AMERICAN ENERGY SECURITY AND INNOVATION: AN ASSESSMENT OF PRIVATE-SECTOR SUCCESSES AND OPPORTUNITIES IN ENERGY EFFICIENT TECHNOLOGIES

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND POWER

OF THE

COMMITTEE ON ENERGY AND COMMERCE

HOUSE OF REPRESENTATIVES

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SUBMITTED MATERIAL

AMERICAN ENERGY SECURITY AND INNOVATION: AN ASSESSMENT OF PRIVATE-SECTOR SUCCESSES AND OPPORTUNITIES IN ENERGY EFFICIENT TECHNOLOGIES

TUESDAY, FEBRUARY 26, 2013

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND POWER,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:08 a.m., in room 2123 of the Rayburn House Office Building, Hon. Ed Whitfield (chairman of the subcommittee) presiding.

Members present: Representatives Whitfield, Scalise, Shimkus, Pitts, Terry, Burgess, Cassidy, Olson, McKinley, Gardner, Pompeo, Kinzinger, Griffith, Upton (ex officio), Rush, McNerney, Tonko, Capps, Barrow, Matsui, Castor, Welch, and Waxman (ex officio).

Staff present: Nick Abraham, Legislative Clerk; Gary Andres, Staff Director; Charlotte Baker, Press Secretary; Mike Bloomquist, General Counsel; Matt Bravo, Professional Staff Member; Allison Busbee, Policy Coordinator, Energy and Power; Patrick Currier, Counsel, Energy and Power; Carolyn Ferguson, Staff Assistant; Tom Hassenboehler, Chief Counsel, Energy and Power; Heidi King, Chief Economist; Ben Lieberman, Counsel, Energy and Power; Gib Mullan, Chief Counsel, Commerce, Manufacturing, and Trade; Mary Neumayr, Senior Energy Counsel; Andrew Powaleny, Deputy Press Secretary; Chris Sarley, Policy Coordinator, Environment and Economy; Lyn Walker, Coordinator, Admin/Human Resources; Jeff Baran, Democratic Senior Counsel; Phil Barnett, Democratic Staff Director; Greg Dotson, Democratic Staff Director, Energy and Environment; Caitlin Haberman, Democratic Policy Analyst; and Alexandra Teitz, Democratic Senior Counsel, Environment and Economy.

OPENING STATEMENT OF HON. ED WHITFIELD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF KENTUCKY

Mr. WHITFIELD. Good morning, and I would like to call this hearing to order this morning. I will recognize myself for an opening statement.

Anyone who focuses on energy issues, I believe, has been amazed at recent discoveries of resources that make it possible for America to be energy independent, both generating electricity and producing fuel for transportation purposes. Certainly, supply and demand affects price and if we can control price, we can be more competitive in the global marketplace, strengthen our economy, and create jobs. That is certainly a goal to which we all aspire.

Now, we have had several hearings about supply in this subcommittee, and today, we are going to focus on demand, and specifically, energy efficiency. In fact, today's hearing is entitled "American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies." Just as we have been successful in finding additional resources for energy production, we have also made great strides in energy efficiency, and we can do even more.

History teaches us that nothing is more efficient than the free market. The only thing you need to spur than improve energy efficiency is profit-seeking companies responding rationally to high energy bills. Any company that doesn't use energy as wisely as possible will lose ground to a competitor that does. This is why free economies are the most efficient and have the lowest energy inputs per units of gross domestic product when you contrast that particularly with centrally-planned economies, which are certainly not as efficient.

We all understand that government has a very important role to play and has contributed much in this area, such as utilizing the latest advances to improve efficiency in federal buildings, and in conducting energy efficiency research. And all of us are fans of the energy savings performance contract program over at DOE, and it continues to do a great job, and we look forward to making sure that it continues to make that kind of contribution.

We have a great panel of witnesses today. We have three panels, and on the first panel, we are very fortunate to have two United States senators. We have Senator Lisa Murkowski of Alaska, who has been a leader in the energy sector. Senator, we really appreciate your taking time to be with us today. And Senator Shaheen of New Hampshire was given a speaking engagement this morning, and she is on her way, and it is not seldom that we have two senators over here, so we are always going to pay particular attention to what they say, because as they say, the House and the Senate need to work closely together on all these issues. So we are excited about the witnesses this morning, and I will introduce the three panels as we come to them.

[The prepared statement of Mr. Whitfield follows:]

PREPARED STATEMENT OF HON. ED WHITFIELD

Energy prices are a function of supply and demand, and high prices are a clear sign that supply is struggling to keep up with demand. That is why expanding domestic energy supplies is a big part of the solution to the nation's energy challenges and one that this subcommittee will continue to address. But this morning's hearing will focus on the demand side of the energy equation, and specifically private sector efforts to develop and utilize innovative technologies and processes to reduce waste and cut costs.

History teaches us that nothing is more efficient than the free market. The only thing you need to spur innovations that improve energy efficiency is profit-seeking companies responding rationally to high energy bills. Any company that doesn't use energy as wisely as possible will lose ground to a competitor that does. This is why free economies are the most efficient and have the lowest energy inputs per unit of gross domestic product. Contrast that with centrally planned economies which are among the least efficient.

