So they were the ones that came up with that idea and we wrote that right into the amendment, as it passed in the Energy Committee.

I think this legislation that we've done is balanced, the preemption work was a great credit, kudos to my colleague from California, again, making sure that it was properly structured, all sides, in essence, coming to the agreement. We pushed both sides, they know that. Now, we may need to see some tweaking here at the end of the day, but I'd to think that what we were able to get through the House, working with you now in the Senate, we're going to see some significant savings.

The bottom line is this, by improving the standard, which is what we're doing, we will save American consumers 65 billion kilowatts of energy, just because of the light bulb changes, when this comes into affect beginning in 2012, 2013.

Sixty-five billion kilowatts is the equivalent of 80 coal-fired electricity plants. That's pretty significant. This is more than just one light bulb at a time, it is in fact, a shining amendment in terms of what we can do together, House and Senate, Republicans and

Democrats, environmentalists and industry, to make sure that we're getting the biggest bang for our buck.

With that, Mr. Chairman, I yield back.

The CHAIRMAN. Thank you both for coming over and testifying and thanks for your leadership on this important issue. I do think this is one of the great opportunities we've got in this Congress, to go ahead and get this enacted. So, that was our purpose in introducing the bill we've introduced here in the Senate. I know it was your purpose in moving ahead with your bill as part of the energy package.

So, I have no questions at this point. Let me just see if Senator Corker has any questions he wanted to ask.

Senator CORKER. Mr. Chairman, I do not. I know they have a tight schedule, leaving early today. But sounds like you all have done an excellent job in trying to balance various interests, but to move our country ahead in a pretty dramatic way over a very simple concept. I wish we could do more of that here in Congress. Thank you for your great testimony. It's been a pleasure listening to you and to watch you all play off of each other and also play off of words, if you will, that have a lot to do with light, I've noticed. But you all have a good—

Mr. UPTON. Just wait, just wait. We've got a lot of ideas more that you don't know.

Senator CORKER. Thank you. Thank you very much.

The CHAIRMAN. All right. Thank you very much. We will go on to our next panel, then. Assistant Secretary Karsner, who is the Assistant Secretary for Energy Efficiency and Renewable Energy in the Department of Energy, is a frequent witness before this committee and we always welcome him and congratulate him on his efforts at the Department. We're anxious to hear your views on this legislation and what can be done in this Congress on the subject.

**STATEMENT OF ALEXANDER KARSNER, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY**

Mr. KARSNER. Thank you, sir. Mr. Chairman and members of the committee, thank you for the opportunity to appear before you today to discuss the Department's work on energy efficient lighting technologies and provide comments on S. 2017, the Energy Efficient Lighting for a Brighter Tomorrow Act. Before I begin, sir, I'd like to introduce to my left, Deputy Assistant Secretary for Energy Efficiency, David Rodgers, and appreciate him being able to join me at the witness table, in the event that we have any technical questions that we need to be responsive to, given the highly technical nature of the testimony.

While the Administration has not had the opportunity to coordinate all interagency views on the legislation, I'm happy to provide you with some preliminary comments this morning. The Department strongly agrees with the essence and overall goal of S. 2017, which would increase efficiency levels for lighting and provide significant energy savings for our nation. But we also have some concerns related to the schedule and timelines, which I have elaborated on in my written testimony.

The Department looks forward to working closely with the committee to resolve any outstanding concerns. DOE's Building Technologies Program is presently working on efficacy appliance standards for general service incandescent lamps, general service incandescent reflector lamps and fluorescent lamps, as was required by the Energy Policy Act of 2005 and consistent with our published time table. The Department, as always, is willing to share technical analysis to inform the ongoing discussions amongst industry members and other stakeholders on voluntary consensus standards.

Our Building Technologies Program is focused on rapid deployment and market penetration of compact fluorescent lighting, as well as significant technological breakthroughs for solid-state lightings and LEDs. Compact fluorescent lamps, CFLs, can easily replace most general service incandescent bulbs, saving up to 75 percent of the initial lighting energy. Although CFLs are priced marginally higher today than comparable incandescent bulbs, they last 8,000 to 15,000 hours, up to 10 times longer than incandescent bulbs. If every home in America replaced just one incandescent light bulb with an Energy Star-qualified CFL, the Nation would save enough energy to light more than 3 million homes annually.

In order to encourage adoption of technologies like CFLs, DOE announced on June 14, that it has teamed up, for the first time ever, with the Walt Disney Corporation in a nationwide campaign to promote energy efficiency through a TV spot and other media, based on the Disney Pixar film, *Ratatouille*. The 30-second animated spot was showcased nationwide during primetime viewing hours, and has reached more than 117 million households thus far, through several different—several familiar targeted, segmented networks, including CNN, HGTV, The Food Network, The DIY Channel, even appearing during NBC's "Meet the Press."

Mr. Chairman, with your permission, I'd like to show the committee this public service announcement, as an example of DOE's unprecedented efforts at outreach for multigenerational education and communication. I'm sure the Disney Corporation will be happy to have that on the record.

[Laughter.]

Mr. KARSNER. Additionally, DOE created and produced education posters in conjunction with the campaign, that are included in the upcoming DVD release, with a projected distribution of 10 million units. The animated video spot and campaign poster are available online and at the Department of Energy's Web site, and will be refreshed regularly with contemporary media as new campaigns are available.

Another prominent example of DOE's education efforts was mentioned in Congresswoman Harman's testimony, the 18second.org campaign, which engages the artistic, creative, and entertainment community to join together with the Federal Government in a multigenerational effort to go beyond preaching to the converted segment of our population and create an enduring campaign to promote energy efficiency through lighting. Based on this premise, that it takes the consumer only 18 seconds to change a bulb, the campaign partners with Yahoo and the A.C. Nielsen Company, using new media to put consumer efficiency decisions on par with our national campaigns earlier, that have been such a success to

fight pollution in the 1970s, drug use in the 1980s, and antismoking campaign efforts today.

The Web site, [www.18seconds.org](http://www.18seconds.org), allows consumers to enter their zip code and immediately learn how many CFLs have been purchased, accurately, in their statistical area and the economic, energy, and environmental benefits that are available to them, where they live, on a contemporaneous basis.

Turning now to the future of lighting, DOE is working to advance efficient white-light sources for general illumination using solid-state lighting, which differs very fundamentally from today's lighting technologies. DOE partners with research from industry, academia, and our National Laboratories to accelerate advances in solid-state lighting. These researchers have made dramatic progress in just the last few years, achieving world records as well as national and international recognition.

Since 2000, DOE funded SSL research projects have thus far applied for more than 64 patents. DOE's goal for general illumination SSL is 200 lumens per watt, more than double the efficacy of today's best fluorescent lamps, by 2025. This year, DOE and its partners announced a breakthrough laboratory performance of 79 lumens per watt, surpassing CFL's white-light performance for the first time.

To ensure the investments in core technology research lead to SSL market penetration, DOE has developed a national strategy to guide market introduction, working with approximately 150 partner organizations. As part of that national strategy, the Department is leading Energy Star management, specification development, and partner relations for SSL devices using general illumination.

In December 2006, DOE released draft SSL Energy Star criteria. Following public review and comment periods, DOE issued a second draft criteria in April 2007. Mr. Chairman, I am pleased to report today, that the final criteria for Energy Star SSL have been approved just this morning and will be released later today.

As I have indicated, we at the Department are focused on advancing technical, commercial, and consumer outreach efforts on lighting. But I want to stress that lighting alone is not sufficient to address our urgent energy security needs. In fact, I encourage the committee to continue and strengthen its focus on comprehensive energy efficiency management efforts to radically transform the built environment.

DOE has begun a historic and important transformation of its own in this respect. On August 8, Secretary Bodman launched the Transformational Energy Action Management Initiative, better known as TEAM, a Department-wide effort aimed at, amongst other things, reducing the energy intensity across the DOE's national complex and assets by at least 30 percent. This initiative will meet or exceed and lead with all energy efficiency goals mandated by the Energy Policy Act of 2005, as well as President Bush's Executive Order 13423 announced in January of this year.

The TEAM initiative adopts an even more ambitious timeline than has been required by the Executive Order. It establishes, for the first time, a model of aggregated demand pull by the Federal Government. Upgraded efficient lighting, including advanced

fluorescents, solid-state lighting controls, day-lighting, and integrated systems are requisite and one of the most cost-effective options for achieving the TEAM initiative, both in DOE and across the Federal Government.

Secretary Bodman expects the Department to lead by example throughout the Federal Government, deploying immediately a wide variety of lighting and other advanced technologies to achieve maximum energy savings. The Secretary's TEAM initiative is bold, and similarly, as Congress looks to green its Capitol complex, we have been pleased to provide the technical support and will continue to extend the information and periodic updates to this committee on all these efforts and actions.

I would like to conclude by thanking this committee for its commitment to improving energy—and prioritizing—energy efficiency. The Administration is committed to diversifying our Nation's energy portfolio, and efficiency gains, particularly within lighting, are the most easily accessible, abundant, and affordable new energy.

The Department looks forward to working with this committee to resolve the technical aspects of S. 2017 and to continue advancing the state-of-the-art in lighting technologies.

Mr. Chairman, this concludes my prepared statement and I'd be happy to ask—answer any questions the committee may have.

[The prepared statement of Mr. Karsner follows:]

PREPARED STATEMENT OF ALEXANDER KARSNER, ASSISTANT SECRETARY, ENERGY EFFICIENCY AND RENEWABLE ENERGY, DEPARTMENT OF ENERGY

Mr. Chairman, Members of the Committee, thank you for the opportunity to appear before you today to discuss the Department's work on energy efficient lighting technologies, and to provide comments on S. 2017, the Energy Efficient Lighting for a Brighter Tomorrow Act. While the Administration has not had the opportunity to coordinate all interagency views on the legislation, I am happy to provide you with some preliminary comments.

The Department generally agrees with the overall goal of S. 2017, which would increase efficiency levels for lighting and provide significant energy savings for our nation. DOE is presently working on standards for General Service Incandescent Lamps, General Service Incandescent Reflector Lamps and Fluorescent Lamps. These activities are included in the January 31, 2006 report to Congress and are covered by the Consent Decree requirements for appliance standards.<sup>1</sup> The analyses that DOE is performing will reveal both technical improvement opportunities and potential economic impacts for manufacturers and consumers. The Department, as always, is willing to share our technical analysis to help inform on-going discussions among industry members and other stakeholders on voluntary consensus standards.

In Section 101, the efficacy standards in the legislation are aggressive, and may require that manufacturers convert their incandescent production lines to halogen capsule/infrared coated lamps requiring substantial capital investment and cost increases to the consumer. The Department also has concerns with the schedule in section 101 for issuing standards. First the time allotted is not sufficient to accomplish the required activities. Secondly, the timing of a follow-up standard would not provide DOE, or the markets, time to gain sufficient experience and understanding of the previous standard. Since there would be very limited knowledge derived through implementation of the first standard, the second standard could be locked into the same technologies or efficiency levels as the standard just put into place.

In Section 107, DOE is concerned that Congress is directing \$60 million of R&D investment into "general service lamps", a term that is not defined in the draft legislation. DOE recommends that this R&D program be authorized for a range of lighting technologies, not exclusively incandescent technologies.

<sup>1</sup>The Consent Decree was filed in the Southern District of New York to settle the consolidated cases, State of New York, et al. v. Bodman and Natural Resources Defense Council, Inc. v. Bodman, which claimed that DOE missed statutory deadlines for rulemakings on appliance efficiency standards.



Our Building Technologies Program is focused on rapid deployment and market penetration of compact fluorescent lighting, technological breakthroughs for solid-state lighting, and long-term research into next generation lighting. In addition, the Department is conducting national publicity campaigns to encourage consumer adoption of energy efficient technologies.

#### COMPACT FLUORESCENT LIGHTING

Compact fluorescent lamps (CFLs) combine the energy efficiency of fluorescent lighting with the convenience and popularity of incandescent fixtures. CFLs can easily replace most incandescent bulbs, saving up to 75% of the initial lighting energy. Although CFLs cost more initially than comparable incandescent bulbs, they last 6,000–15,000 hours, up to 10 times longer than incandescent bulbs. Lighting accounts for approximately 12 percent of the average home's electricity bill. If every home in America replaced just one incandescent light bulb with an ENERGY STAR®-qualified CFL, the Nation would save enough energy to light more than 3 million homes annually. That's \$600 million in annual energy cost savings, and a reduction in greenhouse gas emissions equivalent to taking 800,000 cars off the road. Industry and civic leaders have recognized this cost-effective appeal, and annually join the Department's continuous efforts to educate and energize the general public through efforts such as October's Change a Light, Change the World program. In addition, we have worked closely this year with Wal-Mart and other major national and local retailers to launch significant outreach campaigns that have improved store layouts to promote CFL sales and recycling.

One prominent example of DOE's education efforts is the 18seconds.org campaign, which engages the artistic, creative, and entertainment industry in a national, multi-generational effort to go beyond preaching to the converted and create an enduring educational campaign to promote energy efficiency through lighting. Based on the premise that it takes a consumer only 18 seconds to change a light bulb, the campaign partners with Yahoo and A.C. Nielson to elevate the prominence of energy efficiency, using new media to put consumer efficiency decisions on par with national efforts to reduce pollution in the 1970s, drug use in the 1980s, and smoking today. The website, [www.18seconds.org](http://www.18seconds.org), allows consumers to enter a zip code and immediately learn how many CFLs have been purchased in the area, and the economic, energy, and environmental benefits of that activity.

In order to further encourage consumer adoption of energy efficient technologies like CFLs, the Department has recently embarked upon an innovative partnership with the Walt Disney Corporation. DOE announced on June 14th that it has teamed up with Disney in a nationwide campaign to promote energy efficiency through a TV spot based on the Disney•Pixar film "Ratatouille." The 30-second animated spot features the characters from the movie, and urges viewers to make the switch from incandescent bulbs to ENERGY STAR® compact fluorescent lights. The spot, showcased nationwide during primetime viewing hours, reached more than 117 million households between June 15 and August 15, 2007, through networks including HGTV, Food Network and DIY.

Additionally, DOE created and produced posters using the main animation character, Remy, holding a CFL with the message, "Saving energy is easy. Make the switch today." The posters were distributed to state energy offices and will also be distributed to embassies. They are also available upon request through the EERE Resource Center. The poster is currently being translated into Chinese, Russian, French, Spanish and Arabic.

DOE is sponsoring a second round of public service announcements for national television network distribution for the fall DVD rollout. This additional advertising will air in October/November. In addition, the DOE—Disney CFL poster will be included in the DVD booklet with a projected distribution of 10 million units. The video spot and campaign poster are available online at the Department's website ([www.energy.gov](http://www.energy.gov)).

#### SOLID STATE LIGHTING

DOE is working to advance the development and market introduction of energy-efficient white-light sources for general illumination using solid-state lighting (SSL), which differs fundamentally from today's lighting technologies. DOE has developed a coordinated approach that guides technology advances from laboratory to marketplace by breaking out efforts into the following activities: Basic Energy Science, Core Technology Research, Product Development, Commercialization Support, Standards Development, and an SSL Partnership (competitively selected in 2005, the Next Generation Lighting Industry Alliance).

DOE partners with leading researchers from industry, academia, and national laboratories to accelerate advances in solid-state lighting. These researchers have made dramatic progress in just a few years, achieving several world records as well as national recognition. Since 2000, DOE-funded SSL research projects have applied for a total of 64 patents. DOE's goal is for general illumination SSL at 200 lumen/Watt, double the efficacy of today's best fluorescent lamps, by 2025. This year, DOE and its partners announced a breakthrough laboratory performance of 79 lumens/watt.

Collaborative, cost-shared, competitively-selected DOE R&D projects combine the technical resources of premier research institutions and national laboratories with the product development, manufacturing, and commercialization expertise of industry leaders. DOE invests in research projects that target the needed improvements in price, performance, and manufacturability to speed SSL technologies to market. The investments in research and development have led to major technological breakthroughs, including record brightness and efficacy levels for white light emitting diodes, as well as significant fabrication and packing advances. About 55 R&D projects are now in progress.

To ensure that DOE investments in core technology research and product development lead to SSL market penetration, DOE has developed a national strategy to guide market introduction of SSL for general illumination, including ENERGY STAR® labeling for SSL technologies and products, Lighting for Tomorrow design competition, LED product testing, standards and test procedures development, product demonstrations in buildings, and Fact Sheets for those who desire to learn the trade. The Department has about 150 partner organizations involved in our commercialization support activities.

The ENERGY STAR® label is a highly valued and widely recognized mark of energy efficiency that helps guide the American public to select cost-effective, energy-efficient products. The ENERGY STAR® program is jointly managed by the Department of Energy and the Environmental Protection Agency, with each agency taking the lead on a specific set of technologies.

As part of DOE's national strategy to accelerate market introduction of high efficiency SSL products, the Department is leading ENERGY STAR® management, specification development, and partner relations for SSL devices used for general illumination. The Department's ENERGY STAR® strategy for SSL general illumination products establishes a transitional two-category approach. Category A addresses near-term applications, where SSL technology can be appropriately applied. Category B establishes efficacy targets for a wider range of future applications, which will take effect once solid-state lighting technology is more mature. Eventually, Category A will be dropped, and category B will become the sole basis for the ENERGY STAR® criteria.

In December 2006, DOE released draft ENERGY STAR® criteria for SSL luminaires intended for general illumination. Following public review and comment, DOE issued second draft criteria in April 2007. The Department anticipates releasing final criteria shortly.

In addition, the Department is partnering with the Consortium for Energy Efficiency and American Lighting Association to challenge designers to develop high quality lighting fixtures that take advantage of the unique advantages of SSL through the Lighting for Tomorrow Competition. In 2006, eight SSL products were selected for recognition and we have the 2007 competition in progress.

#### TEAM INITIATIVE

As I have indicated, we at the Department are focused on advancing the technical, commercial, and consumer outreach efforts on lighting. But I want stress that lighting alone is not sufficient to address our urgent energy security needs and the market penetration of new energy efficiency technologies. In fact, I encourage the Committee to think about comprehensive energy management efforts to radically transform the built environment.

DOE has begun an historic and very important transformation of its own. On August 8, 2007, Secretary Bodman launched the Transformational Energy Action Management (TEAM) Initiative, a Department-wide effort aimed at, among other things, reducing energy intensity across the national DOE complex by 30 percent. The TEAM Initiative aims to have the Department of Energy lead, meet or exceed the aggressive goals established by the President for increasing energy efficiency throughout the federal government. Reducing energy intensity by 30 percent across the DOE complex will save millions in taxpayer dollars per year, after projects are paid for.

This Initiative will meet or exceed energy efficiency goals mandated by the EPACT 2005, as well as President Bush's Executive Order 13423, announced in January 2007. The Executive Order directs federal agencies to: reduce energy intensity and associated greenhouse gas emissions; substantially increase use and efficiency of renewable energy technologies; adopt sustainable design practices; and reduce petroleum use in Federal fleets. The TEAM Initiative adopts an even more ambitious timeline than required in the Executive Order.

The Secretary has instructed all DOE sites to host private sector energy service companies to assess efficiency opportunities across the complex, addressing all lifecycle, cost-competitive options. Lighting, including advanced fluorescents, solid state lighting, controls, daylighting, and integrated systems are easily one of the most cost-effective options for achieving the TEAM initiative targets. Secretary Bodman expects the Department to lead by example throughout the Federal Government, deploying a wide variety of lighting and other advanced technologies to achieve maximum energy savings.

The important information that I want to leave with you about the TEAM Initiative is that we are NOT stopping with the issue of lighting. We're looking at every DOE site, every building, and expecting every DOE site, primarily through the use of alternative financing through the private sector, to deploy ALL cost-effective energy efficient and renewable technologies in the service of obtaining state-of-the-art and sustainable results for DOE and to demonstrate these best practices for the rest of the Federal government.

Even with the best lighting improvements, if we did not take advantage of those opportunities by pairing them with other energy conservation measures, we would not be maximizing the energy savings potential of these technologies. For example, heating and cooling systems in a building must account for the reduced heating and cooling load of new lighting technologies. The savings we are looking for at the scale needed to make a dent in our energy use cannot be accomplished with only one technology. Buildings are systems and we must view them holistically to get the desired results. Energy Saving Performance Contracting—established by Congress and endorsed repeatedly by this Committee—is the key to our success.

The Secretary's TEAM Initiative is bold and, as Congress looks to "green" the Capitol Complex, I would be pleased to provide additional information and periodic updates to this Committee on our efforts and actions. As a first step, the Department is working with an energy savings performance contractor to transform its headquarters buildings into showcases of energy efficiency and advanced technology. In that ESPC, we will showcase the lighting technologies I have discussed in my testimony. We will deploy advanced technologies in different locations throughout the headquarters complex so that we can learn, while also demonstrating how these major improvements can benefit our economy and environment.

#### CONCLUSION

I would like to conclude by thanking the Committee for its commitment to improving energy efficiency in so many ways. The Administration is committed to diversifying our nation's energy portfolio, and efficiency gains are the most easily accessible source of "new energy." Increasing the market penetration of efficient consumer products provides a very effective step toward reducing energy intensity and helping ensure a sustainable energy future. We must focus on these technologies and how they fit into the transformation of the entire built environment to get the best results. The Department looks forward to working with this Committee to resolve technical aspects of S. 2017 and to continue advancing the state of the art in lighting technologies.

Mr. Chairman, this concludes my prepared statement. I would be happy to answer any questions the Committee Members may have.

The CHAIRMAN. Thank you very much for your testimony. I guess one question that occurs to me, is I notice on the first page of your testimony here, you say that the Department has concerns with the schedule, in Section 101—this is referring to the bill that we introduced—schedule in Section 101 for issuing standards. Then you go on to say, "First, the time allotted is not sufficient to accomplish the required activity. Second, the timing of a follow-up standard would not provide DOE or the markets time to gain sufficient experience and understanding of the previous standard." Maybe you could elaborate on that somewhat. What we've tried to do is to

come up with a standard that we thought industry could meet. I guess your conclusion is that we've come up with something they can't meet. Is that right?

Mr. KARSNER. Not precisely, sir. It's really not a question of what the industry can meet and by when, so much as the, our capacity to adhere to the statutory requirements in issuing the rules. The statutory requirements demand X amount of data and experience when a new rule is published, that then feeds into the process for another rule. So, since the legislation, I think, contemplates multiple rules over a period of time, it is really the spacing in between the process of the rulemaking that is the primary concern.

The CHAIRMAN. My sort of layman's approach on this is that, what we've done in the legislation is we really imposed backup standards. We basically say, "You shall go ahead and issue standards at various points, but to the extent that they are not issued, then we legislate what those standards are." Is it your view that what we are legislating is objectionable—the substance of it is objectionable or that the process ought to be, to let you folks issue the standards and to give you more time to do so?

Mr. KARSNER. I think it's definitely substantially more a procedural concern than it is a substantive concern, relative to the technology.

The CHAIRMAN. Obviously, I would favor having you folks issue the standards, but at the same time, I would favor getting the standards in place at the earliest possible date in order to get the energy savings that are the result of that. I know you've been working hard to address this backlog of overdue efficiency standards and you referred to one of those in your direct testimony. Could you give a little more information on the status of these, this backlog that exists in the regulation or the promulgation of these regulations or standards?

Mr. KARSNER. Now you're inquiring beyond lighting I presume?

The CHAIRMAN. Yes, lighting specifically, but beyond lighting also.

Mr. KARSNER. Beyond lighting, I'm pleased to report, sir, since you first admonished me during my Senate hearing for confirmation on this, we have been able to live up to our commitment and have met all of our scheduled timelines, that were earlier published. We anticipate that we have the management systems in place now and priority, that we should be able to maintain the published time table that was agreed and confirmed by court order. So, that is the current status. I'd be delighted to follow-up, also for the record, on any particular of those appliance standards, as they are moving.

[The information follows:]

The chart below provides an overview of the status of current rulemaking activity for energy efficiency standards under way in the Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy.

Product Category	Type of Rule to be Completed	Deadline to Publish Final Rule	Report on Status of Rulemaking Activity November 20, 2007
			Rulemaking Status
Room air conditioners	Second amended energy efficiency standard	6/30/11	DOE has initiated the rulemaking for room air conditioners during the first quarter of fiscal year 2008. DOE published an announcement of the availability of the framework document in the Federal Register at 72FR57254 (October 9, 2007). The public meeting to receive initial comment on the framework document was held on October 24, 2007. The final rule with regard to energy conservation standards for room air conditioners remains on schedule for June 30, 2011.
Central air conditioners and heat pumps	Second amended energy efficiency standard	6/30/11	DOE plans to initiate the standards rulemaking for residential central air conditioners and heat pumps during the second quarter of fiscal year 2008. The final rule remains on schedule for June 30, 2011.
Water heaters	Second amended energy efficiency standard	3/31/10	With reference to these heating products (water heaters, direct heating equipment, and pool heaters), DOE published an announcement of the availability of the framework document in the Federal Register at 71FR67825 (November 24, 2006). The public meeting to receive initial comment on the framework document was held on January 16, 2007. DOE is performing the market assessment and engineering analysis work necessary to prepare for the ANOPR and remains on schedule for issuance of a final rule not later than March 31, 2010.
Pool heaters	First amended energy efficiency standard	3/31/10	
Direct heating equipment	First amended energy efficiency standard	3/31/10	
Furnaces and boilers (including mobile home furnaces and small furnaces)	First amended energy efficiency standard for all products	9/30/07	DOE issued the Notice of Proposed Rulemaking (NOPR) standard for furnaces and boilers on September 25, 2006 which was published in the Federal Register at 71FR59204 (October 6, 2006). On February 2, 2007, DOE issued a notice of data availability (NODA) to request comment on a more detailed discussion of data, and that appeared in the Federal Register at 72FR6184 (February 9, 2007). On August 3, 2007, DOE moved the Court pursuant to Section V of the Consent Decree to modify the schedule applicable to the final rule for furnaces and boilers. The motion requested that the existing deadline be extended nine months (until June 30, 2008) in order to enable DOE to develop a more comprehensive rule. Due to unforeseen circumstances, the Court issued an order on September 25, 2007, for a temporary administrative stay of the September 30 deadline. The deadline was stayed until seven calendar days after the date on which the Court enters an order resolving the motion to modify the deadline. If the Court were not to enter an order resolving that motion on or before November 1, 2007, DOE would be required either to issue the final rule pertaining to furnaces and boilers or to seek further modification of the Consent Decree or other appropriate relief from the Court. On November 1, 2007, the Court entered an order denying DOE's motion for modification of the consent decree and requiring DOE to issue the furnaces and boilers final rule within seven calendar days. DOE issued the final rule for furnaces and boilers on November 8, 2007, which was published in the Federal Register at 72FR65136 (November 19, 2007).

Product Category	Type of Rule to be Completed	Deadline to Publish Final Rule	Report on Status of Rulemaking Activity November 20, 2007
			Rulemaking Status
Dishwashers	Second amended energy efficiency standard	3/31/09	The final rule regarding energy conservation standards for dishwashers, ranges and ovens is scheduled for March 31, 2009. The Advance Notice of Proposed Rulemaking (ANOPR) was published in the Federal Register at 72FR64432 (November 15, 2007). The final rule remains on schedule for issuance not later than March 31, 2009.
Clothes dryers	Second amended energy efficiency standard	6/30/11	The Department has initiated the rulemaking for clothes dryers during the first quarter of fiscal year 2008. DOE published an announcement of the availability of the framework document in the Federal Register at 72FR57254 (October 9, 2007). The public meeting to receive initial comment on the framework document was held on October 24, 2007. The final rule for clothes dryers remains on schedule for June 30, 2011.
Fluorescent lamp ballasts	Second amended energy efficiency standard	6/30/11	DOE plans to initiate the standards rulemaking for fluorescent lamp ballasts during the first quarter of fiscal year 2008. The final rule for these products remains on schedule for June 30, 2011.
Ranges and ovens	First amended energy efficiency standard for gas products/Second amended efficiency standard for electric products	3/31/09	The final rule regarding energy conservation standards for dishwashers, ranges and ovens is scheduled for March 31, 2009. The Advance Notice of Proposed Rulemaking (ANOPR) was published in the Federal Register at 72FR64432 (November 15, 2007). The final rule remains on schedule for issuance not later than March 31, 2009.
Fluorescent lamps	First amended energy efficiency standard	6/30/09	
Incandescent reflector lamps	First amended energy efficiency standard	6/30/09	
Additional fluorescent and incandescent lamps	Initial energy efficiency standard	6/30/09	The final rule regarding energy conservation standards for three broad categories of lamps is scheduled for June 30, 2009. DOE is reviewing the ANOPR and remains on schedule for issuance of a final rule not later than June 30, 2009.
Packaged terminal air conditioners and heat pumps	Final action with respect to the rulemaking duty that the Plaintiffs claim was triggered by the 1999 amendment to ASHRAE Standard 90.1	9/30/08	The final rule regarding energy conservation standards for packaged terminal air conditioners and heat pumps is on schedule to be issued by September 30, 2008. On March 13, 2006, DOE published in the Federal Register a Notice of Availability (NOA) announcing the availability of a technical support document (TSD) that DOE was using in re-assessing whether to adopt, as uniform national standards, amendments to the ASHRAE/IESNA Standard 90.1-1999 for certain types of commercial equipment. 71FR12634. In the NOA, DOE stated that it was inclined to seek more stringent standard levels than the efficiency levels in ASHRAE/IESNA Standard 90.1-1999 for PTACs and PTHPs through a separate rulemaking. 71FR12634, 12639 (March 13, 2006). DOE is completing review of the notice of proposed rulemaking and remains on schedule for issuance of a final rule not later than September 30, 2008.
Packaged boilers	Final action with respect to the actions described for these products in 71 Fed Reg. 12634, 12637-68 & Table 1.4 (March 13, 2006)	2/28/07	DOE took the required final action with respect to packaged boilers on February 28, 2007, and that appeared in the Federal Register at 72FR10038 (March 7, 2007).

Product Category	Type of Rule to be Completed	Deadline to Publish Final Rule	Report on Status of Rulemaking Activity November 20, 2007
			Rulemaking Status
Instantaneous water heaters	Final action with respect to the actions described for these products in 71 Fed Reg. 12634, 12637-68 & Table 1.4 (March 13, 2006)	2/28/07	DOE took the required final action with respect to gas fired instantaneous water heaters on February 28, 2007, and that appeared in the Federal Register at 72FR10038 (March 7, 2007).
Motors (1 to 200 hp)	First amended energy efficiency standard	6/30/11	The final rule for a motors (1 to 200 HP) energy conservation standard remains on schedule to be published no later than June 30, 2011.
High intensity discharge lamps	Determinations(s)	6/30/10	DOE is currently undertaking analyses for the HID determination. DOE is on track to publish this notice of determination by June 30, 2010.
Electric distribution transformers	Energy efficiency standard	9/30/07	DOE took the required final action with respect to distribution transformers on September 28, 2007, and that appeared in the Federal Register at 72FR58190 (Oct. 12, 2007).
Small motors	Test Procedure	6/30/09	DOE issued a positive determination on June 2006 that appeared in the Federal Register at 71FR38799 (July 10, 2006) and then initiated an energy conservation standards rulemaking, along with a test procedure rulemaking. DOE published an announcement of the availability of the energy conservation standard framework document in the Federal Register at 72FR44990 (August 10, 2007). A public meeting to discuss the framework document was held on September 13, 2007. The final rule for the test procedure rulemaking is on schedule for issuance no later than June 30, 2009. The final rule for the rulemaking establishing energy conservation standards for small motors is on schedule for issuance no later than February 28, 2010.
Dehumidifiers (residential)	Efficiency Standard	3/31/09	The Advance Notice of Proposed Rulemaking (ANOPR) was published in the Federal Register at 72FR64432 (November 15, 2007). The final rule regarding energy conservation standards for dehumidifiers remains on schedule for March 31, 2009.
Clothes Washers (commercial)	Efficiency Standard	3/31/09	The Advance Notice of Proposed Rulemaking (ANOPR) was published in the Federal Register at 72FR64432 (November 15, 2007). The final rule regarding energy conservation standards for commercial clothes washers remains on schedule for March 31, 2009.
Small Motors	Determination	6/30/06	DOE issued a positive determination in June 2006 that appeared in the Federal Register at 71FR38799 (July 10, 2006). This initiated DOE's rulemaking for the Small Motors efficiency standard.
Distribution Transformers	Test Procedure	4/30/06	DOE completed the rulemaking and published the final rule in the Federal Register at 71FR24972 (April 27, 2006).
Ceiling Fan Light Kits	Efficiency Standard	1/31/07	DOE adopted the efficiency standards proposed in EPACKT 2005 and published the final rulemaking in the Federal Register at 72FR1270 (January 11, 2007).
Central Air Conditioners and Heat Pumps	Test Procedure	9/30/07	DOE issued the final rule September 28, 2007, which was published in the Federal Register at 72FR59906 (October 22, 2007).
Refrigerated Beverage Vending Machines	Efficiency Standard	8/31/09	DOE is on schedule to publish the final rule for refrigerated beverage vending machines in August 2009.

Product Category	Type of Rule to be Completed	Deadline to Publish Final Rule	Report on Status of Rulemaking Activity November 20, 2007
			Rulemaking Status
Commercial Refrigeration Equipment	Efficiency Standard	1/31/09	DOE published the ANOPR in the Federal Register at 72FR41162 (July 26, 2007). DOE is on schedule to issue the final rule by January 31, 2009.
Commercial Refrigeration Equipment	Test Procedure	1/31/08	DOE completed the rulemaking and published the final rule in the Federal Register at 71FR71340 (December 8, 2006).
Automatic Ice Makers (commercial)	Efficiency Standard	1/31/15	DOE plans to initiate this rulemaking in 2011.
Battery Chargers and External Power Supplies	Determination	8/31/08	DOE is on schedule to issue the final rule by August 31, 2008.
Battery Chargers and External Power Supplies	Efficiency Standard	To be scheduled following a positive determination	This Standard is contingent upon DOE making a positive determination on these products.
Battery Chargers and External Power Supplies	Test Procedure	2/28/07	DOE completed the rulemaking and published the final rule in the Federal Register at 71FR71340 (December 8, 2006).
Test procedures for eleven other products	Test Procedure	11/30/06	DOE completed the rulemaking and published the final rule in the Federal Register at 71FR71340 (December 8, 2006).

With regard to the lighting, we are presently internally in a concurrence process to publish an advanced notice of proposed rulemaking for the scheduled lighting, which is due in 2009, the scheduled date for the lighting.

The CHAIRMAN. How does that relate to what we have proposed in this legislation?

Mr. KARSNER. What I would say, is that the legislation would create a new baseline of performance going into that rulemaking, but it would not preclude that rule from—if the inputs that were, in fact, technological feasible and economically justifiable—it would not preclude those standards necessarily for being higher in a published Federal rulemaking process. But it would certainly add a new baseline of minimum performance.

The CHAIRMAN. So it would add a new baseline and it would also provide a backup if the deadlines set out in the legislation were not met. Is that accurate or not?

Mr. KARSNER. I'm not sure if that is accurate, with regard to the first round of proposed rulemaking due out in 2009. I know that is what occurs, according to the legislation, with regard to the latter years of—

The CHAIRMAN. Right.

Mr. KARSNER [continuing]. 2020, 2025.

The CHAIRMAN. OK.

Let me defer to Senator Salazar for any questions he has.

Senator SALAZAR. Thank you very much, Senator Bingaman and thank you very much Andy Karsner for your great work on energy issues, especially in this arena of conservation.

You know, for me, I was thinking about this hearing last night as I was preparing for it and reading the materials. I grew up in a household that didn't have electricity, and so our electricity was,



or our lights in our house at night were the kerosene lamps. I still remember when, in 1981, the public service company of Colorado then extended their power lines out to the ranch and we turned on the lights and made a huge change. So, I was thinking about the fact that as we've lighted up our homes and our buildings to be able to work through the night time and in the day time to do the kinds of things that we do in these buildings, that we've seen this huge revolution, in terms of our culture and really our civilization, with respect to lighting.

Yet, the technology we have, with respect to the lights we currently use, is still the technology of 100 years ago. So I guess I have two questions for you. I'm very supportive of this legislation and I hope that as we get it, get our Energy bill through Conference, that this legislation will be included as part of that package. But my first question is, why—why is it that it has taken us so long to get around to the realization that we have to do something with respect to much more energy efficient lighting and lighting in our homes and buildings? Why is it, for us as Americans, has it taken that long to get there?

Then the second question—Andy, I'd like you also to respond to—is, with respect to the manufacturing capabilities here at home in the United States, what is it that we—from my point of view, we're going to move forward with this agenda, I think DOE and this Congress will move forward with this agenda—how do we make sure that the manufacturing opportunities that we want to create for Americans to have jobs here at home, what kinds of incentives can we provide for that to happen?

Mr. KARSNER. Thank you, Senator. For the first question, why has it taken so long. I can only speculate as much as the next guy, really. There's not an official answer that the Administration could pose.

What I typically answer—I was just in London and Berlin and people chronically ask this question about why an advanced leading technology nation like the United States chronically underperforms its efficiency capacity. The only answer I can give, as a person who grew up in Texas where we sent postcards bragging about oil wells as part of the scenery, is the sociological factors. That we grew up in a nation thinking that our resources were inexhaustible and without impact. Fundamentally, when we put our mind to the notion that they are exhaustible and they do have an impact, we can develop the technology very rapidly, in a world-beating way.

So, we saw that in response to the first, earlier energy crisis in the 1970s, when compact fluorescents were first proliferated, but we also saw that doing so just on the technology basis or the encouragement basis wasn't enough, that we needed comprehensive certification testing, validation, and thus the Energy Star CFL Program was born and has brought great success to the reliability and quality of compact fluorescent and other fluorescent products that did not earlier exist when they were originally proliferated.

So, we are now taking that same approach, both to the pre-commercial R&D for solid-state lighting and the need to proliferate them with intelligent technology advancement outreach education and Energy Star certification and testing, et cetera.

So when we put our mind to it, we get better as we go. I think this legislation and this current dialog will contribute to a much more rapid evolution of the technology and its dissemination.

As to the second question on manufacturing, I'm less suited to address that than the experts that you have in the following panel, but I think it is a very important point and it is a point that is often neglected, not just with lighting, but with renewable energy and efficiency technologies in general. How do we account for the manufacturing and economic development impacts here at home, because as we are eminently destined to incorporate these technologies that the taxpayer invests so heavily in, we are seeing a growing trend that the manufacturing is occurring someplace else and that tax policy is geared for the re-importation cost of this. So, I think you will hear from experts far more qualified than myself in the next panel and I will defer to them, but I commend you and this committee for holding out the importance of the manufacturing impacts.

Senator SALAZAR. I appreciate your response to that. I think on that second question, it's a very important question for us to explore, you know, for me in Colorado as a—I've seen the work of this committee under the leadership of Senator Bingaman and Senator Domenici. I see real impacts that are happening in Colorado where today we have almost 1,500 megawatts of wind power being created and have been able to bring a company in that's helping now produce some of the wind turbines and blades in the State of Colorado.

So, as I think about this clean energy revolution that we're embarking upon here, I think it's always important for us to keep thinking about how that clean energy revolution can help create jobs here in the United States and how we incentivize those jobs in being created. So that would include what we do with efficiency, in terms of our lighting.

Thank you.

Thank you, Senator Bingaman.

The CHAIRMAN. Thank you very much. Let me just go ahead and stop with that.

Thank you very much for being here and thanks for your continued work with the committee on trying to get this legislation into a form that makes sense.

Mr. KARSNER. Thank you, sir.

The CHAIRMAN. All right. Why don't we go ahead with the next panel? We have three witnesses on the next panel, Paul Waide with International Energy Agency in Paris, Kyle Pitsor, with the National Electrical Manufacturers Association, and Steve Nadel, who's with the American Council for an Energy Efficient Economy.

Thank you all for being here. Why don't we have you go in the order that I just described, with Mr. Waide from the International Energy Agency first, and then Kyle Pitsor, and then Steve Nadel.

Mr. Waide, thank you for coming all this distance.

**STATEMENT OF PAUL WAIDE, SENIOR POLICY ANALYST, ENERGY EFFICIENCY AND ENVIRONMENTAL DIVISION, INTERNATIONAL ENERGY AGENCY, PARIS, FRANCE**

Mr. WAIDE. Thank you very much for inviting and I have to comment the Senate and the Congress for developing the legislation you are in this regard, which I think is going to be landmark legislation in energy efficiency terms, is going to have very important impacts internationally, and domestically, of course. I think is really marking a sea change in the importance given to energy efficiency as a topic, internationally.

My agency, the International Energy Agency, is an intergovernmental body. We have 26 member countries, the United States is one of them, and we are based in the city of Lights, as was featured in the Ratatouille promotion just seen recently. I'm pleased to be able to inform you, that least the Eiffel Tower in Paris is now lit up by LEDs and rather than by incandescent lamps. So progress is being made in many different fronts.

Since 2005, we've been invited by the G-8 group of countries to support them in developing their plan of action for a clean and competitive energy future. One of the first products we put out was a book called "Lights, Labors, Lost: Policies for Energy Efficient Lighting," and as you can see from the title, we're not immune to using bad word play on watt lighting as well, shamelessly borrowing from a Shakespearian play. This publication documents, as best as we understand it, the international use of lighting in the current time, globally and by regions, looks at all of the opportunities to save energy in lighting, what technologies can be deployed, what practices can be deployed and the economics and environmental impacts of doing that—and energy impact, of course—and also looked at the policy sets which were being, had been deployed, what they'd achieved, and what more could be done to try and move things forward.

Now from this we determined that lighting accounts for roughly 19 percent of global electricity consumption. To put that into context, that's roughly the entire production of gas-fired generation internationally. Within that, incandescent lighting is about 7 percent of global electricity consumption, and that's approximately half of the output of the world's nuclear power plants at the current time. So, this is the sort of rough magnitude of the arena that we're working in here.

There are globally about 12.5 billion incandescent lamps sold every year and, has already been mentioned, they are very low efficiency. They only have 5 percent of their—of their input energy is converted to visible light, and the rest is to heat. The technology is little changed since it was first introduced. We, of course, have many more efficient technologies coming into the market now. The compact fluorescent lamps have been mentioned.

It was also asked why are things not moved forward faster in that domain. I think there are several reasons, but as the speaker said, it was speculation about really what they are. But partly, we have to acknowledge that the technology itself has actually improved in recent years. I just brought some examples to illustrate that. When they first came out they were very bulky. You can now get them down to this size or smaller, even. So they fit into all

screw-based sockets and into all fixtures much better than was previously the case.

Also the quality of these lamps has improved dramatically as well. Although there are still some issues that are important to bear in mind about quality between different types of lamp technologies. I think the next speaker's going to be talking—giving some illustrations of these, so I won't dwell on that.

What we found, as well, is that obviously were everybody internationally to move to using compact fluorescent lamps instead of incandescents—now maybe there will be some blend of technologies moved instead or adopted instead—this would save roughly 75 percent of that 7 percent of electricity consumption and to put that in context of CO<sub>2</sub> on a global level. It's roughly equivalent to replacing a hundred times the current installed wind capacity in the United States in lieu of unsequestered coal, in terms of abating CO<sub>2</sub>. Or, according to our estimates, it's approximately equivalent to almost three-quarters of the—of CO<sub>2</sub> abatement commitments of the Annex-1 CO<sub>2</sub> signatures. So this is very large amounts of CO<sub>2</sub> that are being potentially—be abated from these, from adopting this kind of technology.

What I'd like to do and my testimony does, is summarize what's been happening internationally. Our industry deserves a tremendous amount of credit for what they've done in the last 12 months on this topic. They've endorsed the objective of moving away from incandescent lighting over a reasonable timeframe, and that actually happened, both at individual companies announcement, initially in Brussels in December last year, and then at a workshop we organized in Paris in February where other major players came together and agreed on that objective.

Since then, we've seen an explosion of activity in terms of policy measures internationally. The week prior to our workshop, the government of Australia made their famous announcement that they wanted to see incandescent lighting or inefficient incandescent lighting phased out by 2011. They are currently developing their precise plans, but as it stands, they're planning to phaseout the majority of lamps next year, in 2008, and then various of the monish products by—in the intervening period up to 2014, in fact. They are setting a second-tier standard as well, although they haven't quite decided though exactly what the level that should be at the moment.

We've also seen that, in March, the European Council of Ministers, this is the heads of state meeting, which takes place periodically in Europe. For the first time ever, actually, made a pronouncement about energy efficiency. What they did, is they asked the European Commission to develop a regulation by 2009 at the latest, within the terms of an existing regulatory framework called the Ecodesign Directive, to facilitate the phase-out of inefficient incandescent lighting.

We've also seen, although that will apply EU-wide minimum efficiency standards presumably, although the regulations are still being developed at this current time, so we don't have anything on the table as yet from the Commission. They've hired a consultant. The consultant's due to report in November. There will be consultation process taking place next year with all of the member States,

and that's when the—the steps that you are already looking at here, will start to be crystallized in the European process.

But in the meantime, the European industry's actually come forward with their own proposal. They're proposing staged phase-out of incandescent lighting beginning in 2009, they have a tier-one and a tier-two level. So 2009 to 2015, depending on the wattage of the lamps, and then going from 2011 to 2017, depending on, again, the wattage of the lamp for the tier two levels. That's presumably in the base proposal and then the member States will discuss that with them, about what their final position will be.

But we actually have, now five EU member States, first the UK, then Ireland, Portugal, Belgium, the Netherlands, who've also made it clear that they intend to phase-out incandescent lamps by 2011, at the latest. Because they are not by EU law, able to introduce minimum efficiency standards, which are not applicable EU-wide, it has to be an EU process for that, in the terms of the single market. They're doing this in ways by which they are working with the supply chains, get agreement that they will stop stocking incandescent lamps, and some retailers have already announced that they will do that in the UK.

They are also subsidizing compact fluorescent lamps, only the high-quality ones, not the low-quality ones. In the UK right now, you can buy those lamps for the same price as an incandescent lamp, effectively. They are proposing, although this isn't finalized, to potentially introduce taxes, import duties on incandescent lamps, as another way of pricing them out of the market. So, there are many ways by which you can influence the market to reach this kind of outcome.

Canada has also come forward. They've made a pronouncement that they want incandescent lights phased-out by 2012. Natural Resources Canada has come forward with a specific proposal on how that should happen. Some of the details are put forward in my testimony, but they will obviously give you more details. As proposing a lumen per watts approach for a standard and there will be a tier-one and tier-two approach within that.

We've also seen Switzerland, most recently, coming forward, that linking it to the energy label, which is used on European lamps sold in the European Union and also in Switzerland. Just to show you an example, this is what it looks like. You have an A to G rating. It works in any language in Europe, which is why it's phase simplified. You could have more information were there not the linguistic problems. Their proposal is to ban certain classes, of inefficient classes over a certain period of time and to ramp that up so that by 2012, all lamps would be reaching class B efficiency on this. That's again linked to a lumens per watt type approach.

Now, if we add all of this up and what's happening here, we're looking at roughly half of the lamps in the world, the incandescent lamps in the world being subject to some sort of regulatory measures coming into effect over the next decade, at various time levels. That means a huge transformation in the lamp industry.

Lamps are traded globally. The—as has already been mentioned—the majority of the world's compact fluorescent, for example, are sourced from China at the moment. What happens in one

part of the world has a significant impact potentially on the markets in other parts of the world.

So one of the issues that we have been bringing to people's attention and we're starting to discuss this with our member governments, is potentially the need to coordinate some of these measures, to ensure that there are no shocks in the supply chain. Because this is a massive transformation that is to be required, replacing billions of lamps by billions of other kinds of lamps, having lamps with very different replacement cycles, some which might be 1,000 hours for a standard incandescent lamp now, as opposed to 6,000 upwards for incandescent lamps, implies a totally different volume of lamp production. It implies transforming the capacity for production, which may have implications for stranded assets in the new capacity. There is a risk in certain situations that that could arise. That's something that OECD is engaged in this process, is keen to avoid.

But it actually, just to conclude my testimony, just to say that this isn't limited to the OECD. Many of the measures are actually being adopted elsewhere. Funny enough, the first country to have actually phased-out incandescent lighting is Cuba. They did this periodically, starting last year, and I believe it's already happened now. They introduced a ban and they also, actually, went around households and delamped the old incandescent lamps and replaced them with—with compact fluorescent. They are reporting significant drops in electricity demand, as a result of that step. Now I don't imagine that kind of measure's going to be happening in the OECD, but it just shows that, what countries can do.

China is seriously considering this issue. They are—with the EU—are the joint second-largest market in the world, they're about a sixth of the world market for incandescent lamps. They are starting work now, looking at whether or not they will follow suit and introduce policy measures to bring them in line.

We've seen in many other large non-OECD economies—Indonesia, Egypt, South Africa, Brazil—they've all introduced major compact fluorescent lamp programs over the years and they have been ramping those up. Some of those economies, such as Brazil for example, half of their screw-based lamps are now CFLs and they've saved a significant amount of power by making that transformation.

I understand that the Global Environmental Facility in the process of developing a—what they hope will be a global project to support, not only OECD countries to phase-out incandescent lighting. So it's not inconceivable that over the 10 to 15 years, that maybe all of the incandescent lamps or in the conventional form or the conventional efficiencies of today, will be removed from the global market. This is obviously a tremendous undertaking and I think you need to be commended for your efforts in contributing to that process.

Thank you.

[The prepared statement of Mr. Waide follows:]

PREPARED STATEMENT OF PAUL WAIDE, SENIOR POLICY ANALYST, ENERGY EFFICIENCY AND ENVIRONMENT DIVISION, INTERNATIONAL ENERGY AGENCY, PARIS, FRANCE

DISCLAIMER

The information and views expressed in this testimony reflect the personal understanding and opinion of Dr Paul Waide. He accepts no liability for the accuracy of the information presented or any subsequent use that is made of it, but offers this testimony in good faith according to his best understanding of the topic at the time of writing.

SYNOPSIS

This testimony summarises the international status of policy efforts to phase-out inefficient incandescent lighting, provides estimates of potential energy and CO<sub>2</sub> savings, gives a timeline of the developments to date, explains broader international policy dynamics and how they may influence the US lamp market and provides comments on some issues pertinent to the proposed US legislation.

SUMMARY

Since early 2007 almost all OECD governments have begun to develop policies aimed at phasing-out inefficient incandescent lighting. The intention of the regulations already adopted or under consideration is to encourage energy savings through the usage of higher efficiency lamps and most notably the use of compact fluorescent lamps (CFLs) in place of standard incandescent lamps (known as GLS, which is an abbreviation of general service lamps).<sup>1</sup> The countries which are currently actively developing policy measures to phase-out incandescent lamps account for roughly half the global GLS market and consume about 6.5 billion GLS per year out of a global market volume of approximately 12.5 billion lamps. Other countries may also be poised to introduce similar initiatives in the near future, such that it is conceivable that standard GLS lamps could be phased-out globally within a decade. The USA is the largest single GLS market and accounts for almost a third of the global market by volume. The next largest markets are the European Union and China, which each account for about a sixth of the global GLS market. The global market for screw-based CFLs is estimated to have been roughly 1.6 billion lamps in 2006 of which approximately four-fifths were manufactured in China. CFL sales are growing strongly internationally, with growth in demand in almost all markets, but GLS sales are likely to remain high and even increase without policy intervention.

Incandescent lamps consume about 7% of global electricity consumption and give rise to approximately 2% of global energy-related CO<sub>2</sub> emissions.<sup>2</sup> First commercialised in 1879 the technology is little changed since the 1920s and has a physical energy efficiency of about 5%, which means that only 5% of the input power is converted to visible light and the rest is converted into heat. Compact fluorescent lamps are typically between four and five times more energy-efficient i.e. they convert between 20 and 25% of the input power into visible light. Were people around the world to universally stop using incandescent lamps from 2012 onwards and instead use lamps with an efficiency of CFLs it would save 5.5% of global power demand and avoid roughly 500 million metric tonnes of CO<sub>2</sub> emissions.<sup>3</sup> This magnitude of CO<sub>2</sub> abatement is equivalent to what would be achieved by installing one hundred times current US wind generation capacity in lieu of unsequestered coal-fired power plants, or alternatively from building 77 one-gigawatt nuclear power plants in lieu of unsequestered coal-fired power plants. To give an alternative context were these savings to be realised it would amount to abatement of CO<sub>2</sub> emissions equivalent to almost three-quarters of the 2012 reduction commitment of the Kyoto Protocol signatories.<sup>4</sup>

<sup>1</sup>On average a CFL uses a quarter of the energy of a GLS lamp for the equivalent light output and hence leads to very significant and cost effective energy savings. GLS and most CFLs have screw-base or bayonet-base caps but are collectively called "screw-based lamps."

<sup>2</sup>This is just their direct electricity use and does not take account of any additional energy that may be used or saved for space conditioning purposes as a result of the heat emitted by these lamps.

<sup>3</sup>These figures are IEA estimates derived from projections made in a global lighting model developed for the 2006 publication, *Light's Labour's Lost: Policies for Energy Efficient Lighting*, IEA, Paris.

<sup>4</sup>The IEA has estimated that Annex 1 Kyoto protocol signatory countries need to abate about 700Mt of CO<sub>2</sub> in 2012 to satisfy their reduction commitments under the treaty. Reference: *Act Locally, Trade Globally*, IEA, Paris 2005.

However, CFLs are not the only alternative to conventional general service incandescent lamps and there are other lamp technologies which could be used in place of GLS lamps that have higher (or slightly higher) energy efficiency but are not as efficient as CFLs. They include: halogen lamps, which can have efficiencies that are between a few percent better than GLS to up to twice as high as GLS depending on the technology used; and light emitting diodes (LEDs), which are just beginning to appear on the market. LED technology is making great advances; however, it is still unclear how viable it will eventually be as a replacement for general service incandescent lamps. There is uncertainty about the future rate of product development and the eventual market acceptance of LED costs, light level and distribution characteristics, heat dissipation and chromatic properties.

Regulations could thus be promulgated, which would phase-out conventional general service incandescent lamps but could still be met by significantly less efficient lamps than CFLs. Under such circumstances the magnitude of energy savings resulting from the regulations would depend on the relative preference expressed in the market place for the less-efficient compliant lamp options and for CFLs. In the lower extreme energy savings could be as little as 10 to 20% of GLS lamp energy consumption as compared to roughly 75% with the full adoption of CFLs. Some of the factors to be considered when developing such regulations are discussed in Section 4 of this testimony, including a summary of the issues pertaining to current screw-based lamp technology discussed in Section 5. The following section gives a chronology of international regulatory developments in relation to the phase-out of standard incandescent lamps and provides information on their current status.

#### CHRONOLOGY OF INTERNATIONAL REGULATORY DEVELOPMENTS

Regulations in place in 2006.—In 2006 the only economies that had adopted any kind of regulation to influence the efficiency of general purpose standard incandescent lamps with screw-caps were the Republic of Korea and California. In both cases the regulations are set at a level of stringency that continues to allow conventional GLS lamps to be sold but excludes the least efficient varieties. These measures are expected to result in energy savings for screw-based lamps of a few percent which reflects the narrow spread in energy efficiency of currently available GLS lamps.

With current commercially available lamps designed to use existing screw-base sockets it is only possible to get much larger energy savings by the use of fundamentally different lamp technologies.<sup>5</sup> Energy savings of 75-80% can be achieved through the use of compact fluorescent lamps (CFLs) in place of GLS and lesser savings of from 0-50% can be realised through the use of halogen lamp technology.

#### *Policy Developments From 2006 to the Present*

Light's Labour's Lost.—In June 2006, as part of its work for the G8 Plan of Action on a Clean, Clever and Competitive Energy Future the IEA released a 558 page publication on lighting energy use and energy efficiency issues around the world, entitled *Light's Labour's Lost: Policies for Energy Efficient Lighting*.<sup>6</sup> The book's findings received widespread media attention and were widely circulated among lamp manufacturers and policy makers. The key findings are:

- Some 19% of global power consumption and some 3% of global oil demand is attributable to lighting.<sup>7</sup>
- Overall lighting gives rise to 1900 million metric tonnes of CO<sub>2</sub> emissions, which is roughly 70% of the CO<sub>2</sub> emitted by light duty vehicles (cars, SUVs, motorcycles etc.)
- Without new policy measures global energy consumption for lighting is projected to grow by 60% from 2005 to 2030.
- Over 38% of future global lighting energy demand could be avoided by the use of more efficient lamps and ballasts<sup>8</sup> which are routinely available on today's market.

<sup>5</sup>Note this does not preclude the possibility of more efficient incandescent lamps being commercialized in the future.

<sup>6</sup>Light's Labour's Lost: Policies for Energy Efficient Lighting, IEA, Paris, 2006. <http://www.iea.org/Textbase/publications/free—new—Desc.asp?PUBS—ID=1695>

<sup>7</sup>About 1.1 million barrels of oil a day are used in road vehicles to power their lights and some 1.3 mb/d is used in liquid petroleum products, such as kerosene, to provide lighting in households without access to the electricity grid. Approximately 1/5th of the world's population rely on fuel-based lighting in their homes.

<sup>8</sup>Ballasts are devices used by some types of lamps to regulate the input current and voltage so that the lamp operates properly. Ballasts consume power to operate and some types are more efficient than others.



- Were the global phase-in of such high-efficiency lamps and ballasts to start in 2008 following natural equipment replacement cycles it would give rise to 16.6 billion metric tonnes of CO<sub>2</sub> savings globally by 2030 and reduce the total cost of lighting over the same period by some 2.6 trillion US\$ due to reduced energy costs.
- Each metric tonne of CO<sub>2</sub> abated would provide a net economic benefit of US\$156.

The key findings regarding phasing-out inefficient incandescent lamps in favour of more efficient technologies, such as CFLs, are:

- Globally incandescent lamps are estimated to have accounted for 970 TWh of final electricity consumption in 2005 and given rise to about 560 million metric tonnes of CO<sub>2</sub> emissions.
- About 61% of this consumption is in the residential sector with most of the rest in commercial and public buildings.
- The IEA estimates that incandescent lamps used in the USA and Canada jointly consumed about 350 TWh of delivered electricity in 2005 and gave rise to about 217 million metric tonnes of CO<sub>2</sub> emissions.
- If current trends continue incandescent lamps could use 1610 TWh of final electricity globally by 2030.
- In the hypothetical case that all standard incandescent lamps were to be replaced by CFLs it would save roughly 800 TWh and 470 million metric tonnes of CO<sub>2</sub> emissions in 2010 rising to 1200 TWh and 700 million metric tonnes of CO<sub>2</sub> in 2030.
- Cumulatively this would reduce global net lighting costs by US\$1.3 trillion from 2008 to 2030, and avoid 6.4 billion metric tonnes of CO<sub>2</sub> emissions at a negative abatement cost of -US\$205 per tonne.
- The typical rate of return on investment<sup>9</sup> in a CFL compared with a standard GLS lamp is in excess of 180%.

#### *Time Line of International Policy Developments Since 2006*

In May 2006, under the terms of the 1992 Energy Policy Act the US DOE initiated a rulemaking process to determine the case for Federal standards applicable to general service incandescent lamps, incandescent reflector lamps and general service fluorescent lamps. Under the original timetable it was expected that an advance notice of proposed rulemaking would be issued by November 2007 and a final rule by June 2009, to take effect by June 2012.

Also in May 2006 and within the rubric of the G8 Plan of Action, which was launched following the 2005 Summit of the G8 in Gleneagles, the IEA made four concrete policy recommendations on energy efficiency for consideration by the G8 at the St Petersburg summit in July. The recommendation regarding lighting encouraged G8 and plus-5<sup>10</sup> leaders to enact policies to raise the energy efficiency of lighting in line with international best practice. The G8 welcomed the recommendations and asked the IEA to elaborate on them with more explicit proposals.

In the USA, Wal-Mart and Home Depot launched programmes to dramatically increase the sale of CFLs in their retail outlets.

Cuba banned the sale of incandescent lamps and implemented a programme of direct substitution of GLS with CFLs in households. It is understood that this was completed sometime in 2007 making Cuba the first country in the world to have phased-out incandescent lighting. Another 10 Caribbean countries and Venezuela are reported to be implementing similar measures.

In December 2006 Philips Lighting, the worlds largest lamp manufacturer, held a press conference in Brussels at which they announced they would welcome the global phase-out of general service incandescent lamps over a 10 year period under proviso that the same regulatory conditions apply to all market actors.

On January 30, 2007, California Assemblyman Lloyd Levine proposed a bill to ban the sale of general service incandescent lamps in the state by 2012.

On February 26th 2007 the IEA and European Commission held a joint workshop in Paris on CFL Quality and Strategies to Phase-out Incandescent Lighting which was attended by energy efficiency policy makers and industry. At this workshop the other major international lamp producers,<sup>11</sup> who supply the majority of lamps sold

<sup>9</sup>The Internal Rate of Return.

<sup>10</sup>The "Plus 5" are Brazil, China, India, Mexico and South Africa.

<sup>11</sup>The major international lamp companies who jointly supply the majority of lamps currently sold in the economies of the OECD are: Philips, Osram-Sylvania and General Electric—note in

within the economies of the OECD, announced their support for the objective of phasing-out of inefficient incandescent lamps within a reasonable timeframe.

In the week preceding the IEA workshop (on February 20th) the government of Australia held a press conference announcing their intention to phase-out inefficient incandescent lighting by 2011. The Government of New Zealand has since confirmed that they support the policy and will harmonise their requirements with Australia. The final details of the regulation are still being settled but as of the end of August 2007 the structure of the regulations appeared to be as follows. From 1 October 2008 the majority of screw-based lamps imported into Australia would need to have an efficacy<sup>12</sup> of 20 lumens per Watt (denoted (lm/W)).<sup>13</sup> The intended result of these regulations is that conventional GLS lamps will effectively be eliminated from the Australian marketplace and that CFLs will dominate screw-based lamp sales afterwards, although some mains voltage halogen lamps would remain. From 2010 the scope will be expanded so that decorative screw-based lamps such as candle-shaped, “fancy rounds”, etc. have to meet the 20 lm/W requirement. From 2012 mains voltage halogen lamps and incandescent reflector lamps (PAR, R, ER, etc.) will also be required to attain 20 lm/W. From 2014 pilot lamps, refrigerator and oven lamps will need to satisfy 20 lm/W.<sup>14</sup>

In the same week (on February 22) the “How Many Legislators Does it Take to Change a Light Bulb Act (AB 722)”, was introduced in the California State Legislature. This proposed that GLS lamps would not be sold after 2012.

On March 9th, 2007, the EU Council of Ministers<sup>15</sup> called on the European Commission to establish a regulation addressing incandescent lighting by 2009 within the framework of the already existing Eco-design for Energy Using Products Directive 2005/32/EC. This Directive is a regulatory framework which grants the European Commission authority to set mandatory (or voluntary) energy performance standards for tradable goods sold across the EU.

On March 12th, 2007, the UK government announced a plan to complete the phase-out of inefficient incandescent lamps within the UK by 2011, even if this is in advance of the provisions that are ultimately set in the EU Eco-Design Directive. Under the terms of the European Single Market individual EU member states do not have the authority to set non-EU harmonised performance requirements for tradable goods. Accordingly it is understood that the UK government are considering a mixture of: voluntary agreements with lamp suppliers and retailers; subsidies to encourage the sale of high quality compact fluorescent lamps; and fiscal measures to discourage the sale of low efficiency incandescent lamps. Some major UK retailers have already announced that they will stop stocking GLS lamps.

During the period of March to May 2007 the governments of the Republic of Ireland, Portugal, Belgium and the Netherlands announced similar policies and initiatives to the UK.

On March 15, 2007, US Representative Jane Harman proposed a bill (HR1547) in the House of Congress that would impose efficacy standards for general service lamps sold within the USA. This has since been modified and entered within the House energy bill (S. 3221—Sec 109).

On March 28th, 2007, a cross-party group of members of the European Parliament urged EU governments and the European Commission to quickly introduce new energy efficiency standards for lighting and to introduce market surveillance measures to prevent existing product quality standards from being flouted by importers.

Also in March 2007 California assemblyman Jared Huffman submitted a competing bill (AB 1109) to the Levine bill (AB 722) based-on technology-neutral performance standards for various categories of lighting.

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Europe Osram and Sylvania are separate companies whereas in North America they are a joint company.

<sup>12</sup>The efficacy of a lamp is the standard metric denoting its functional efficiency and is the amount of visible light it emits (expressed in lumens (lm)) divided by the power it consumes (expressed in watts (W)).

<sup>13</sup>Note that 20 lm/w is for 1200 lm (60w) lamp. The precise efficacy requirement is expected to be a curve based on lamp light output. Lamps required to meet this requirement would include IEC bulb designations A55–A60–PS60, M50 and M60 (& possibly others) designed to operate at >220V and with screw-caps of E26, E27 or B22d. When comparing these proposals with those under consideration in the USA account needs to be taken of the difference in operating voltage. Due to physical laws incandescent lamps operating at higher voltages are less efficient than when operating at lower voltages. Incandescent lamps designed to operate at 220–240V electricity networks, such as in Europe and Australia, are roughly 15 to 20% less efficient than comparable products designed for 120V systems such as those used in North America.

<sup>14</sup>Source: Australian Phase-out of Incandescent Lamps, presentation by Shane Holt, Australian Greenhouse Gas Office, Government of Australia.

<sup>15</sup>The regular meeting of EU heads of state.

Shortly afterwards several other bills were introduced in other US states. These include: bills in Rhode Island (SB 806), Nevada (AB 178), New York (#A07944 and AB 6190) and North Carolina (DRH30218-RT-5) of a similar nature to the CA Levine bill; a bill introduced in Minnesota (SB 1442) which proposed to tax the sale or transfer of incandescent lamps by a wholesaler at \$0.25 per lamp; a bill entitled, "Act Concerning Inefficient Incandescent Lamps" in Connecticut (HB 6550); bills that would require all state buildings to switch to CFLs over the next three years were introduced in New Jersey (A 3983), South Carolina (SB 97), Illinois (HB 1460), Hawaii (SCR 53 and SR 28) and Arkansas (HB 2551). The Nevada bill AB178 was approved by the Governor in June and requires lamps sold in the state from 2012 to attain an efficacy of 25 lm/W or higher.

April 18th, 2007, the government of Ontario announced a policy to phase-out the sale of incandescent lamps within the province by 2012.

April 25th, 2007, the government of Canada announced a policy to set performance standards for all lighting to phase-out the use of inefficient light bulbs in common applications by 2012. The intention is to have defined details of the requirements by the end of 2007. At a workshop held in Toronto on June 26th staff from the Office of Energy Efficiency in Natural Resources Canada set out a provisional rulemaking proposal containing the following elements. The standard is expressed by an equation that represents the shape of a curve of lamp efficacy (lumens per watt) to lumen output (lumens) where  $E$  (expressed in lumens per watt) =  $4.2375 * \ln(\text{Lumens}) - 13.7912$ . This equation is intended to be approximately 50% higher than the best fit curve through existing general service lighting products. The proposal also includes a lower standard (at 30% higher than best fit) for "enhanced spectrum lamps". A second Tier was proposed that would be approximately 100% higher than current efficacy levels to come into effect in 2015. The following table summarises the required efficacy thresholds that would apply were this proposal to be adopted.

PROVISIONAL CANADIAN GOVERNMENT REGULATORY PROPOSALS FOR  
MINIMUM EFFICACY LEVELS APPLICABLE TO SCREW-BASED LAMPS  
SOLD IN CANADA<sup>16</sup>

Current			Proposed		Current
Typical Wattages	Typical Lumen Level	Efficacy (best fit)	Tier 1	Tier 2	Energy Star Qualified CFL (equivalent lumens)
Effective			2012	2015	
25	210	8.4	12.7	21.1	45
40	490	12.3	17.8	29.7	45
60	840	14	21.1	35.1	45
75	1170	15.6	23.1	38.4	60
100	1690	16.9	25.3	42.2	60
>100	2850	19	28.5	47.4	60

<sup>16</sup>Source: minutes of the National Lighting Summit: Summary of the first consultation on the Government of Canada's proposed national performance standard for general service incandescent light bulbs—Toronto, June 27, 2007. Natural Resources Canada.

On 5th June 2007 the European Lamp Companies Federation, an industry association which includes Philips, Osram, GE and Havells Sylvania, issued a press release setting out a voluntary proposal to phase-out the sale of GLS lamps in Europe. Under the proposal, by 2015, 85% of the total EU traditional incandescent lamp market of 2.1 billion lamps would need to meet new efficiency requirements. The proposal envisages a staggered phase-out of GLS lamps such that lamps above 100W would have to meet an initial efficacy limit of 18 lm/W by 2009 and a more stringent one of 20 lm/W by 2011, lamps of 100W to 75W power would have to meet a first efficacy requirement of 14 lm/W by 2011 and of 17 lm/W by 2013, lamps of 60W to 75W would have to meet a first efficacy requirement of 13 lm/W by 2013 and one of 15 lm/W by 2015, lamps of 40W to 25W would need to satisfy a first

efficacy requirement of 11 lm/W by 2015 and 14 lm/W by 2017 and lamps of less than 25W would need to satisfy a first efficacy requirement of 10 lm/W by 2015 and 12 lm/W by 2017.<sup>17</sup> There has yet to be any consideration of this proposal within the European Commission's rulemaking process under the rubric of the Eco-design of Energy Using Products Directive, 2005/32/EC. To date the Commission has hired consultants to examine all the technical issues pertinent to the preparation of a rule-making and they are planning to report their first results in November 2007. The Commission has been instructed by the EU Council of Ministers to issue a final rulemaking on the topic before 2009 and is expected to begin a consultation process with representatives of EU Member States in early 2008.

On 6–8 June 2007 the G8 Summit met at Heiligendamm in Germany and endorsed twelve concrete energy efficiency policy recommendations from the IEA. In the case of lighting the IEA recommended that:

- Governments should move to phase-out the most inefficient incandescent bulbs as soon as commercially and economically viable.

These recommendations were also circulated to the 26 IEA energy ministers for consideration at the 2007 IEA Ministerial held in Paris on May 15th 2007 and were strongly supported.

On June 12th US Senator Bingaman introduced a Senate Bill 1115 the Energy Efficiency Promotion Act that is subsequently renumbered as S1419 and then S.2017 (the subject of the current hearing). The bill includes measures aimed at phasing-out inefficient general purpose lighting.

In August 2007 the Government of Switzerland published an Energy Efficiency Action Plan which included a proposal for regulations to phase-out inefficient incandescent lamps. Under the proposal all incandescent lamps sold from 2008 onwards will need to be of an efficiency of class E or higher according to the EU household lamps energy label<sup>18</sup> (e.g. requires a minimum efficacy of 11.2 lm/W for a 750 lm lamp), from 2010 onwards to be class D or higher (e.g. requires a minimum efficacy of 13.0 lm/W for a 750 lm lamp) and from 2012 to be class B or higher (e.g. requires a minimum efficacy of 20.5 lm/W for a 750 lm lamp). Fluorescent lamps must perform to level A from 2010 onwards (e.g. requires a minimum efficacy of 65.9 lm/W for a 750 lm lamp). This proposal is currently entering into a consultation process.

Beyond the economies of the OECD the governments of Thailand and of Ghana have recently announced policies to phase-out incandescent lamps. Government and utilities in Egypt, India, Indonesia, South Africa and Vietnam are all strengthening existing major CFL promotional programmes. Several other countries including Brazil and Mexico have previously launched successful large scale programmes to promote the use of CFLs in place of incandescent lamps.

The Government of China is understood to be in the process of initiating a project to investigate the issues associated with phasing-out incandescent lamps to help them to determine whether to introduce new policy measures to that effect.

The Global Environment Facility of the UNFCCC is currently in the process of developing a global project to support non-OECD economies to phase-out incandescent lighting. It is anticipated this project will be formally launched before the end of 2007.

#### ISSUES BEING CONSIDERED BY LEGISLATORS

Legislators around the world considering the adoption of regulations to phase-out inefficient incandescent lighting are facing similar issues. They need to weigh in the balance the potential for energy performance requirements to deliver significant energy savings, and their associated environmental and economic benefits, with the desire to ensure there is an on-going supply of lamps that satisfy consumer needs. Setting general energy performance requirements in a manner that facilitates the required industrial and commercial transition but doesn't result in unintended consequences is a challenge. In particular, determining appropriate treatment for niche applications without creating substantive loopholes is one of the biggest technical issues to be addressed and reaching a satisfactory resolution will require careful attention to detail during the policy making process.

<sup>17</sup>When comparing these proposals with those under consideration in the USA account needs to be taken of the difference in operating voltage. Due to physical laws incandescent lamps operating at higher voltages are less efficient than when operating at lower voltages. Incandescent lamps designed to operate at 220–240V electricity networks, such as in Europe and Australia, are roughly 15 to 20% less efficient than comparable products designed for 120V systems such as those used in North America.

<sup>18</sup>Commission Directive 98/11/EC, OJ L 71 10.3.1998, p. 1–8.

A recurrent issue is whether to set requirements that allow more than one type of currently-available screw-based lamp technology to be deployed, or whether to set them at a level which guarantees maximum energy savings but may exclude some genres of lamp technologies. The response will depend on how regulators and the market view the suitability of the various higher-efficiency alternatives to standard incandescent lamps and on the relative importance given to the trade-offs implied. To provide some sense of what these are the main characteristics of the principal alternative technologies to general service incandescent lamps are briefly described in section 5. Some thoughts are also offered about complementary measures which can help to minimise some of the trade-offs.

When developing regulations care needs to be taken to ensure that regulatory lead times and market rewards are sufficient for industry to adjust their manufacturing base to produce compliant lamps in the required volumes. At present, most regulatory discussions have been taking place independently of those in other jurisdictions and there has been relatively limited discussion between regulatory authorities about the combined impact of their measures on global lamp supply. As lamps are internationally traded products and a large proportion of lamps sold in any one jurisdiction are often sourced from elsewhere there may be a need to ensure that international regulatory developments are coordinated to minimise the risk of lamp shortages once the regulations come into effect. Specifically the risk of a shortage in regulatory-compliant lamps arises from the following concerns:

a) The substantially different average lifetimes of CFLs compared to incandescent lamps means that, dependent on the rate of transition to CFLs, there is a possibility of the development of a short-lived peak in global demand for CFLs followed by a depression as lamp markets move to significantly longer replacement cycles.<sup>19</sup> Were this to occur it would create a risk of those manufacturers investing in new CFL production capacity being left with stranded assets. From a regulators perspective the concern is that industry might not invest sufficiently in meeting the peak in global CFL demand and thus bring about a shortfall in lamps at the moment of inflection in global compliant-lamp demand.

b) There are technical limits to the rate at which the global lamp industry is capable of increasing CFL production capacity mostly due to the time it takes to increase production and supply of key materials and components (notably glass of an appropriate grade, phosphors and electronics). This is a particular concern for the supply of higher quality CFLs, such as currently sold in the economies of the OECD.

Performing simulations of the potential impacts of current global regulatory developments on demand for CFLs and other regulatory-compliant lamp types would be one means of assessing the seriousness of these risks and determining if greater co-ordination in policy setting may be required. The IEA is developing a project to examine this issue.

Lastly, not only do near-term regulatory performance thresholds need to be achievable with current technology but regulators must also be mindful about the signals they send regarding investment in future technology. It is appropriate to consider the degree to which the regulatory framework put in place in the short-term may influence near and medium-term investment decisions in lamp production capacity and the extent to which this is consistent with longer-term public policy objectives. To this end regulators will need to decide whether to specify longer-term performance objectives at the same time as announcing near-term regulatory requirements or not.

#### SUITABILITY OF REPLACEMENT LAMPS

CFLs.—The suitability of CFLs as replacements for incandescent lamps has increased significantly in the last decade due to on-going improvements in the lamp technology and their production. CFLs are now available at much lower prices than hitherto, they come in a much larger range of dimensions and thus models can be found which will fit into almost all light fixtures using a screw-based socket, and their light quality has improved substantially. Because they require only a quarter to a fifth of the energy of conventional GLS lamps CFLs are far more economical to operate and hence are more cost-effective for the end-user. They also last between

<sup>19</sup>The average GLS lasts for 1000 hours and the average CFL for 6000 hours, therefore the lamp sockets currently supplied by global sales of 12.5 billion GLS per annum could be supplied by sales of 2.1 billion CFLs per annum once all GLS had been replaced by CFLs and a CFL replacement market were operational; however, during the transition period much higher volumes of CFLs could be required depending on how short the transition period were to be.

five and fifteen times as long as a standard GLS lamp (5000 to 15000 hours for CFLs compared with 750-1500 hours for GLS). The limitations of CFLs compared with GLS lamps are as follows:

- Good CFLs give out light with a colour-rendering index (CRI) of about 85 as compared with that from an incandescent or halogen lamp of 100. This means that they are not quite as good at producing a faithful rendering of colour as are incandescent lamps. For most applications a CRI of 85 is perfectly adequate for end-users but there may be some cases where end-users would prefer a higher CRI.
- While an incandescent lamp produces light as soon as they are switched on there is a very short delay for CFLs and the lamps take slightly longer to produce their full light output.
- While CFLs are available in much smaller sizes than was previously the case there is a limit to how small they can be made. Incandescent lamps and halogen capsules can be produced that are even smaller still and these may be better suited to certain kinds of lamp fixtures.
- CFLs contain trace levels of mercury. The levels included in modern lamps are much less than was previously the case but some economies, most notably the EU, are introducing requirements for their safe disposal at end of life. The corollary to this issue is that in economies that use a significant amount of coal-fired generation in the electricity mix there is likely to be a significant overall reduction in mercury release to the environment from the use of CFLs. This is because the avoided power demand reduces coal-derived airborne mercury emissions by levels that significantly exceed the amount of mercury used in the lamp.
- CFLs can be produced to have a light colour (referred to as the colour temperature) which matches that of GLS lamps but they can also be produced to emit light of a different colour temperature. To avoid confusion among consumers, many of whom will be seeking to have lamps with identical colour temperature characteristics to the GLS lamps they have always used, some additional effort may be required to communicate the colour temperature characteristics in a user-friendly way at the point of sale.
- CFLs are not as well-suited to provide well directed beams of light as are certain types of incandescent lamps (most notably halogen reflector lamps) and hence are not adapted to provide some types of reflector lamp applications.

**Halogen Lamps.**—Halogen lamps are a type of improved incandescent lamp which can have higher energy efficiency than conventional GLS lamps but cannot attain the levels of CFLs with today's technology. The most efficient halogen lamps, which are just in the process of being commercialised on OECD markets, have an efficiency that is roughly twice as high as for a comparable GLS lamp. They have the same high colour rendering (i.e. a CRI of 100) and last two to three times as long as a GLS (2000 to 3000 hours compared with 750–1500 hours for GLS lamps). With today's lamp technology it is possible to produce halogen lamps that could substitute for almost all conventional GLS applications and that would give energy-savings of from 0 to 50% depending on the explicit halogen technology used. It is expected that the most efficient varieties will be significantly more expensive than GLS and even CFLs when first entered on the market and that their price will decline as and when their market volumes increase. It is not easy to estimate whether halogen or CFL lamps would be the cheapest in a market where no conventional GLS lamps were permitted to be sold, but it seems likely that CFLs would be cheaper than the most efficient halogen lamps at least in the short term.

**Light Emitting Diodes (LEDs).**—Light emitting diodes are rapidly evolving but are not yet widely available as substitutes for screw-based GLS lamps. Current lamps can be produced with a higher efficacy than GLS lamps and with very long lifespans (tens of thousands of hours) but the lamp costs are very high and there appear to be ongoing problems with:

- providing adequate amounts of light
- providing light distribution in a manner which satisfies consumer needs
- ensuring chromatic properties are sufficiently stable from batch to batch and that the light colour matches consumer requirements
- adequately addressing heat dissipation

The pace of development of the technology is such that many, if not all, of these issues may be overcome in the next few years but the outlook is still somewhat uncertain.

**Ensuring and Communicating the Quality of Compliant Lamps.**—Some of the lamp characteristic issues raised above can be addressed by taking steps to ensure

the quality of high efficiency lamps sold in a market is sufficiently high for most consumer needs to be met. This can be done by setting and enforcing minimum lamp quality requirements and by encouraging higher quality requirements be met through endorsement schemes such as Energy Star. Where lamp quality characteristics may vary but are not universally important to consumers the relevant information could be made available through improved lamp labelling designed to communicate pertinent factors in an accessible manner.

The CHAIRMAN. Thank you very much for your testimony.  
Mr. Pitsor, why don't you go right ahead?

**STATEMENT OF KYLE PITSOR, VICE PRESIDENT, GOVERNMENT RELATIONS, NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION, ROSSLYN, VA**

Mr. PITSOR. Chairman Bingaman and members of the committee, on behalf of the National Electrical Manufacturers Association, I'm Kyle Pitsor, NEMA Vice-President of Government Relations. NEMA is the National Association representing the electrical manufacturing industry. That's significant for today's hearing, representing light bulb or lamp manufacturers that sell over 95 percent of the light bulbs sold in the United States.

Mr. Chairman, earlier this year, the NEMA lamp section announced a joint industry commitment to advance public policies that would transform the U.S. market to more energy efficient lighting within a decade.

NEMA views any lighting market transformation as a matter of national importance that must come about through a Federal solution by setting technology neutral, performance-based standards that would eliminate today's inefficient general service light bulbs from the market.

A Federal regime is crucial in order to maximize national energy savings, provide manufacturer certainty in order to schedule investments for transforming the market, and to avoid a patchwork of conflicting and unworkable State mandates that would complicate manufacturing, distribution, retailing, and create consumer confusion. We look to the Senate for action.

We support S. 2017's focus on general service light bulbs. There are about 4 billion—4 billion—of these medium screw-based general service light bulbs installed in the U.S. today, with about 79 percent of those in residences. This is where the greatest energy savings can be attained on a national scale.

In the United States, NEMA members sold about 1.7 billion medium screw-based light bulbs in 2006. Of that 1.7 billion, about 1.5 billion were the general service incandescent bulbs very familiar to you today and about 200 million were compact fluorescent lamps, or CFLs. CFLs represent about 10 percent of the installed base today and have been growing at about 50 percent—50 percent per year since year 2000.

NEMA member manufacturers proposed, Mr. Chairman, to replace today's inefficient light bulbs with a combination of products that will provide consumers product choices. The replacement light bulbs will be a combination of the compact fluorescent light we see today, along with new technologies, including high-efficiency halogen, high-efficiency incandescent, and LEDs. This is an example of the new high-efficiency halogen bulb that our members are looking

to produce. This is about 40 percent more efficient than today's companion incandescent bulb.

Choice is important for several reasons. These compact fluorescent lamps, while relatively efficiency, are relatively deficient in color rendering, tend to be larger than incandescent lamps, creating fit issues of existing light fixtures, have low light output in exceptionally hot or cold temperatures and conditions, and in general, are not dimmable. Meeting demand for these new replacement bulbs is a difficult, challenging, and sustained task. Accordingly, the legislation needs to provide for an orderly and phased national approach for the transformation to be successful.

S. 2017 currently proposes to start the phase-in on January 1, 2012 and for it to be completed in 2 years. NEMA proposes that the phase-in start on January 1, 2012 and be completed in 3 years.

Neither industry nor regulators will be able to be reliable in predicting the dynamics of the market acceptance of these new types of replacement light bulbs. Manufacturers must be able to learn as we go, in order to be prepared to build the right manufacturing and commercial capacity to meet the market demand prudently.

A 3-year transition period, we believe, is eminently reasonable to interpret these new market forces heretofore unforeseen in this industry. For each of the different categories of light bulbs that we're talking about, manufacturers have to reposition new equipment, build new capacity, invest in new designs, safety test the products, and also undertake a significant work force adjustment in the U.S. market. Manufacturers also have to undertake a massive education campaign to inform consumers and retailers on why they should be converting from a 100-watt light bulb to a 72-watt light bulb, as in the legislation.

Further, industry projects the new halogen technology that we've talked about for the 100-, 75-, and 60-watt bulbs, is not going to be suitable for the replacement of the 40-watt light bulb, and a new technology will need to be invented for that. Accordingly, that's why we propose in the legislation that the effective date for the 40-watt light bulb be moved from January 1, 2014 to January 1, 2015.

Let me now turn to the bill's efficiency standards. With light bulbs, the best way to save energy is to reduce connected load, and that is watts. This bill does that by setting a maximum wattage that any bulb can consume for a given lumen range, or amount of light you get from the bulb, being lumens. We estimate that U.S. consumers will save over 50 percent—50 percent—of the energy they now use annually, if this—if the bill's standards become law. This strategy is superior to the lumen per watt approach that was passed in the House bill. An LPW approach may have the perverse affect of driving consumers to buy higher wattage bulbs, which would be—result in more, and not less, electrical consumption and this is the wrong direction.

The legislation also provides for lumen ranges, which we believe are consistent with consumers experiences buying their current bulbs, so they will have the same quantity of light, but achieve that at a significantly lower energy consumption. As in most other standards applied in this legislation, Mr. Chairman, S. 2017 sets the initial standards, and then directs the Department of Energy to conduct follow-on rulemakings to determine if the standards



should be amended. There are two follow-on rulemakings proposed in the legislation.

The bill also includes a backstop standard that would automatically become the 2020 standard if DOE missed its statutory rule-making deadline. The bill language would essentially establish the 2020 standard at 45 lumens per watt.

NEMA strongly apposes the setting of a minimum 45 lumens per watt performance standard now, to be effective in 2020. An LPW standard would essentially permit only these compact fluorescent lamps being available based on manufacturers projections of technical feasibility and acceptance. Further, these CFLs have previous concerns as I noted in my testimony and are overwhelmingly sourced from China.

In addition, the proposed 45 LPW standard would also have the affect of outlawing the new high-efficiency halogen product and new high-efficiency incandescent products the industry will be introducing only five to 8 years earlier. This brings into question whether industry would be willing to undertake new product investment at all if it becomes law and if so, at what price to the consumer.

Therefore NEMA does not support mandating today, in 2007, what the new efficiency standards should be in 2020, given that this is 13 years into the future. We are committed to work with Congress and stakeholders to ensure that DOE stays on schedule.

Mr. Chairman, the bill sets up a number of additional provisions to track exempted and specialty bulbs, and to impose additional standards if there's abnormal growth in those products. This is an important step. We also note the bill provides an opportunity to petition DOE to undertake a rulemaking on products not initially covered by the standards, if such products become used in general service applications. The bill supports a provision for new consumer labeling for light bulbs, and we think this is very important. For the first time, the bill allows States, in addition to the Federal Government, to enforce these national light bulb standards.

Mr. Chairman, in closing, let me thank you for introducing this significant bill. One estimate that I have seen, suggests this bill by itself, is the single largest source of energy savings from any appliance standards—standard set to date. Moreover, the energy savings are nearly as large as the combined standards of all of the Federal standards adopted from 1987 through 2000, over 88 billion kilowatt-hours.

NEMA looks forward to working with you and the committee and to support legislation for national energy efficiency standards for medium screw-based general service light bulbs.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Pitsor follows:]

PREPARED STATEMENT OF KYLE PITSOR, VICE PRESIDENT, GOVERNMENT RELATIONS,  
NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION, ROSSLYN, VA

On behalf of the National Electrical Manufacturers Association, I am Kyle Pitsor, NEMA vice president of government relations. NEMA is the national trade association representing the electrical manufacturing industry. Founded in 1926 and headquartered in Rosslyn, Virginia, our 450 member companies manufacture products used in the generation, transmission, distribution, control, and end-use of electricity. These products are used in the utility, medical imaging, industrial, commercial, institutional, and residential markets.

NEMA members are at the very heart of our national effort to reduce energy use through the research, development, manufacturing, and deployment of energy-efficient products and technologies. Significant for today's hearing, NEMA is the association for the U.S. lighting industry representing light bulb (lamp) manufacturers. The NEMA Lamp Section consists of 15 companies that sell over 95 percent of light bulbs used in the U.S. NEMA members are engaged in all the various types of light bulb technologies—incandescent (including halogen), fluorescent, high intensity discharge, and solid state (e.g., LEDs or light emitting diodes)—and serve all lighting application markets.

Mr. Chairman, earlier this year the NEMA Lamp Section announced a joint industry commitment to advance public policies that would transform the U.S. market to more energy-efficient lighting within a decade. Lighting use in the U.S. consumes 20–22 percent of all electricity generated. Based on Department of Energy data, 765 billion kWh of energy is used annually in the U.S. by lighting systems, and about twice that much is lost as heat in the production and transmission of that electricity. Put another way, every time you save 1 watt with lighting, the utility will also save the equivalent amount of fuel it takes to produce 3 watts of power. Thirty percent of the energy consumed in an office building is from lighting use, and 5–10 percent of residential energy use is for lighting. There are about 4 billion medium screw-base general service light bulbs installed in the U.S. with 79% of these found in residences.

Given the significance of lighting in our economy, NEMA views any lighting market transformation as a matter of national importance that must come about through a federal solution by setting technology-neutral, performance-based standards that would eliminate today's inefficient general service light bulbs from the market. A Federal regime is crucial in this area, since a host of state legislatures stretching from Connecticut and Rhode Island to California and Nevada have been considering widely varied state regulations that are sometimes unworkable, raising the specter of a patchwork of unwieldy and conflicting mandates that would complicate manufacturing, distribution and retailing, and create customer confusion. We look to the Senate for action due the ambiguity in the preemption provision for light bulbs in the recently passed House energy bill.

We support S. 2017's focus on general service light bulbs. This is where the greatest energy savings can be attained on a national scale. The entire discussion of "phase out of least efficient general service light bulbs" has been at the industry's initiative. This is not a case of manufacturers dragging their heels, but of leading the way. New standards-setting legislation is needed in order to further educate consumers on the benefits of energy-efficient products. Importantly, the legislation will provide manufacturers certainty in order to schedule investments for transforming the market.

In the U.S., NEMA members sold about 1.7 billion medium screw-based light bulbs in 2006. Of that 1.7 billion, about 1.5 billion were incandescent bulbs and 200 million were compact fluorescent lights (CFLs). CFL screw-based types represented about 10% of the market in 2006, having grown about 50% per year since 2000. U.S. production is over 4 million light bulbs daily, with CFLs and additional bulbs imported. NEMA member manufacturers propose replacing today's least efficient light bulbs with a combination of products that will provide consumers multiple product choices. The replacement light sources will be a combination of compact fluorescent and new technologies, including high-efficiency halogen, high-efficiency incandescent, and high-brightness light emitting diodes (LEDs). This choice is important for several reasons. Compact fluorescent lamps, while relatively efficient, are relatively deficient in color rendering (especially red), tend to be larger than incandescent lamps (giving rise to "fit" issues in existing lighting fixtures), have low light output in exceptionally hot or cold conditions, and, in general, cannot be dimmed since they are not compatible with dimmers.

Meeting demand for replacement products and providing consumer education on the new lighting products will be a difficult, challenging, and sustained task. Accordingly, the legislation needs to provide for an orderly and phased national approach in order for the transformation to be successful. S. 2107 currently proposes to start the phase-in on January 1, 2012, and for it to be complete in 2 years (by January 1, 2014). NEMA proposes that the phase-in begin on January 1, 2012, and be completed in 3 years (by January 1, 2015).

Neither industry nor regulators will be able to reliably predict the dynamics of market acceptance of the different kinds of replacement lamps. Manufacturers must be able to "learn as we go" in order to be prepared to build the right manufacturing and commercial capacity to meet market demand prudently. A sound phase-in period would allow industry to evaluate market responses and act accordingly. A 3-year transition period would be eminently reasonable for the interpretation of such

new (and likely strong) market forces which necessitate manufacturing responses of a magnitude not previously seen in this industry. Timing and learning are crucial factors for an orderly and cost effective transition to a new array of products that are taken for granted in today's vast consumer market.

While we support the beginning of the phase-in on January 1, 2012, the bill also targets the 40 watt category to be effective January 1, 2014. The 2014 target date presents a serious problem for the manufacturers. For the reasons below, NEMA recommends that a one-year interval between the 60 and 40 watt effective dates be adopted, with the 40 watt category effective date set at January 1, 2015.

This timetable is absolutely crucial for U.S. manufacturing conversion. Industry projects that the halogen technology suitable for replacing the 100 watt, 75 watt, and 60 watt general service lamps will not likely be applicable for the 40 watt replacement. For good color rendering and dimmable replacement light bulbs, an entirely new technology will have to be introduced. Moreover, pegging the phase-out to 2015 only impacts 12 percent of general service light bulbs sold today.

For each of the product categories, before the new halogen and high efficiency incandescent bulbs can be sold, the manufacturers must design, build, and install new production equipment for each product line, retire or re-purpose existing equipment, determine the cost impact of stranded investments, ensure suppliers of new raw materials and components are evaluated, invest in new packaging designs, safety test and qualify the new products for market, and address production capacity needs. In addition, extensive work force adjustments must be undertaken for the new facilities.

Phasing is also needed for retailers and consumers. Manufacturers will need to undertake massive education programs to ensure that retailers and consumers understand how the new lower wattage products should be promoted and used. Furthermore, phasing helps consumers transition from today's world where a 25 cent light bulb is taken for granted to a new world where a light bulb is an investment.

Let me now turn to the bill's efficiency standards. With light bulbs, the best way to save energy is to reduce connected load; that is "watts." This bill does that by setting a maximum wattage that any bulb can consume for a given lumen range (amount of light from the bulb). We estimate that U.S. consumers will save over 50% of the energy now used annually if the bill's standards become law. This strategy is superior to a minimum lumens-per-watt (LPW) approach which was made part of the House-passed bill (H.R. 3221). An LPW approach may have the perverse effect of driving consumers to buying higher wattage light bulbs which would result in more—not less—electrical consumption. This is the wrong direction.

The Senate's proposed wattage cap with a lumen range approach is also technology neutral and allows manufacturers the ability to offer a range of products to consumers using different technologies. The lumen ranges proposed in the bill are consistent with consumer experience with today's general service categories of 100, 75, 60 and 40 watt light bulbs thereby providing consumers with the same quantity of light while using significantly less energy.

As in most other appliance standards legislation, S. 2017 sets the initial standards levels, and then directs the Department of Energy (DOE) to conduct follow-on rulemakings to determine if the standards should be amended in the future. In this bill, two follow-on rulemakings are included. One is scheduled to be effective on January 2, 2020, and a second to be effective on January 1, 2025. The bill includes a "back-stop standard" that would automatically become the 2020 standard if DOE missed its statutory rulemaking deadline. The bill's language would establish the 2020 standard at 45 LPW.

NEMA strongly opposes setting a minimum 45 LPW performance standard now, to be effective in 2020. A 45 LPW standard would essentially permit only compact fluorescent lights (CFLs), based on today's manufacturers' projection of technical feasibility and market acceptance, including cost. Manufacturers have the expertise necessary to best make those assessments. Further, these CFLs have the previously mentioned performance limitations and are overwhelmingly sourced from China. The proposed 45 LPW standard would also have the effect of outlawing the new high-efficiency halogen and new high-efficiency incandescent products that the industry will be introducing only 5–8 years earlier. This brings into question whether industry would be willing to undertake new product investment at all if this becomes law, and if so, at what price to the consumer. NEMA does not support mandating in 2007 what the new product efficiency standard should be in 2020, given that this is 13 years into the future. We are committed to work with the Congress and stakeholders to ensure that DOE stays on schedule.

We note that while the bill is properly focused on transforming the general service light bulb market, it also does set up a process to track exempted or specialty light bulbs, and for additional standards to be imposed if abnormal market growth devel-

ops. This is important to ensure that non-general service application bulbs do not become a means to circumvent the transformation to energy-efficient products for general lighting applications. We also note that the bill provides the opportunity to petition DOE to undertake a rulemaking on products not initially covered by the standards if such products become used in general service applications.

NEMA supports the bill's provision for new consumer labeling of these new light bulbs to better assist consumers in making the right choices for their lighting needs, and the bill's provision to allow States, as well as the Federal Government, to enforce these national light bulb standards.

Title II of the bill incorporates a consensus standard developed by NEMA and the American Council for an Energy-Efficient Economy (ACEEE). This consensus standard would set for the first time new federal standards on certain metal halide lighting fixtures. A similar provision was incorporated in H.R. 3221 which passed the House of Representatives on August 4, 2007. NEMA supports this provision.

Mr. Chairman, in closing, let me thank you for introducing this significant bill. One estimate that I have seen suggests this bill, by itself, is the single largest source of energy savings from any appliance efficiency standard to date. Moreover, the energy savings are nearly as large as the combined energy savings from ALL federal appliance standards adopted from 1987 through 2000 (88 billion kWh/year).

NEMA looks forward to working with you and the Committee to address the issues we raised in our testimony, and to support legislation to provide for national energy efficiency standards for medium screw-base general service lamps. I would be pleased to address any questions. Thank you.

The CHAIRMAN. Thank you very much for your testimony.

Now we'll hear from Mr. Nadel, and then we'll have some questions. Go right ahead.

**STATEMENT OF STEVEN NADEL, EXECUTIVE DIRECTOR,  
AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY**

Mr. NADEL. OK. Thank you, Mr. Chairman, Senator Murkowski, my name is Steve Nadel, I'm the Executive Director of the American Council for an Energy Efficient Economy. We're a non-profit organization dedicated to increasing energy efficiency as a means to promoting both economic prosperity and environmental protection.

I'm here today representing not only ACEEE, but also a variety of other energy efficiency groups, including the Alliance to Save Energy, The Appliance Standards Awareness Project, The Earthday Network, The Natural Resources Defense Council, and the Southwest Energy Efficiency Project.

Our coalition believes that this is a big step in the right direction for improving the efficient use of energy in the United States. We thank you, Senator Bingaman, as well as Senator Stevens and the other co-sponsors for introducing this bill and moving this dialog along. However, we also think this bill can and should be improved in several ways, as I discuss in my written testimony.

In the brief time here today, I just wanted to concentrate on two issues. First, I wanted to talk about the tier-two or the stage-two standard, the 2020 standard. We think this is vitally important. About half of the savings in the bill are in this tier-two. As Representative Harman testified earlier, this was an essential ingredient to lock in this tier-two, if you will, for their agreeing in the House to the preemption language.

As you noted, Senator Bingaman, this calls for DOE rulemaking, but then has a backstop. If the backstop were to be called for, there are a variety of ways that manufacturers can meet it. Obviously there are compact fluorescent lamps, there are also LEDs. Assistant Secretary Karsner earlier testified that we're already up to 79

lumens per watt for LEDs in the lab and they're targeting 200. So those, by 2020, should be widely available.

There were also other advanced incandescent products. To just quote from a recent GE press release on their new high-efficient product. They say, "Ultimately, the high-efficiency lamp technology is expected to be about four times as efficient as current incandescent bulbs and comparable to CFL bulbs." So GE has already gone public on an incandescent product that would meet this backstop standard.

Also, I should point out, in the Senate bill, unlike the House bill, it doesn't mandate as a backstop, 45 lumens per watt, it says that—it says that the DOE rulemaking should save an average of 45 lumens per watt. So there is the flexibility for DOE to say, for certain product classes it will be below 45 lumens per watt, as long as it's higher than others. So these details can be worked out by DOE.

I think by setting a floor now, Congress is providing firm direction to manufacturers about what products they need to develop by 2020. As we just heard, manufacturers believe they need until 2015 in order to complete the transition to the tier-one standard. They need multiple years to prepare. If we delay a decision to the very end, manufacturers don't have advanced warning, they could again be saying, "Oops, sorry, there's not enough time to prepare." By providing this backstop, we give them plenty of time to know about where we're heading and then the details can be worked out.

The second area I wanted to concentrate on is about loopholes. This bill regulates the most common types of lamps, but less common lamps, that still can be used in general service applications, are not regulated. So you're still free to sell a 60-, 100-, 150-watt version of these unregulated products and put them in a normal fixture. We think this needs to be addressed.

The bill does contain a petition process, under which someone can petition DOE to set standards for new product classes, but it's a time-consuming and burdensome process. For example, you need to provide sales data on the exempted products, you need to provide data on how these products are being used in homes. Only manufacturers have the sales data, other people don't. It would require a field survey, an expensive process, if you want to show actually how bulbs are being used in homes. So we think this process doesn't really achieve its intended purpose.

The bill also does have a process where manufacturers can petition to add exemptions to the bill. We think this is a much better process to put most of these bulbs through, rather than having to close loopholes, we much prefer a manufacturer having to petition to open a loophole, or to petition to say we're not opening a loophole. So, we recommend that as a general rule, you regulate all the products, list a whole bunch of specific exemptions we can identify now that won't be used in general service applications, but if someone comes up with new product, rather than just assume it's exempt, they need to show that it's needed for an application, it can't meet the standard, and wouldn't be used in general service applications.

What I wanted to show is a couple of examples of this. This is a BR lamp. It's a type of lamp that was exempted in the 1992 En-

ergy Policy Act. It was a niche product at the time, but the slight little bulge made it exempt. It's now over half of the sales of reflector lamps for residences, become a major loophole. Likewise, this is what's called an intermediate-base ceiling fan lamp. These things weren't even invented when the Energy Policy Act of 2005 was passed. That Act required—only regulates medium-base bulbs. So, some manufacturers came out with these intermediate-base bulbs. They're half an inch in diameter. They're not regulated at all, and virtually all of the savings from the ceiling fan standard are now being lost due to bulbs like this.

Turning now to this bill, we have the G lamp. It's a round lamp, a globe lamp, but you can fit it into most of the existing fixtures, not regulated, you can still sell a 60-watt, a 100-watt version of these. We recommend that these be covered, as well.

To provide a couple of other examples. Here I have what are called the CP19 and a BT15. These are both products you can fit in most fixtures. These happen to be regulated. What if someone were to come up with a CP15, slightly smaller, or a BT19, slightly larger. They're totally unregulated. There are lots of ways to get around this standard. So that's why we recommend that instead of just regulating a narrow group, regulate them broadly. You can meet these standards with these products, but allow, both for additional exemptions in this bill and for a process for people to petition for a new exemptions.

With that, I wrap up my testimony and welcome any questions you may have. Thank you.

[The prepared statement of Mr. Nadel follows:]

PREPARED STATEMENT OF STEVEN NADEL, EXECUTIVE DIRECTOR, AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY

#### SUMMARY

This testimony is presented on behalf of a coalition of energy efficiency advocacy organizations. We believe that S. 2017 is a huge step in the right direction for improving the efficient use of energy in the United States. The version of the bill as introduced is a substantial improvement over earlier drafts, particularly in how it sets a floor for the DOE rulemaking that will set a revised standard that takes effect in 2020. We think it is vitally important to set such a floor so that large savings are ensured (nearly half the savings are from the second stage standard) and so that manufacturers have ample time to prepare for the product changes that will be needed to meet this new standard.

While there are many provisions we like in the bill, we also think it can and should be improved in order to:

1. Expand coverage of the bill to additional lamp types and take other steps that are needed to plug loopholes that would allow low-efficiency exempted products to be sold in place of the higher efficiency products called for by the bill. If these loopholes are not addressed, much of the savings projected for the bill could evaporate.
2. Include lumen per Watt requirements and/or adjust lumen output bins in order to reduce the likelihood that lamps with low light output will be sold that consumers think are too dim. If consumers find that lamps are too dim, some of them will switch to higher wattage lamps, eliminating significant energy savings.
3. Modify the preemption of state standard provisions in order to protect states that have adopted or are in the process of adopting state standards on general service incandescent lamps.
4. Make a variety of technical changes so that intent is not misunderstood and implementation can proceed in a logical fashion.

5. Consider a new section on fluorescent tube efficiency standards based on discussions between ACEEE and lamp manufacturers. This new provision would update standards set by Congress in the Energy Policy Act of 1992.

With our recommended changes we estimate that this bill will, by 2030, reduce annual electricity use by nearly 200 billion kWh, reduce peak demand by 31,000 MW (equivalent to capacity of more than 100 power plants of 300 MW each) and reduce consumer and business energy bills by about \$18 billion per year. These are very large savings. In addition, these provisions will reduce greenhouse gas emissions by nearly 40 million metric tonnes, adding to the substantial savings in the Senate-passed energy bill and making a useful downpayment in efforts to address global warming. We urge you to include these improved provisions in an energy bill reported out of this Committee and the upcoming House-Senate energy bill conference.

#### INTRODUCTION

My name is Steven Nadel and I am the Executive Director of the American Council for an Energy-Efficient Economy (ACEEE), a nonprofit organization dedicated to increasing energy efficiency as a means of promoting both economic prosperity and environmental protection. I am here today representing a coalition of energy efficiency organizations that has been working together on lamp standard issues for many months. In addition to ACEEE, other members of this coalition are the Alliance to Save Energy, Appliance Standards Awareness Project, Earth Day Network, Natural Resources Defense Council, and Southwest Energy Efficiency Project. Our coalition thanks you for the opportunity to testify today.

S. 2017 is an important step forward in efforts to secure large energy savings and greenhouse gas reductions by reducing the energy now used by general service incandescent lamps and also metal halide lighting fixtures. The provisions on consumer education will also be very useful as are the sections on research and development and mercury use. We thank Senators Bingaman and Stevens for introducing this bill and moving the discussion forward on how best to regulate lighting products to produce energy savings in a way that provides consumers with the light and amenities they need and that is workable for manufacturers.

In my testimony here today I will discuss each of the bill's sections in turn—what we like about this bill and how it can be improved. I will also recommend that a new section be added to adopt updated standards on fluorescent tubes, based on discussions between ACEEE and the National Electrical Manufacturers Association (NEMA).

#### GENERAL SERVICE INCANDESCENT LAMPS

General service incandescent lamps are a very important target for energy savings. According to a recent study commissioned by the U.S. Department of Energy (DOE), there are approximately 4 billion general incandescent lamps in use in the U.S. that consume approximately 286 billion kWh of electricity annually. At the current national average electricity price of about 9 cents per kWh, this means consumers and businesses are paying more than \$25 billion per year to operate general service incandescent lamps. Of this energy use, 58% is in the residential sector, making these standards particularly important to individual consumers.<sup>1</sup>

S. 2017 will save energy from general service incandescent lamps in several stages. In the first stage, effective 2012–2014, it will phase out the most common types of incandescent lamps in favor of products that use about 25–30% less energy (e.g., a 60 Watt bulb will be replaced with a bulb using 43 Watts or less). In addition, because these 43 Watt bulbs likely will cost somewhat more than today's 60 Watt bulbs, many consumers will choose to purchase a compact fluorescent lamp (CFL), saving additional energy (e.g., one using about 15 Watts instead of 43 Watts) at little additional cost. In the second stage, the bill requires the DOE to set a new standard, but provides an important backstop by requiring that the new standard save at least as much energy as a standard that would require 45 lumens of light output per Watt of energy input. Using the same example of a current 60 Watt bulb, this means that in stage 2, energy use will be reduced to about 20 Watts, more than doubling the energy savings from the first stage. The bill also calls for a third stage, with the standard to be set by DOE.

<sup>1</sup>Navigant Consulting, 2002, U.S. Lighting Market Characterization, Volume 1: National Lighting Inventory and Energy Consumption Estimate. Washington, DC: Office of Energy Efficiency and Renewable Energy, USDOE.

Our coalition believes this bill is a huge step in the right direction for improving the efficient use of energy in the United States. However, we also think it can and should be improved, primarily by plugging potential loopholes in the bill that would allow low-efficiency exempted products to be sold in place of the higher efficiency products called for by the bill. In addition, we think that refinements are needed to reduce the likelihood that lamps with low light output will be sold that consumers think are too dim and to protect states that have adopted or are in the process of adopting state standards on general service lamps. Later in my testimony I elaborate on these points, as well as several recommended technical corrections.

As most of you probably know, the energy bill recently adopted by the House of Representatives includes a section on general service incandescent lamp standards authored by Representatives Jane Harman and Fred Upton. This provision is broadly similar to S. 2017 in that it requires efficiency improvements to these lamps in two stages with effects similar to the first two stages in S. 2017. However, there are quite a few differences in the details of these bills, some of which are important.

For example, S. 2017 was drafted to fit into existing appliance and equipment standards law while the House bill is a stand-alone section. We support the S. 2017 approach since it takes advantage of the many important implementation details now in current law. We also like the fact that S. 2017 includes phase 1 standards based on maximum power (watts) for each range of light output (lumens) that is comparable to today's incandescent lamps. By contrast, the House bill used a lumens-per-watt approach that, unless Watt caps are also added, could allow improved efficiency to be translated into more light (i.e., higher-output lamps) rather than lamps that use less electricity while providing about the same amount of light. On the other hand, there are several provisions in the House bill that are superior and should be incorporated in S. 2017 as I discuss later in my testimony.

ACEEE, with help from the Alliance to Save Energy, has estimated that the House general service incandescent lamp standard provision will reduce U.S. electricity use by about 81 billion kWh in 2020, peak electric demand by nearly 10,000 MW (the capacity of 33 power plants of 300 MW each), and greenhouse gas emissions by 16 million metric tonnes of carbon. By 2030, due to the stage two standards in the bill, these annual savings increase to 143 billion kWh, 17,500 MW of peak power (the capacity of 58 power plants), and 28.5 million metric tonnes of carbon. At 9 cents per kWh, annual energy bill savings from these standards will be about \$7 billion from stage 1 and \$13 billion from stage 2.

By comparison, our estimate is that S. 2017 will save a little more energy in 2020 and a little less in 2030 than the House bill. Savings in 2020 are higher since S. 2017 includes watt limits on intermediate and candelabra base lamps and also includes wattage caps on all lamps (these items are not in the House bill). Savings are lower in 2030 since the guaranteed second stage standard is stronger in the House bill. Specifically, our estimates of savings from S. 2017 are as follows:

- In 2020, annual energy savings of 85 billion kWh (reducing bills by \$7.7 billion) and peak demand reductions of 10,500 MW (the capacity of 35 power plants of 300 MW each). Greenhouse gas reductions of 17 million metric tonnes of carbon.
- In 2030, annual energy savings of 139 billion kWh (reducing bills by \$12.6 billion) and peak demand reductions of 11,600 MW (the capacity of 38½ power plants of 300 MW each). Greenhouse gas reductions of 27.8 million metric tonnes of carbon.

Our estimates of savings from both bills are highly approximate as they depend on judgments on the second stage standard to be set by DOE (our estimate assumes the minimum) and how widely manufacturers and importers exploit loopholes that differ between the bills.

To assure these savings, it is absolutely critical that final legislation close the easy-to-exploit loopholes that would allow circumvention of the intended standards.

Turning now to some of the details of S. 2017, our comments fall into five categories:

1. The second stage standard (which takes effect 2020).
2. Closing potential loopholes.
3. Discouraging dim lamps.
4. Preemption of state standards.
5. Additional technical issues.

#### SECOND STAGE STANDARD

Our coalition strongly supports having a guaranteed second stage standard in the bill. S. 2017 takes a smart approach by calling for a DOE rulemaking but providing



a backstop standard in case DOE either does not complete the rule in time or the DOE standard fails to achieve the same energy savings as a 45 lumen per Watt standard. Effectively, this provision puts a floor on the DOE rulemaking, based on current known products (e.g., CFLs) and products that are expected to achieve these efficiency levels well before 2020 (e.g., light emitting diodes, or LEDs).<sup>2</sup>

As this committee knows, DOE has missed all of its Congressionally-set deadlines for new efficiency standards since 1990, so it is important to have a clear and achievable minimum standard in place if DOE does not act in time. Most of the new standards set by Congress in the Energy Policy Act of 2005 and in energy bills passed by the House and Senate in 2007 either contain such a backstop provision or allow states to set standards if DOE misses its deadlines. Also, in the case of new lamp standards, in order to achieve the large energy savings that can clearly be achieved with stage two, major product changes will be needed. The provision to create a floor for the stage 2 standard provides a clear direction to manufacturers to work on developing a full array of products that can meet this floor by 2020. In other words, manufacturers have 13 years to prepare for the new standard.

Without such clear direction, manufacturers could argue during a 2014–2017 rule-making that they are not ready for a strong standard and either the standard needs to be weakened or they need many more years to prepare, delaying the effective date of the new standard. These savings are substantial—ACEEE estimates that nearly half of the annual energy and carbon reductions in 2030 from the general service incandescent lamp standard in S. 2017 are due to the stage 2 standard.

The costs of any delay in stage 2 implementation would be enormous. Unlike many other products, lamps last a few months to a few years. As a result, the total effect in reduced electricity demand and emissions reductions from a new standard is attained soon after implementation.

Our coalition also notes that while we support the approach in S. 2017, we are also comfortable with the approach in the House bill that sets a similar stage 2 standard, but without the DOE rulemaking. (Some of our coalition prefer the House approach.)

While we strongly support the stage 2 lamp standard provision in S. 2017, we also think it should be refined in a few ways:

1. The wording on p. 18 (lines 10–16) is ambiguous and should be clarified in order to make clear that the backstop standard goes into effect if DOE either misses the deadline or sets a standard that results in less energy savings than a 45 lumen per Watt standard. We suggest specific rewording in the appendix to my testimony.
2. The backup standard of 300% of the efficacy of a 100 Watt lamp (p. 18, line 19–23) is imprecise, because there are many types of 100 Watt lamps. The most common 100 Watt lamps on the market today are about 17 lumens per Watt. To eliminate ambiguity, we recommend that 50 lumens per Watt (rounding 300% of 17 lumens per watt) be the backstop standard. This would save a lot of work to interpret this provision and help avoid the prospect of controversy, potential delays, and litigation.
3. The bill calls for the Secretary to formally set the backstop standard (p. 18, lines 17–23), even if the backstop goes into effect because of DOE inaction. If a specific backstop standard is set as we recommend above, then Congress can and should just set the backstop standard instead of requiring DOE action.
4. The bill makes clear that DOE, in the stage 2 rulemaking, should not limit consideration of new standards to just those achievable by incandescent technology (p. 17, lines 9–10). We think it would be useful to further clarify that if other provisions of the law are met (including the provision to not reduce consumer utility), it is possible that the new standard will be met only by technologies that are not incandescent. We are not saying such an event is likely, but instead saying that the legislation should be clear about permitting such an event if justified. We suggest specific legislative language in the appendix to this testimony.
5. In discussing the DOE stages 2 and 3 rulemakings, the bill uses the term “more stringent maximum wattage than the standards specified [for stage one]” (p. 17, lines 1–4) and page 19, lines 5–10). We think DOE should have more flexibility to consider other metrics such as lumens per Watt, especially since the default standard is specified in lumens per Watt. More agency flexibility

<sup>2</sup>Other promising technologies are also in development such as ceramic filaments, selective emitters, and photonic lattices. See Calwell, Chris, Jan. 25, 2005, “Technical Basis for General Service Incandescent Lamp Standards in California.” Power Point presentation available from Ecos Consulting, Durango, CO. Additional options are provided by more efficient fill gases (used today but use could expand) and low voltage input (planned for some European products).

could enable DOE to better meet the underlying legal criteria of economic justification and technical feasibility and may be useful for harmonizing with international standards. To allow such consideration, the words “maximum wattage than the” should be deleted. Alternatively, a period could be added after “amended” in line 1 on page 17 and the rest of the paragraph through the end of line 4 struck.

#### CLOSING POTENTIAL LOOPHOLES

Past history shows that when Congress sets lamp standards, creative manufacturers (not necessarily large companies or even companies in the market today) can often find ways to legally evade the law by exploiting loopholes. Typically a small manufacturer takes the first step to exploit a loophole and evade Congressional intent, and then larger manufacturers produce similar “loophole products” in order to be competitive.

For example, in the Energy Policy Act of 1992, a small niche product known as “BR” lamps (BR for “bulged reflector”) were exempted because they were an obscure niche product. However, after enactment, the inefficient BR lamp became the dominant reflector lamp for the residential market, increasing from niche status to more than 50% of sales. This loophole is finally being narrowed in the incandescent reflector lamp provision of the 2007 House and Senate energy bills.

Likewise, the Energy Policy Act of 2005 required ceiling fan light kits to use CFLs, but provided an exception for lamps that do not use medium-screw bases (the common ~1 inch diameter screw base). Since this legislation, intermediate base incandescent lamps (~½ inch in diameter) have become prevalent in ceiling fan light kits and use of candelabra bases (~¼ in diameter) has also increased, defeating the intent of the law, which was to ensure use of more efficient CFLs rather than inefficient incandescent lamps in ceiling fans.

Given this history, this new legislation should be especially vigilant for potential loopholes. S. 2017 takes important steps in this regard, including identifying likely loopholes such as vibration service, rough service, and shatter-proof lamps and calling for monitoring of sales of these lamps and a procedure to close these loopholes if sales of these exempt products double from baseline levels. However, much more is needed to prevent loopholes. Below we identify a number of potential loopholes and suggest ways to fix these.

New lamp shapes and bases.—The bill lists specific lamp shapes that are regulated or their “equivalent” (p. 4, lines 14-18). “Equivalent” can be a very specific term and this appears to us to allow manufacturers to develop new shapes that are similar to but not equivalent to current shapes in order to get around the law. We strongly recommend changing the bill language to cover all screw base lamps, and then adding to the list of exemptions as needed—for example, exempting T and G40 lamps as well as exempting B, BA, CA, F, G16½, and S lamps less than or equal to 40 Watts. Significantly, if all bases are covered, there is no incentive for some manufacturer to develop a new base.

At a minimum, the phrase “equivalent” should be changed to “similar” and this section moved to after the reference to the ANSI standard, since our understanding is that ANSI does not define either “equivalent” or “similar.”

We should note that the House bill also has the same loophole problems. Representative Harman’s staff have told us they are supportive of efforts to address this problem.

Petitions for extended coverage.—If the Senate elects to stick with the narrowly defined approach to coverage in the current bill, we recommend that the provision allowing for extension of coverage on page 14 be clarified. Currently, the language allows for petitions seeking extension of coverage to those products “excluded” from the definition. The bill explicitly defines nineteen “exclusions.” However, the bill also implicitly excludes dozens of other lamp types, shapes and bases (some of which are not yet even invented) but which could become common for general service lighting. The law should make crystal clear that petitions to close loopholes may apply to both explicitly and implicitly exempted products. We suggest language in the appendix to the testimony.

Also, the procedure for interested parties to expand coverage to new lamp classes (p. 15, lines 1–10) provides too high a burden on petitioners. We recommend that line 5 be amended to insert “availability and/or” in front of “sales.” It is hard for petitioners outside of lamp companies to have sales data; data on lamp availability can be more readily collected. Likewise, on line 9, insert “likely” in front of “being.” Without doing an expensive field survey, it cannot be determined if a specific type of lamp is widely being used. Addition of the word “likely” or “probably” allows for reasonable judgments to be made without definitive evidence. This provision only

initiates a longer process during which additional data can be collected before decisions are made.

G (globe) and P lamps.—G lamps are round lamps, which are becoming more popular. While large lamps of this type (such as G40 lamps, which are 5 inches in diameter) cannot be used in the most common lighting fixtures, smaller lamps such as G25 and G30 (between 3 and 4 inches in diameter) often can. Likewise, P lamps (pear?) can also be used in many general lighting fixtures. The change suggested in the paragraph above will address these problems. But if the Senate elects not to make this change, these lamps should be added to the coverage of this standard so they don't become loopholes. At an absolute minimum, these lamps should be added to the sales monitoring section of the legislation and if sales double relative to the baseline, then these lamps should be subject to the same standards as their A-shaped cousins.

B, BA, CA, F, G16½, and S lamps over 40 Watts.—These are different types of decorative lamps that are generally 40 Watts or less, but for most of these products, 60 W lamps are also sold. But 60 Watts is the most common incandescent lamp size and if 60 Watt lamps of these types are allowed, we would expect sales of these lamps to grow dramatically, thus undercutting a significant fraction of the energy savings expected from phase 1 standards. To address this problem, we strongly recommend that these lamps be limited to no more than 40 Watts, the same as for intermediate base lamps.

Candelabra bases.—As noted above, candelabra bases are becoming more common in ceiling fan light kits in order to get around the new standard set in the Energy Policy Act of 2005. If new standards go into effect for many of the more common lamps, we expect candelabra bases to become even more common. S. 2017 attempts to address this problem by imposing a 60 W cap on candelabra bases (p. 13, line 12). But, as discussed above, 60 Watts is the most common incandescent lamp size and if 60 Watt candelabra bases are allowed, we would expect sales of these lamps to increase substantially, undercutting the standard. To address this problem, we recommend that these lamps be limited to no more than 40 Watts, the same as for intermediate bases. Candelabra lamps are historically designed for decorative purposes, usually in multi-socket fixtures, and often with dimming controls, where the extra light output of a 60 Watt lamp is not needed.

Rough, vibration, etc. service.—As discussed above, S. 2017 requires DOE to monitor the sales of rough and vibration service, and shatter-resistant lamps. These lamps are virtually the same shape as conventional lamps and can be used in virtually all conventional lamp sockets. To help keep sales of these lamps from exploding, we recommend that the bill direct that these lamps be exempted from the standards only if sold at retail in single-lamp packages. Wholesale sales can still be in bulk, but retail sales should be restricted. We have already seen 10-packs of low-cost vibration service lamps for sale in California in order to get around California's incandescent lamp standards. Single-lamp packaging (or at most, two-lamp packaging) will keep that from happening nationally. The House bill includes a requirement for single-lamp packaging of these lamps. The Senate bill should adopt this same provision. S. 2017 includes single-lamp packaging as part of the backstop standard for these lamps, but by the time the backstop standard is imposed, significant energy savings will be lost. It is better to close this door before the horse leaves the barn.

As noted above, S. 2017 calls for an accelerated DOE rulemaking if the sales of any of these lamps double relative to the baseline and provides a backup standard if DOE does not complete the rulemaking within one year. The House bill automatically imposes the backup standard without a rulemaking, thereby imposing the backstop standard sooner and also saving rulemaking resources for more important matters. We recommend that the Senate adopt the House approach and drop the rulemaking requirement.

#### DISCOURAGING DIM LAMPS

S. 2017 sets minimum lamp wattages for different lumen bins. The bins are meant to be equivalent to conventional 40, 60, 75 and 100 Watt lamps, but some of the bins are broad enough that lamps 14% dimmer than today's most common lamps can be sold. The approach in S. 2017 encourages production of dimmer lamps by implicitly reducing the efficacy (lumens per watt) requirement as light output declines with each lumen bin. As lamps get dimmer, some consumers may be dissatisfied and move up to a higher lumen class, eroding much of the savings achieved. To address this potential problem, the bill would include both wattage caps and lumen per Watt floors in order to keep lamps from being too dim or too bright. We recommend adding the following lumen per watt (LPW) minimums within the var-

ious lumen bins of the tier one incandescent lamp standards in the table on p. 11 of the bill: 1490–2600 lumens: 22.5 LPW, 1050–1489 lumens: 22 LPW, 730–1049 lumens: 20 LPW, 310–729 lumens: 17 LPW.

But if this step is not taken, at a minimum, we recommend revising several of the lumen classes in order to limit the bottom of the class to only 10% dimmer than today’s most common bulbs. Specifically, we recommend that the 60 Watt equivalent class be 750–1049 lumens (not the 730–1009 lumens now in the bill) and that the adjoining classes be adjusted so that the next lower class ends at 749 lumens and the next higher one starts at 1050 lumens (this change should be made in the table on p. 11).<sup>3</sup> A similar change should be made to the lumen ranges for modified spectrum lamps (for the table on top of p. 12).

Also, regarding the standards for modified spectrum lamps (on top of p. 12), these modified spectrum lamps will be considerably dimmer than the conventional lamps they replace. The lumen ranges in S. 2017 for modified spectrum lamps are 25% lower than for standard lamps. Given recent technical developments announced by the major manufacturer of modified spectrum lamps,<sup>4</sup> we believe that lower lumen levels are not needed, but if lumen levels are relaxed for modified spectrum lamps, they should be dropped no more than 15%.

#### PREEMPTION OF STATE STANDARDS

S. 2017 preempts state lamp standards with one limited exception—states with standards that precede the legislation (currently California and Nevada) are allowed to enforce their standards until the federal legislation takes effect (p. 34, lines 16–24). We support the ability of states to enforce their existing standards, but believe that the preemption language overall is an unacceptable infringement on states’ rights. What is most troubling is that a strong Nevada standard now part of state law will be replaced by a weaker federal standard when the initial federal standards in S. 2017 take effect. To our knowledge, in the 20 years of federal standards legislation, Congress has never done this before. In the past, stronger state standards have been grandfathered and preemption does not apply to them. We recommend that this approach be taken here and the Nevada standard (and any other state standards on general service incandescent lamps adopted prior to the enactment of federal standards) be grandfathered.

In addition, California has begun a proceeding to revise its incandescent lamps efficiency standards and would like to continue this rulemaking without preemption so that they may meet the requirements of existing and pending state laws. California is submitting detailed comments to the Committee on this issue. We support California’s ability to complete their current rulemaking and move up the effective dates of the different federal standards, if such action is taken by appropriate authorities in the state.

#### ADDITIONAL TECHNICAL ISSUES

We have a few other technical corrections to suggest as follows:

1. General service lamps are defined (p. 4, lines 9–10) to be 200–3000 lumens, but the standard in the legislation only covers lamps of 310–2600 lumens. The coverage should be modified to be the same as the specific standards so as not to leave 200–310 and 2600–3000 lumen lamps in a state of limbo.
2. The definition (p. 4, lines 11–13) includes lamps with “a voltage range at least partially within 110 to 130 volts.” It is unclear whether lamps that may be advertised as “rated for 140 volts,” but that will operate at 110–130 volts, are covered by the standards. They should be covered, to avoid yet another potentially serious loophole. We recommend this sentence be changed to read “is capable of operating at a voltage at least partially within the range of 110–130 volts.” We believe this is the intent of the provision. The same change should be made in Section 105 on page 35, lines 22–23. Our understanding is that the major lamp manufacturers agree with this recommendation.
3. The provision on 150 Watt lamps (p. 27, line 4 through p. 28, line 15) should be specified in terms of a lumen range (e.g., 2601–3300 lumens) and not as a specific wattage. As currently written, sales of 149 or 151 Watt lamps, for example, would not be tracked and could become a loophole. Specifically, the

<sup>3</sup>A soft white 60 W lamp is typically 840 lumens; 10% lower is 756 lumens. A soft white 75 W lamp is typically 1180 lumens; 10% lower is 1062 lumens. We have rounded to the nearest 50 lumens.

<sup>4</sup>“GE Announces Advancement in Incandescent Technology; New High-Efficiency Lamps Targeted for Market by 2010.” Press release issued Feb. 23, 2007. <http://www.genewscenter.com/Content/Detail.asp?ReleaseID=1260&NewsAreaID=2&MenuSearchCategoryID=7>.

words “150-Watt” should be replaced with “2,601–3,300 lumens” each place it appears in this section (p. 27, line 4, p. 27, line 9, and p. 27, line 25).

4. On page 8, we recommend clarifying the language by deleting “similar to but not limited to” in lines 7 and 8 and adding before the comma at the end of line 9, “or similar configurations.” We recommend parallel clarifications to lines 1 through 4 on page 10.

5. In the heading to the table at the bottom of page 11, “INSIDE FROST” should be changed to “FROSTED” to be consistent with the definition on page 4 and usage throughout the rest of the bill.

#### METAL HALIDE LIGHTING FIXTURES

Metal halide lamps also provide a substantial savings opportunity, although not as large as for incandescent lamps. Metal halide lamps are commonly used in gymnasiums, big box retail stores, and other high-ceiling applications. A recent study for DOE estimates there are some 4 million metal halide fixtures in the U.S. that consume about 54 billion kWh per year.<sup>5</sup> At 9 cents per kWh, these cost nearly \$5 billion per year to operate.

Multiple states have adopted standards requiring that new metal halide fixtures use “pulse start” ballasts instead of the older and less efficient “probe start” ballasts. Use of pulse start ballasts typically reduces energy use by about 15%. States that have enacted these standards are Arizona, California, Connecticut, Massachusetts, Maryland, New York, Rhode Island, Vermont, and Washington.

In July, 2007, ACEEE and NEMA completed negotiations on a consensus federal standard that would achieve the same purpose but provide a little more flexibility to manufacturers. ACEEE estimates that this provision will save 14 billion kWh annually by 2030, reducing peak power demand by about 3900 MW (the capacity of 13 power plants of 300 MW each) and greenhouse gas emissions by nearly 3 million metric tonnes of carbon. At 9 cents per kWh, this provision will reduce energy bills by about \$1.4 billion per year after stock turnover gradually replaces the existing fixture base. This provision is included in the House-passed energy bill. We thank you for including this identical provision in S. 2017 and support its enactment into law.

#### CONSUMER EDUCATION

For incandescent lamp standards to work, consumers need to be educated that they are purchasing lamps for their light output, not their watt input. Section 102 directs that the FTC review and revise current lamp labeling rules to help consumers better understand new high-efficiency products. We see this as an essential complement to the standards set in the bill.

#### FLUORESCENT TUBES

Fluorescent lamps account for about the same amount of energy use in the U.S. as incandescent lamps—313 billion kWh per year according to a recent study for DOE. At 9 cents per kWh, consumers and businesses spend \$28 billion annually to operate fluorescent lamps.<sup>6</sup>

Congress passed efficiency standards for these lamps in the Energy Policy Act of 1992. Revisions to these standards are overdue. ACEEE and NEMA have been discussing a set of recommendations that would set new standards for fluorescent tubes. The primary effect of these new standards will be to encourage consumers and businesses now using T12 tubes (1.5 inches in diameter) to use the more efficient T8 tubes (1 inch in diameter). T8 lighting systems are highly cost-effective to consumers and businesses, but many (roughly half) have yet to convert to T8. Our recommended standard would encourage the change by limiting T12 tubes to the very highest efficiency levels on the market. As a result, T8 lamps will not only be more efficient than T12, they will also be less expensive.

As this point, ACEEE and NEMA have not reached agreement. The primary differences are in the stringency of the new T12 standard. ACEEE wants only the most-efficient T12 lamps to meet the standard, thereby encouraging further conversions to even more efficient T8 systems. NEMA is suggesting that only the least-efficient T12 systems fail the standard. There is also a difference regarding the effective date.

ACEEE estimates that its version of this provision will reduce U.S. energy use by 23.5 billion kWh in 2030, reducing peak demand by 7550 MW (the capacity of

<sup>5</sup> See footnote 1 for reference.

<sup>6</sup> See footnote 1 for reference.

25 power plants of 300 MW each). At 9 cents per kWh, more than \$2 billion in annual energy bill savings will result. Greenhouse gas emissions reductions will total nearly 5 million metric tonnes of carbon in 2030.

A copy of our recommended changes to existing law is attached to my testimony. If remaining issues can be resolved with manufacturers, we urge you to incorporate this language into federal legislation.

#### OTHER PROVISIONS

S. 2017 also includes provisions on research and development, market research on ways to increase use of products that exceed the new standards, and research on ways to limit the release of mercury from lamps. We support all of these provisions.

#### CONCLUSION

S. 2017 contains important provisions to improve the efficiency of general service incandescent lamps and metal halide lighting fixtures. In my testimony our coalition recommends crucial ways to improve this legislation by minimizing opportunities for loopholes and misinterpretation, and addressing technical concerns and protecting states' rights for continuing to enforce state efficiency standards. We also recommend adding new fluorescent tube standards to the legislation. A table summarizing our estimate of savings from S. 2017, and savings from our recommended modifications to the bill, is provided below.

Item	Annual Savings in 2030					
	Billion kWh	Peak MW	Power Plants (300 MW ea.)	Energy Bills (@ \$.09/kWh)	Million Metric Tonnes Carbon	
S. 2017						
Incandescent	139	17,100	57	\$12.6	27.8	
Metal halide	14	3,900	13	1.4	2.9	
Subtotal	153	21,000	70	14.0	30.7	
Modifications						
Incandescent	20	2,500	8	1.8	4.0	
Fluorescent	24	7,500	25	2.1	4.7	
Subtotal	44	10,000	33	3.9	8.7	
Total	197	31,000	103	\$17.9	39.4	

With our recommended changes we estimate that this bill will, by 2030, reduce annual electricity use by nearly 200 billion kWh, reduce peak demand by 31,000 MW (the capacity of more than 100 power plants) and reduce consumer and business energy bills by about \$18 billion per year. These are very large savings. In addition, these provisions will reduce greenhouse gas emissions by nearly 40 million metric tonnes, adding to the substantial savings in the Senate-passed energy bill and making a useful downpayment in efforts to address global warming. We urge you to include these improved provisions in an energy bill reported out of this Committee and the upcoming House-Senate energy bill conference.

This concludes my testimony. Thank you for the opportunity to present these views.

The CHAIRMAN. Thank you very much.

Thanks to all three of you for your excellent testimony. Let me ask a few questions and then Senator Murkowski, I'm sure, will have some questions.

Mr. Waide, let me ask you first. You referred to the fact that Canada is getting ready to establish similar standards, requiring more efficient lighting. It would seem to me to make good sense for us to be in sync with what they're doing in Canada, since our economies are so integrally connected in a lot of ways. To your knowledge, what is the extent of the difference between what they're likely to be doing there and what we're proposing to be doing here?

Mr. WAIDE. I think firstly, is to say that my understanding is that the Canadian government and the people who are preparing the regulations for the Canadian government would very much like for there to be harmonization between the two economies' requirements, as well. Obviously, as you share the same lamp market, that makes perfect sense. They have in mind, my understanding is, the main difference, they have a, everything by 2012 at the current requirement. They would, I believe that includes lamps of 40 watts and below, as well. They have a lumen per watt approach that is based on a curve. The thinking here is that all lamps, whether you're dealing with compact fluorescent lamps or incandescent lamps, they actually are less efficient, that means they give out less lumens per watt of power going in at lower light output levels, than they do at higher light output levels. They typically follow a curve of that kind. They've devised an equation, which is intended to be 50 percent higher for their tier-one standard, than the average current incandescent performance, based on that curve. So, they are saying from 2012, lamps should meet that.

This is their proposal and I believe they're in discussions about, in consultation process about it, so I'm sure there's flexibility to consider some issues on it. But that's what they've proposed so far.

The CHAIRMAN. Let me ask Mr. Pitsor and Mr. Nadel, if you had any opinion as to whether there should be an effort by us here in the United States to coordinate with Canada on the standards, or whether it's not a big issue either way?

Mr. PITSOR. Mr. Chairman, we have been meeting with the Canadian authorities of the new lamp member manufacturers and are participating in those discussions. We think it's important to try to harmonize as much as possible and are participating in those discussions.

The CHAIRMAN. OK. Do you know if anyone from our Department of Energy is involved or monitoring the details of those discussions?

Mr. PITSOR. I don't have firsthand knowledge as to that, no.



The CHAIRMAN. OK. Mr. Nadel, did you have any knowledge about this?

Mr. NADEL. I don't know whether DOE is monitoring the Canadian procedures. I know that NRK in Canada usually attends most of the DOE procedures. Frankly, the United States market is much bigger than the Canadian market and they tend to pay close attention and often follow what we do, because we're such a larger market.

The CHAIRMAN. OK. Let me ask, Mr. Pitsor especially, one of the issues Senator Salazar raised, is concern about how we can maintain some of the manufacturing jobs here, that result from moving to these newer technologies. Do you have any thoughts? I know there is some manufacturing of lighting fixtures and products in this country. What will the effect be on that, of moving to these higher or different standards, as you see it? Will we lose additional manufacturing activity here or can we maintain our manufacturing level here and perhaps even grow it with these new standards?

Mr. PITSOR. Mr. Chairman, this is an important part of the whole standards efficiency discussion. Because the transformation to transform a \$4 billion installed base, we need a phase-in period in order for us to phase-out our current production lines and install new production lines, retrain workers, qualify new suppliers. That's why it's important to have this 4 year, or this 3 year phase-in period, so we can maintain U.S. manufacturing for the new technologies that we want to do to replace today's general service incandescent light bulb. We're not going to see CFLs being made here. Those are sourced from China. These are the products, I think that Senator Domenici was referring to. These actually end up being hand-assembled. They're very energy efficient, but they're labor-intensive. So, that's why these are globally sourced from China, I think, for the European market, Canadian market, U.S. market.

So, the phase-in is very important to us, so we can reposition equipment to maintain a U.S. manufacturing and production base for the new technologies.

The CHAIRMAN. OK. My time is up.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman. I'm sorry that I missed the testimony from Undersecretary Karsner, but I appreciate the opportunity to hear the discussion this morning from you gentleman.

Coming from the State of Alaska, I'm very interested in understanding where the technology is. Mr. Pitsor, you have indicated that the CFLs have low light output, particularly in the hot temperatures and the cold temperatures. Can you define what the cold temperatures are? I'm sure the people here or in the South would be interested in knowing what the range is on the hot temperatures, too. But when I've got a family that's pulling into their driveway at 6 o'clock at night in the middle of winter in Fairbanks, Alaska and it's pitch dark and there's ice fog. They need to now that that porch light or that garage light is actually working in temperatures that are 40 to 60 degrees below zero. Can you give me a little more background on the adequacy of or performance in the cold and hot temperatures?

Mr. PITSOR. I can supply you with some more technical information.

Senator MURKOWSKI. OK.

Mr. PITSOR. We refer to some of the technical data from the manufacturers. The issue with the heat is that because the CFLs have, if you will, the little ballast is built in here, heat causes the electronics of this to fail, if it overheats. So in hot temperatures or in enclosed fixtures, this base, the electronics stop working—

Senator MURKOWSKI. So does it fail completely? Or is it just a dimmer output, if you will.

Mr. PITSOR. No, no. In an overheating capacity, the capacitor basically burns out and it fails completely.

Senator MURKOWSKI. In cold as well?

Mr. PITSOR. In cold temperatures, it's an issue of starting the light, for it to be excited, in order to provide the light in the cold temperature. The actual temperature range I'll have to get back to you on.

Senator MURKOWSKI. Do you know, just from experience now, Canada is clearly utilizing these. In Europe, I'm sure you've got some Scandinavian countries where they face the same issues, in terms of cold. So I'm just wondering how extreme it needs to be on either end of it to allow for the failure of the technology, really.

If you could get me the specifics on that, I think customers in general would want to know. They're looking at these as, we all want to be more efficient in our usage when it comes to electricity, but we also recognize that these bulbs are a little more expensive. If I'm going to buy it, I want to make sure that it's going to be working. So it would be very helpful if we could have a better understanding of that. But further to that point, is there continuing work with the technology to address these inefficiencies in performance at the low end and the high end of the thermometer here?

Mr. PITSOR. Yes, I mean there's work going on, both with the compact fluorescent technology, improving the color of the light, the quality of the light, as well as in LEDs, the light emitting diodes.

Senator MURKOWSKI. Right.

Mr. PITSOR. That whole technology, which is, you know, we see it in niche applications today, in traffic signal lights, for instance, some under-cabinet lighting, getting a white LED so that we can convert that into the new general-purpose light bulb. That's something which is, we see, proceed down the road. All the major manufacturers are investing and studying that technology.

Senator MURKOWSKI. What about dimmers? This is really important to my husband.

Mr. PITSOR. Right. Dimming is very important. The halogen and incandescent technologies and the LEDs are fully dimmable products.

Senator MURKOWSKI. But not the CFLs?

Mr. PITSOR. The CFLs, generally, are not dimmable. You can—you can make a dimmable CFL, but you have—it's more expensive, it's a larger product and you also have different dimmers for them.

Senator MURKOWSKI. But, I guess my question is, are we looking to make those advances in the technology so that will ultimately be available to us?

Mr. PITSOR. Yes. There's work occurring on all those fronts by the manufacturers.

Senator MURKOWSKI. All right.

Mr. PITSOR. Bringing new products to the market every day.

Senator MURKOWSKI. Good.

Let me ask you, Dr. Waide, you noted in your testimony that the CFLs contain the small amounts of mercury vapor. If I understand correctly, that in Europe you have a recycling process of sorts for the CFL bulbs. Can you explain to me how much mercury vapor is actually contained in one of the CFLs and is it your recommendation that we would want to provide for some form of a recycling process in this country as well?

Mr. WAIDE. This is quite a sensitive issue, and unfortunately I'm not an expert on mercury, critical pathways, and human health risks to be able to really answer that question competently. What I can say, is that it's roughly up to five milligrams or less or mercury, which is a lot less than what used to be in fluorescent lamps. In terms of total quantity of mercury, or at least to the environment, you will see far more when you have coal as your—as a significant contributor to your generating mix, as you do in the United States, by avoiding power consumption from using a CFL, because coal-fired generation gives rise to mercury emissions.

Now, in terms of the health risk, that depends on the critical pathways of airborne versus mercury in lamps and how that might potentially get into humans. I'm really not qualified to talk about that. I can comment that I understand that in Europe, this scheme which is really just getting underway, and so I'm waiting to see how it's really going to function in practice. But I understand from manufacturers, this is going to add about 25 Eurocents per lamp to the cost of a CFL, to pay for end-of-life recycling.

Senator MURKOWSKI. The recycling—

Mr. WAIDE. Yes. So that might—

Senator MURKOWSKI [continuing]. Process?

Mr. WAIDE [continuing]. Be a ballpark figure. But I think it—the way the recycling is being done is quite different, I understand, than in the States, and even in some different regions within States, depending on how they're structured. So it's really going to be a huge laboratory, and if people are interested in looking at that issue, I would suggest that they go and have a look at what's happening.

Senator MURKOWSKI. Does Canada have a recycling program?

Mr. WAIDE. Scandinavia?

Senator MURKOWSKI. Canada?

Mr. WAIDE. Canada. Not yet. That's what I understand. There's certainly no requirement to. This is quite an important issue that was being discussed in their first consultation meeting they had on this topic, as to whether or not they should be setting up some sort of mandated recycling or not of fluorescent lamps.

Senator MURKOWSKI. Mr. Pitsor, did you want to join in on that?

Mr. PITSOR. A complement on those. The—earlier this year, the NEMA manufacturers issued a public statement committing to a mercury maximum in CFLs or no more than five milligrams—as Mr. Waide has indicated. In actual practice, today these are around three to four milligrams of mercury per CFL. There are a number

of State programs that are being looked at, in terms of some recycling. NEMA has supported recycling of fluorescent, both compact and linear product. There's a lot more installed, in terms of the commercial product, your four-foot linear. But today there's not any optimal solution for recycling of these. Given the very small amount of mercury in them, it is very costly to reclaim that mercury. I think EPA has come out with an analysis of a running, between 50 cents to \$2 per bulb to undertake recycling.

Senator MURKOWSKI. Wow.

Mr. PITSOR. So, that's why in this bill, Mr. Chairman, is your section 108, which has—which calls for a, the EPA and DOE to come back to Congress with recommendations on mercury. We think that's an appropriate mechanism, to come back to Congress with recommendations and what we might be able to do with respect to the mercury and recycling.

Senator MURKOWSKI. I think that would be an important point, to make sure that we fully understand and get those systems in place if they will be necessary.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Let me ask on this loophole issue that, Mr. Nadel, you talked about there. What's the solution to this? Do we just have general authority to DOE to issue regulations to fix these problems as they develop, or to cover anything that we're not otherwise specifically covering, or what do we do? Maybe Mr. Pitsor, you have a point of view as to whether this is a serious issue that needs to be addressed as part of our legislation. Either one of you.

Mr. PITSOR. OK.

Mr. NADEL. I will start and I'm sure he will add a few comments.

What we believe is that the coverage of the bill should be broadened, that all screw-base lamps need to meet the standard, unless they are specifically exempted. We could come up with exemptions for, you know the flame shape bulbs, less than 40 watts, and various other ones. Get rid of most of the specialty products. But that a product that can be used in a general service application, that's 60 watts or more, generally should meet the standard unless they specifically petition DOE to be exempted, and the exemption would say they can't meet the standard, they need an exemption for special applications, and it won't be used, is unlikely to be used in general purpose applications.

So we think the coverage should be much broader, but then deal with these special product for exemptions. Now, we're just letting all these special products out. I can think of a dozen ways, if I were a manufacturer, that I could evade this standard with no trouble at all, and we need to close those.

The CHAIRMAN. Mr. Pitsor, what are your thoughts on that?

Mr. PITSOR. We—NEMA obviously would be concerned about loopholes as well, because our members are making investments in these new technologies. We don't want that to be circumvented by some other manufacturers, from overseas perhaps, trying to skirt the U.S. law by coming up with new products that—or coming up with products to, that are not as energy efficient.

However, we think that there's two things to be done here. One, is maintain the focus on general service light bulbs. That's what

we're trying to transform in the U.S., the four billion sockets, the four billion of these that we're trying to convert out to new efficient products. Keep our focus on general service. We think the petition process and having an active monitoring of the marketplace will be the way to go here, not over regulate decorative and décor and all these specialty light bulbs, which we don't see as being, right now, a loophole at this time. We would revisit this as we go forward through the legislation.

The CHAIRMAN. Let me ask about the one other issue that Congresswoman Harman addressed, and that is the preemption issue. The House has provisions in their bill, to ensure that once we establish Federal standards, they are the standards that apply nationwide. I assume that's something the manufacturers strongly support and I'd also be interested in your view on it, Mr. Nadel. Also, Mr. Waide, if you could give us any insights as to how this has been handled in Europe.

Mr. PITSOR. If we're going to be successful in transforming the market, this has to be done at the national level, at a Federal level, and we need to then put those standards in place. We can allow the States to adopt those standards with those same effective dates so they can enforce the in their own State. But we need to be able to do this in an orderly for the manufacturers to make the changes, make the products, and bring them to the market on a national basis. So, that's why we support the proposal that's in the bill.

The CHAIRMAN. Mr. Nadel.

Mr. NADEL. Yes. I'm representing a diverse coalition with different views on this issue. I think we all agree with Representative Harman that you should not have Federal preemption that overrides an existing State standard. In this case, the State of Nevada has passed a law that is stronger than this bill. They would be preempted and I don't believe Congress has ever before preempted a stronger State standard. What they typically have done is grandfathered in that specific standard. So, our whole coalition supports grandfathering, as the House bill did, for existing standards.

Beyond that, our coalition does vary some, in terms of preemption and whether a State like California, which is now working on new standards, should be allowed to proceed. I know the California Energy Commission was invited to testify here. They weren't able to make it, but they'll be submitting detailed comments on their desire, effectively, to continue with their current rulemaking.

The CHAIRMAN. Mr. Waide, is this an issue in Europe or that the European Union is taking on, so everyone understands that that preempts everyone else, or how does this work?

Mr. WAIDE. I think in a slightly different it is an issue in Europe. This is probably why we're seeing some many EU member States introducing their own measures to phase-out incandescent lighting. Going in parallel with what's happening at EU process. But of course, it's not in the technical sense because it's quite clear in EU law, that EU member States don't have right to introduce performance regulations for tradable goods, which are not harmonized at the EU level.

In reality, what can happen is, and what does happen, is that they have the right to set building code requirements, so they can say you can't install a product, you can buy it, you can sell it, you

can trade it, but you can't install it. Or you can, and obviously for compliance purposes, that's a very complex way of handling something. Or they have the right to deal with different duties and to use fiscal measures and subsidies as the UK is currently exploring.

I think, you know, one of the issues that—I haven't heard it mentioned here, but I don't know if there's any means by which the Federal level subsidies for higher-performing lamps could be introduced as a way of dealing with the tradeoff between quality, ensuring that lamps of all types of optimum light quality are available, but on the other hand, ensuring that when the sensitivity of that issue is less important, which it is in the majority of cases, that there is an incentive to go for the higher-efficiency option. I think we're seeing economies starting to introduce blends of measures to try and stimulate, get the right balance in terms of getting the energy savings outcome, but still permitting lamps of a sufficient variety to be available on sale.

The CHAIRMAN. We could go on here, but I think I'll just stop with that. I want to thank you all for testifying. I think your testimony's been useful. I think the hearing's been useful in informing our deliberations on the issue around here. We appreciate it. That will conclude the hearing.

[Whereupon, at 12:32 p.m., the hearing was adjourned.]

[The following statement was received for the record.]

STATEMENT OF THE CALIFORNIA ENERGY COMMISSION

The California Energy Commission believes that S. 2017 is a significant and welcome step to address the inadequate level of energy efficiency of existing general service lighting in the United States, and will, if passed into law, provide for significant national energy savings and accompanying greenhouse gas reductions. That said, however, we must register our strong opposition to the proposed law's strict and inflexible preemption of state ability to develop strong, early, and effective lighting efficiency standards. We believe that such limitation challenges California's ability to meet our climate change goals.

We appreciate the commitment of Chairman Bingaman and Senator Stevens towards achieving significant national energy savings in lighting use. Such energy savings, and more, are an essential part of achieving not only national goals for greenhouse gas reductions, but also for California's enacted greenhouse gas reduction targets signed into law by Governor Schwarzenegger in 2006 (Assembly Bill 32).

We particularly appreciate the acceptance of the Chair and Committee members of this written testimony on S. 2017.

Our testimony will focus on S. 2017's language preempting state standards regulating lighting, an issue of utmost importance to California if we are to meet our enacted greenhouse gas targets.

In addition, we support the recommendations for closing loopholes, expanding coverage, changing lumen bin levels, and improving clarity that are included in the testimony of Steven Nadel on behalf of the ACEEE and a coalition of energy efficiency advocacy organizations.

S. 2017 preempts all state general service lamp standards with one limited exception—states with standards in place prior to the enactment date of the legislation are allowed to enforce their standards until the federal legislation takes effect (p. 34, lines 16–24). While we understand that the lighting industry would prefer the certainty of one national standard in place at one time, we must strongly oppose the preemption language as written in S. 2017.

Over thirty years ago California took on the mantle of setting energy efficiency standards for appliances and buildings—leading the nation in this effort. We continue to update our building standards every three years, providing—cost-effectively—the most efficient homes and buildings in the nation to our citizens. We continue to lead the nation in regularly developing and adopting cost-effective appliance standards—where not preempted by Federal standards. The majority of current federal appliance standards have been built upon California's previous efforts, often

using the same language. We believe that it is valuable to the nation, not just California, to continue to allow strong state leadership and innovation in lighting regulations. S. 2017 would shut down this path to better national lighting policies.

In 2006, we adopted standards for general service lighting that go into effect at the beginning of 2008. Indeed, many of the definitions and basic regulatory structure envisioned in S. 2017 are derived from California's adopted lighting standards. These standards, which we have found to be technically-feasible and cost-effective for the state's electricity consumers, will lead to significant energy savings in California and dramatic changes in general service lighting options available to our citizens. While we are pleased that SB 2017 will allow us to enforce these standards until the effective dates of any Federal standards, we are deeply troubled that the bill would prevent us from acting to update these standards.

Subsequent to our adoption of the current California general service lighting standards, the California Legislature enacted and Governor Schwarzenegger signed into law Assembly Bill 32, committing California to reduce the greenhouse gases the state is responsible for to 1990 levels by 2020. This represents approximately a 30% reduction in GHG emissions from projected levels, and more than a 40% reduction on a per capita basis, in just 13 years. It is clear that meeting these targets will require strong and early actions to improve energy efficiency in California. We have committed to updating our lighting standards to address this challenge, indicating our intention to update the lighting standards by January 1, 2010. S. 2017 would cause this effort to come to a halt.

Recognizing California's commitment to climate change goals, the Legislature recently passed and sent to the Governor, Assembly Bill 1109, requiring the California Energy Commission to establish a schedule of lighting efficiency standards by December 31, 2008 that would lead to a 50% reduction in residential lighting use in the state by 2018. While this bill has yet to be signed into law by Governor Schwarzenegger, its passage is a clear directive to the Commission to move forward on updated lighting standards in an expeditious and significant manner. The preemption language in S. 2017 would prevent California from pursuing state regulations that reflect the state's climate change timetable.

Reasonable state standards do not present an undue burden to industry on a national level. In our three decades of experience, no member of the appliance industry has ever approached the Commission after a standard has been in effect and made a case that the standard is imposing an undue burden. Industries already produce, ship, and distribute appliances with different performance characteristics to different regions of the country and the globe. In fact, for a decade before DOE regulated appliances, California had its own standards for refrigerators, heating and cooling equipment, water heaters, and plumbing fittings, and industry complied with the separate standards without obvious difficulty. In addition, the lighting market is an international marketplace, with a variety of standards in progress for general service lighting. A national standard that preempts state standards does not remove the likelihood that industry will be faced with making products to meet a variety of international standards.

In fact, we believe that more flexibility in allowing states to pursue standards at a pace consistent with that state's energy goals provides a valuable 'phasing' function for the change in lighting technology envisioned by the industry. States like California that have strong reasons to accelerate the movement to more efficient lighting can act as the initial phase for manufacturers, smoothing out the transition to new technologies. This also provides for lessons learned in earlier states to be brought to bear nationally or in states that represent later 'phases' of the transition.

In addition, we are troubled that a sister state, Nevada, will have the stronger early standard it has enacted replaced, in only a few years, by the weaker federal standard in S. 2017. To our knowledge, in the 20 years of federal standards legislation, Congress has never done this. In the past, stronger state standards have been grandfathered. We recommend that this approach be taken here and that the Nevada standard be grandfathered. It is particularly ironic that by the time the Nevada market gets used to the reduced efficiency allowed by the Federal standard in the 2012 to 2020 timeframe, S. 2017 would enact a significantly stricter Federal standard. We believe that it makes sense to leave the Nevada standard in place until the stricter Tier 2 standard in S. 2017 becomes effective.

We understand that the energy bill recently adopted by the House of Representatives includes a section on general service incandescent lamp standards authored by Representatives Jane Harman and Fred Upton. While this bill also unduly limits states ability to adopt lighting standards, it provides more flexibility than S. 2017. Specifically, the House bill would allow states to modify their state standards to reflect the provisions in federal law with earlier enforcement dates.

While we believe that any federal preemption of California's ability to adopt strong lighting standards is detrimental to the state's goals, if federal preemption is to occur, we support as much state flexibility as possible. Here, the House bill clearly provides more flexibility than S. 2017. If the federal government limits California's ability to adopt lighting standards without including such flexibility, California will likely fail in its attempt to meet the greenhouse gas reduction targets adopted in Assembly Bill 32, and will likely fail in its attempt to reduce average residential lighting use by 50% by the year 2018, as envisioned by Assembly Bill 1109. We need to take early actions in California to meet our goals, and S. 2017 unduly constrains us from taking such an early action.

Further, we believe that preemption of general service incandescent standards, if enacted, should be subject to the same 'preemption sunseting' provisions as S. 2017 contains for metal halides (Section 206, adding new subparagraph (9) to 42 U.S.C. section 6297(c)). We have consistently supported preemption sunseting if the federal government fails to meet deadlines for timely updating of standards.

In summary, the S. 2017 language goes further in preemption than is necessary to protect the legitimate interests of the industry. The bill would severely restrict the states in their efforts to protect their consumers and their environments. We do not believe that the federal government should limit state entrepreneurship in establishing lighting standards. Doing so can frustrate the ability of the states to meet individual state goals such as California's global climate change targets.



## APPENDIX

### RESPONSES TO ADDITIONAL QUESTIONS

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#### RESPONSES OF PAUL WAIDE TO QUESTIONS FROM SENATOR DOMENICI

*Question 1.* As more nations look to more efficient CFL lighting, will global production be able to meet this increased demand? In other words, will we mandate the phase-out of incandescent lights only to be faced with CFL shortages?

Answer. At the moment the situation is not sufficiently clear and it is for this reason that the IEA is proposing to do an analysis of the combined impact of mooted or pending legislation on the international demand for higher efficiency lamps and the capacity of the global lamp industry to meet it. The IEA would be happy to send the Senate details of this work on request. We believe that it is important that this analysis be done quickly to clarify whether or not there may be a need to coordinate international regulations.

*Question 2.* Are other nations planning to rely solely on CFLs as a substitute for general service incandescent lighting or will they allow efficient halogen, more efficient incandescent, and LED lighting?

Answer. All of the pending regulations in OECD economies are technology neutral, in other words they set minimum energy performance criteria rather than specify compliant technologies; however, in practice the regulations as proposed would result in conventional screw-based incandescent lamps (GLS) being phased-out. In practice this means that they could be satisfied by any mix of:

- CFLs, which are already commercialized and are available in numerous forms.
- Advanced efficiency halogen lamps, which are just being commercialized and whose costs are not yet very clear but may be above or below those of CFLs once mature.
- LEDs, which are developing very rapidly, are commercialized for some applications but have yet to be fully demonstrated as a commercially viable option for screw-based lamps and for which product costs are hard to predict at present.
- High efficiency incandescent lamps. GE has been pioneering technology for the latter and put out a press release early in 2007 asserting that they expected to have a high efficiency incandescent technology available.

#### RESPONSES OF PAUL WAIDE TO QUESTIONS FROM SENATOR SALAZAR

*Question 1.* Many of the compact fluorescent light bulbs currently used in the United States are manufactured abroad. Can you describe the current manufacturing situation in the U.S. for producing the more energy efficient light bulbs? Is it realistic to expect greater U.S. production of the energy efficient light bulbs?

Answer. NEMA are better placed to answer this than I; however, it is important to consider the following factors. Based on what is known about current screw-based lamp technology the standards as currently proposed in the Senate and House bills would enable any combination of the following technologies to be sold:

- advanced halogen lamps
- CFLs
- light emitting diodes (LEDs)
- high efficiency incandescent lamps

CFLs are the only technology among these that tend to have a relatively high manual labor input and hence are relatively sensitive to labor cost advantages, which in global market terms has resulted in the majority of them being produced in China. Nonetheless, TCP, based in Aurora, Ohio, is a major supplier of CFLs to the North American market and my understanding is that their production is based in North America and is highly automated. They report that they have been sub-

stantially increasing production in response to rising CFL demand in North America in recent years.

GE, the main US-based screw-based lamp producer, is reported to be a leader in advanced incandescent lamp technology and put out a press release early in the year asserting that they planned to commercialize a highly efficient incandescent screw-based lamp; however, to my knowledge this is not yet on the market.

Philips are understood to have begun to commercialize a series of advanced halogen lamps that would meet the standards requirements of both the Senate and House bills; however, it is not yet fully apparent how expensive these lamps will be and thus whether they, or CFLs, would be the cheapest regulatory-compliant screw-based lamp in the medium term. While having an energy efficiency that is higher than GLS lamps the best advanced halogen lamps are about half as energy efficient as the best current CFLs.

To my knowledge at present LEDs have not been able to produce as much light as most screw-based lamps at a reasonable cost; however, the energy efficiency of this technology has been increasing at a very rapid rate, while light output levels are rising and production costs are probably falling. It is thus not yet clear how viable LEDs may be as GLS alternatives in the medium term albeit they appear to have considerable promise. Commercially available LEDs are already more efficient than GLS lamps and are getting near to CFL efficacy performance levels, albeit with some difficulty in producing the same quantity of light.

*Question 2.* Can you describe the areas of research you think are most needed to help the industry achieve the energy efficiency standards mandated by S. 2017? What are the most pressing areas of need to ensure the new energy efficient lighting provides consumers the same quality of lighting they are accustomed to getting?

Answer. In terms of research there are two main strands that need support:

- a) continuing to provide resources to support the accelerated development of high efficiency, high quality and affordable solid state lighting, such as LED technology (the DOE is already active in this area),
- b) support to develop superior phosphors and lamp electronics used in CFLs and other fluorescent lighting technology. In theory, improved phosphors might be able to significantly increase the efficiency of fluorescent lamp technology.

Aside from research there is arguably an even more important need to strengthen lamp quality control mechanisms to minimize the risk of consumer dissatisfaction. Quality control is already an important issue for CFLs and may well become one for solid state lighting too. It is less likely to be a serious issue for the advanced halogen lamps. Most economies have not yet done enough to prevent low quality CFLs from being present on the market and in the past this has resulted in consumer dissatisfaction with the technology. Accordingly, additional resources may be required to set up and administer a robust lamp quality control system while it may also be appropriate to set legally-binding minimum lamp quality requirements.

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#### RESPONSES OF STEVEN NADEL TO QUESTIONS FROM SENATOR DOMENICI

*Question 1.* The original agreement between industry and efficiency advocates presented to me in June called for a three-year phase out instead of the two-year time frame set forth in S. 2017. Why was this change made? Would you contain to support the agreement with a three-year time frame?

Answer. S. 2017 provides a three-year period for the regulations to go into effect, with bulbs currently around 100 W replaced in 2012, bulbs currently around 75 W replaced in 2013, and bulbs currently around 40 and 60 W replaced in 2014. The June agreement you refer to was between NEMA with one efficiency organization (the Alliance to Save Energy). This agreement delays the effective date for bulbs currently around 40 W to 2015. While we prefer the 2014 date, the difference between 2014 and 2015 is low on our list of priorities. We can support a 2015 date if our other key priorities are addressed. These priorities, as discussed in my testimony, are to retain tier 2, cover all screw-in incandescent lamps, and revise the third lumen bin to cover lamps from 750–1049 lumens.

*Question 2.* S. 2017 establishes a “back-stop” standard of 45 lumens per watt for the year 2020 if DOE fails to complete a timely rulemaking. Isn’t this “lumens-per-watt” approach contrary to the legislation’s wattage cap approach? Why do you support setting a lighting standard 13 years in advance—even before the phase-out is initiated? Do you agree with industry’s assessment that this standard, if imposed, will result in the use of CFLs only?

Answer. We support setting a backstop standard for 2020 of 45 or 50 LPW. While this is 13 years in the future, we believe it is important to establish this backstop

standard now so manufacturers know many years in advance that the standard will be at least 45 LPW and they can focus their R&D efforts on products that will at least meet these levels. Going from ~20–22 LPW (tier 1) to 45 LPW will require many product changes and we want to give manufacturers adequate time to prepare. We do not want manufacturers arguing in 2017, just before when DOE finalizes its standard, that 2020 is too close and they need additional time to prepare. Given the large change in efficiency between the initial standard and the backstop revised standard, we believe that a LPW standard will be adequate but do not oppose setting equivalent values in terms of wattage caps. Both LPW and wattage caps have advantages and disadvantages. Finally, we strongly disagree that a 45 LPW standard will result in use of CFLs only. In addition to CFLs, in the 2020 timeframe, 45 LPW can be met by LEDs and probably by new advanced incandescent lamps. For example, on Feb. 23, 2007, GE announced an advanced incandescent lamp and in their press release stated that: “Ultimately, the high efficiency incandescent (HEI) technology is expected to be about four times as efficient as current incandescent lamps and comparable to CFL bulbs.” A copy of this press release is attached to these responses for inclusion in the hearing record. Finally, there are a variety of new technologies in development, some of which are likely to be on the market by 2020. Footnote 2 on page 4 of my testimony includes references to some of these technologies.

*Question 3.* You testified that you would like to see the state preemption standards modified. Isn't a national approach preferable to a patchwork of conflicting state standards?

Answer. The preemption issue is a complicated one. On the one hand, we agree that national standards are much easier for manufacturers to implement than a patchwork of state standards. ACEEE and other efficiency advocates have supported preemption of state standards once national standards take effect, provided standards are regularly reviewed and updated and existing state standards stronger than the initial national standard are “grandfathered”. Given the slow pace by which DOE has issued updated standards, all of our recent consensus agreements with manufacturers include some type of “backstop” if DOE does not act—either a backstop standard set in the legislation or the waiving of preemption after DOE misses a deadline. S. 2017 contains a backstop standard and meets this criteria.

Given DOE's poor history at revising standards, the California Energy Commission is now questioning whether uniform national standards make sense for California, particularly given several new California laws which require substantial energy savings and emissions reductions beyond levels achievable with current federal standards. They are providing their own comments on this issue for the hearing record.

#### RESPONSES OF STEVEN NADEL TO QUESTIONS FROM SENATOR SALAZAR

*Question 1.* Many of the compact fluorescent light bulbs currently used in the United States are manufactured abroad. Can you describe the current manufacturing situation in the U.S. for producing the more energy efficient light bulbs? Is it realistic to expect greater U.S. production of the energy efficient light bulbs?

Answer. I will let the NEMA representative answer this question as they have much more information on this issue than I do.

*Question 2.* Can you describe the areas of research you think are most needed to help the industry achieve the energy efficiency standards mandated by S. 2017? What are the most pressing areas of need to ensure the new energy efficient lighting provides consumers the same quality of lighting they are accustomed to getting?

Answer. Industry is now bringing to market products that will meet the initial standards in S. 2017. While some products on the market now meet the 2020 backstop requirements, further research will be useful to improve these products and bring additional products to market. Areas meriting additional research in my view include the following:

1. Improved CFLs including further size reductions for the highest lumen output bulbs, decreased time to reach full brightness, and efforts to reduce the cost of dimmable CFLs and to develop CFLs that can operate on a common dimmer switch (current dimmable products require more sophisticated dimming controls).
2. Continued improvements in LED lighting including improved efficiency, improved color quality and reduced prices.
3. Continued research on advanced incandescent technologies such as the new GE technology (details not released yet), ceramic filaments, selective emitters, and photonic lattices. References to these technologies are provided in footnote 2 of my testimony.

There are likely additional productive areas for research, but these are the ones I know about.

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RESPONSES OF ALEXANDER KARSNER TO QUESTIONS FROM SENATOR DOMENICI

*Question 1a.* S. 2017 contains a “back-stop” standard of 45 lumens per watt for the year 2020 if DOE fails to complete a rulemaking in time. Does it make sense to specify a new standard today that would take effect 13 years from now? Also, if we did set a future standard, shouldn’t we use the wattage cap approach set forth in the legislation instead of a lumens-per-watt approach?

Answer. DOE believes a “back-stop is unnecessary. First, DOE is committed to meeting its rulemaking schedule. Since DOE issued its first Report to Congress on the status of the Appliance Standards Program in January 2006, the Department has not missed a single rulemaking deadline. Second, this is a time of rapid market and technological development for lighting products, and there is considerable uncertainty around the future price and performance of lamp products in 2020. DOE believes the appropriate standard level should be determined based on a full technical and economic impact analysis as required by section 325 of EPCA (42 U.S.C. 6295).

*Question 1b.* Also, if we did set a future standard, shouldn’t we use the wattage cap approach set forth in the legislation instead of a lumens-per-watt approach?

Answer. Both a lumen per watt and a wattage cap can be equally effective, if the levels are structured to be mindful of consumer and market responses to the standard. A wattage-cap approach can be effective if the product classes on which the limits are established are based around appropriate lumen output levels (or ranges).

*Question 2.* The lighting industry maintains that the two-year phase-out directed by S. 2017 is too short—particularly to reach the new requirements for a standard 40 watt bulb. Instead, the manufacturers support a 3-year phase out. What is DOE’s position on this timing issue?

Answer. DOE has not conducted a manufacturer impact analysis on the phase-out of 40 watt lamps within these time periods. DOE therefore cannot comment on whether a two—year phase-out is adequate or would impose undue hardship relative to a three-year phase-out.

*Question 3a.* There has been concern over the mercury content in CFLs and the proper disposal of such lighting. I understand that the mercury contained in a CFL is much less than that contained in a thermometer. Does the mercury contained in CFLs pose any danger if the bulb breaks?

Answer. Mercury is a common ingredient in compact fluorescent lighting sources, and we take this matter very seriously. However, as you have correctly observed, there is a great disparity in the amount of mercury present in a compact fluorescent lamp (CFL) versus that contained in a mercury thermometer. Typically, about four or five milligrams of mercury are present in a CFL, while a “traditional” thermometer contains anywhere from 500 to 3,000 milligrams.

While CFLs are in use, the mercury within them presents absolutely no health risk. It is only when lamps are broken that tiny amounts of mercury may be released into the atmosphere where, if inhaled, it could pose a health risk. The possible health risks associated with the occasional breakage of CFLs in homes, especially if the area is ventilated and the breakage cleaned up and properly disposed of, are thought to be insignificant. There may also be health risks associated with the disposal of large numbers of CFLs in conventional landfills. However, these risks may be offset by the reductions in airborne mercury emissions as a result of the lower electricity demand achieved through the use of CFLs.

*Question 3b.* What is the proper method of disposal?

Answer. The recommended disposal method is through local recycling options for compact fluorescent light bulbs, if available. Consumers can identify their recycling options by going to [www.epa.gov/bulbrecycling](http://www.epa.gov/bulbrecycling) or contacting their local municipal solid waste agency directly.

If their state permits disposing of CFLs in the garbage, consumers should seal the light bulb in two plastic bags and place it in the outside trash for the next regular trash collection.<sup>1</sup>

*Question 3c.* Does breakage on different surface areas affect disposal in any way?

Answer. The best way to dispose of a broken CFL does vary based on whether the surface is hard or carpeted. Regardless of the surface type, one should open a window and leave the room for at least 15 minutes after the bulb breaks. Also, one

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<sup>1</sup> <http://www.energystar.gov/ia/partners/promotions/change—light/downloads/Fact—Sheet—Mercury.pdf>

should not handle the fragments with bare hands, instead using disposable rubber gloves if they are available.

For a solid surface, the best cleanup method is to scoop the glass fragments and powder into a plastic bag using cardboard or stiff paper and placing the contents in two plastic bags. One should then wipe the area clean with damp paper towels or we wipes and place them in the bag as well. The sealed bags should be placed in the outside trash container for the next pickup. Ideally, brooms and vacuum cleaners should not be used to clean up bulbs broken on hard surfaces.

When a CFL breaks on a carpeted surface, one should follow the above directions as well as possible and then use sticky tape, such as duct tape, to pick up remaining pieces and powder. If vacuuming is still needed, one should vacuum the area where the bulb was broken and then remove the vacuum bag (or empty and wipe the canister) and place the bag or vacuum debris into two sealed plastic bags. The sealed bags should be placed outside in the trash container for pickup.

It is important to note that some states prohibit disposal of broken and unbroken lamps in the trash and require that they be taken to a recycling center.

RESPONSE OF ALEXANDER KARSNER TO QUESTION FROM SENATOR CANTWELL

*Question 1.* Mr. Karsner, Pacific Northwest Laboratory (PNNL) has been the technical lead on a number of DOE lighting projects in recent years, including projects intended to improve the technical performance and market adoption of compact fluorescent lamps (CFLs), reflector CFLs (R-CFLs), and CFL recessed downlight fixtures. In addition, PNNL led a DOE-funded project to investigate the effects on human productivity of lighting systems that provide both high quality light and superior energy efficiency. Currently, PNNL is assisting DOE in developing novel organic light emitting diodes (OLEDs), strategies and projects to speed commercial sector acceptance of high efficiency lighting equipment and systems in commercial buildings, and the technical foundation for launching solid state lighting (SSL) into the general illumination market.

I understand DOE has been very active in working with the SSL industry to create a technical foundation for the launch of SSL products into the general illumination market. In this regard I've heard a little about DOE's work on Energy Star SSL specifications, new SSL performance test procedures, and a range of technical information products. Could you please tell me more about what work DOE is doing in this area and why DOE believes it is so important?

Answer. To complement the ongoing R&D portfolio, DOE has developed a suite of programs that are responding to real-time market needs for emerging LED technologies and products, including the ENERGY STAR label for qualifying LED products, announced September 12, 2007. Working with a number of partners (about 150 companies), including the Next Generation Lighting Industry Alliance (Alliance), DOE is establishing product performance expectations through ENERGY STAR, creating an educational and foundational information base, and, through product testing and design completions, reducing the risk of poorly performing early products which result in lost consumer confidence and lost energy savings. Through early market support actions, DOE seeks to encourage early and continuing energy savings through consumer confidence. DOE has produced a series of "Fact Sheets" to educate initial buyers about the technology and appropriate applications for early adoption, and the code and standards-writing organizations (IES, ANSI, NEMA, and others) are teaming up to provide standard definitions, testing procedures, and safety guidelines to lay a foundation for an organized market. This year, DOE is demonstrating LED lighting in several buildings to establish the functionality and performance of these lighting systems. To learn more about available products, DOE tests white-light LED products, informs manufacturers of results, and makes the information available on its web site for educational purposes. The "Lighting for Tomorrow" design contest encourages lighting manufacturers to produce new, high performance LED-based products. In conjunction with the Alliance, lighting industry, efficiency groups and other interested parties, DOE created the performance specification for white light LED-based products necessary must meet to receive the ENERGY STAR designation. By "setting the bar high" in these early market years, DOE will show the product quality level possible and, through a better informed consumer, encourage manufacturers to provide better engineered and designed lighting.

RESPONSE OF ALEXANDER KARSNER TO QUESTION FROM SENATOR SMITH

*Question 1.* With regard to Section 104 of S. 2017, it appears that preempting the states abilities to establish their own standards upon the date of enactment of the legislation could inhibit progress on regional efforts to increase energy efficiency and

reduce carbon emissions. For example, why should the states of Oregon and Washington be preempted from taking action in the near term that would, at a minimum, match California's recently established lighting standard thereby creating a west-wide market for light bulbs having the same level of efficiency?

Answer. The preemption language in S. 2017 being referred to here is consistent with preemption language contained in section 327 of Energy Policy and Conservation Act (EPCA) (42 U.S.C. 6297). Consistent with EPCA's focus on setting national energy efficiency standards, DOE generally believes it is appropriate that individual States be preempted from establishing standards in those areas in which national standards apply. Furthermore, this is consistent with the preemption that applies if DOE were to establish the standard through rulemaking under EPCA. While DOE carefully considers existing State standards as one source of relevant information in the standard-setting process, EPCA directs a preference for a single national standard.

RESPONSES OF ALEXANDER KARSNER TO QUESTIONS FROM SENATOR SALAZAR

*Question 1a.* Many of the compact fluorescent light bulbs currently used in the United States are manufactured abroad. Can you describe the current manufacturing situation in the U.S. for producing the more energy efficient light bulbs?

Answer. While the vast majority of CFLs are manufactured offshore, there is some CFL manufacturing capacity in the U.S. Current manufacturing methods for CFLs requires substantial labor input, making it unlikely that U.S. manufacturing of CFLs would grow substantially in response to higher U.S. demand for CFLs. Finally, there may not be adequate global capacity to satisfy the demand for CFLs if the market rapidly shifts from incandescent lamps to CFLs. This is a topic receiving significant study by several countries, DOE, and the International Energy Agency.

*Question 1b.* Is it realistic to expect greater U.S. production of the energy efficient light bulbs?

Answer. There is significant opportunity for U.S. industry to increase production of efficient lighting technologies, apart from CFLs. This is especially true for solid state lighting (SSL) because, as directed by Congress, the patents emanating from the DOE Solid State Lighting research program are subject to a requirement that substantial manufacturing must occur in the U.S. We are working closely with our industry partners in the Next Generation Lighting Industry Alliance to accelerate this technology to market through R&D and commercialization efforts, including the recently announced ENERGY STAR labeling program for solid state lighting.

*Question 2a.* Can you describe the areas of research you think are most needed to help the industry achieve the energy efficiency standards mandated by S. 2017?

Answer. The Department interprets the term "general service lighting" to include a wide range of traditional lighting. Currently, our R&D program addresses the full range of lighting technologies, including incandescent, fluorescent, and solid state technologies. The goal is a portfolio that maximizes potential energy savings from all lighting technologies. For example, among the "general service lamps", traditional technologies that show better energy savings potential are high intensity discharge lamps (HID) and fluorescent lamps. Improving HID lamps requires R&D in luminaire efficacy, coatings, dimming, and chemical fills. A key area in fluorescent technology is improvement in phosphors for better energy conversion into visible light.

*Question 2b.* What are the most pressing areas of need to ensure the new energy efficient lighting provides consumers the same quality of lighting they are accustomed to getting?

Answer. Quality is a paramount concern for the Department's R&D and deployment efforts. ENERGY STAR programs for CFLs and SSLs ensure only top quality products get the ENERGY STAR label. For solid state lighting, key areas of quality include total cost of ownership, color rendering, appropriate shade of white light for the application, and geometry of lamp. For compact fluorescent lamps, manufacturers are addressing delay in start up and dimmability. Also additional attention is being paid to mercury content and disposal. Development of fixtures and lighting systems appropriate for the new technologies is being encouraged through the Lighting for Tomorrow competition co-sponsored with the American Lighting Association.

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[Responses to the following questions were not received at the time the hearing went to press:]

## QUESTIONS FOR KYLE PITSOR FROM SENATOR DOMENICI

*Question 1.* The original agreement between industry and efficiency advocates presented to me in June called for a three-year phase out instead of the two-year time frame set forth in S. 2017. Why was this change made? Do you still support the agreement?

*Question 2.* S. 2017 establishes a “back-stop” standard of 45 lumens per watt for the year 2020 if DOE fails to complete a timely rulemaking. Isn’t this “lumens-per-watt” approach contrary to the legislation’s wattage cap approach? Why do you believe this standard, if imposed, will result in the use of CFLs only?

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