These private sector innovations can take the form of energy efficient technologies like combined heat and power systems. They can also take the form of novel instruments like energy savings performance contracts. We will discuss both kinds of innovations today.

The benefits of energy efficiency are something that both Republicans and Democrats can agree upon. They are also something that both the House and the Senate can agree upon, which is why I am pleased that Senators Lisa Murkowski and Jeanne Shaheen are joining us to discuss energy efficiency efforts underway in the Senate. Those of us in the House are always ready to learn from the world's greatest deliberative body.

Some make the mistake of thinking that efficiency only happens as a result of federal regulations or other mandates. But the stories we will hear from our private sector witnesses demonstrate otherwise. Utilities, manufacturers, commercial property owners and others are continually developing clever new ways to save on their energy costs, and are not waiting for orders from Washington DC.

In fact, government policy can sometimes get in the way of energy efficiency. For example, a provision included in the Energy Independence and Security Act of 2007 mandates the elimination of all fossil fuel-generated energy use in new and modified federal buildings by the year 2030. This federal mandate potentially restricts the adoption of high-efficiency technologies such as natural gas combined heat and power and waste heat recovery systems in federal facilities. We need to reconsider any and all federal impediments to energy efficiency.

On the other hand, there is a constructive role for the government to play, such as utilizing the latest advances to improve efficiency in federal buildings, and in conducting energy efficiency research. We need to steer government efforts in a positive direction.

Necessity is the mother of invention, and the necessity brought on by expensive energy, tight budgets, and the pressures of global competition has fostered some great private sector advances in efficiency. I look forward to learning more about these exciting developments and yield back the balance of my time.

Mr. WHITFIELD. And with that, Mr. Rush, I would recognize you for an opening statement.

OPENING STATEMENT OF HON. BOBBY L. RUSH, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. RUSH. I want to thank you, Mr. Chairman, for holding today's hearing on the successes and opportunities in energy efficiency technology. It is my sincere hope that after hearing from today's panel of witnesses, members on both sides of the aisle will be able to come together and move their country's energy policy forward by working to enact common sense energy efficiency legislation.

Mr. Chairman, I remain optimistic that this subcommittee may return to the days of enacting bipartisan and comprehensive energy policy like we did most recently in '05 and '07. I believe that the area of energy efficiency may, in fact, be the opportunity for us to do so.

The story of energy efficiency is one that is filled with success stories that I really hope propel our Nation forward by making us more independent and more secure, while also reducing the cost of energy, both in our pocketbooks and its impact on the environment. According to a recent ACCC study, U.S. energy consumption in 2010 was less than half of what it would have been without the energy efficiency improvements made since 1970.

Mr. Chairman, while today's hearing focuses on the progress made in the private sector, let us not forget that it was the leadership of State and Federal Government activities that paved the way for many of these energy efficiency successes. DOE rulemaking spurred dozens of national efficiency standards for appliances and equipment since 1987. ACCC—EEE, rather, found that these existing standards will provide net savings of $1.1 trillion through 2035, while also reducing carbon pollution by the equivalent amount of taking approximately 118 coal-fired power plants offline by that same year. In fact, in 2010, overall U.S. energy use was 7 percent less than it would have been without these extending—existing, rather, standards.

However, Mr. Chairman, it is important to note that the ACEEE also found, and I quote, "The prospect for future improvements is large." In fact, the report estimates that additional energy efficiency efforts could reduce U.S. energy use by 42 to 59 percent over current projections, which will create over one million jobs and increase U.S. GDP by $100 to $200 million by the year 2050.

So, Mr. Chairman, it is important that the Federal Government does not abdicate its responsibility, its leadership role, of promoting, of encouraging, of enticing interested stakeholders to continue with the progress that has already been made in energy efficiency technologies so that we may keep moving forward, moving our Nation forward. We have a rich and strong legacy to stand on, Mr. Chairman, and let us not abandon the work that has already been done. Energy efficiency has been the low-hanging fruit that may, indeed, as I said earlier, bring both sides together in a legislative manner while also making our Nation safer, more secure, and more attentive to the impacts of climate change.

Mr. Chairman, I look forward to hearing from these outstanding members of the other body, our Nation's leaders, and I look forward to this hearing. And with that, I yield back the balance of my time.

[The prepared statement of Mr. Rush follows:]

PREPARED STATEMENT OF HON. BOBBY L. RUSH

Thank you, Mr. Chairman, for holding today's hearing on the successes and opportunities in energy efficient technologies.

Mr. Chairman, it is my sincere hope that after hearing from today's panel of witnesses, members from both sides of the aisle will be able to come together and move the country's energy policy forward by working to enact commonsense energy efficiency legislation.

I remain optimistic that this subcommittee may return to the days of enacting bipartisan and comprehensive energy policy, like we did most recently in 2005 and 2007, and I believe the area of energy efficiency may, in fact, provide us with an opportunity to do so.

Mr. Chairman, the story of energy efficiency is one that is filled with success stories that have really helped propel our country forward by making us more independent and secure, while also reducing the cost of energy, both in our pocketbooks and its impact to our environment.

According to a recent American Council for an Energy-Efficient Economy (ACEEE) study, U.S. energy consumption in 2010 was less than half of what it would have been without the energy efficiency improvements made since 1970.

Mr. Chairman, while today's hearing focuses on the progress made in the private sector let us not forget that it was the leadership of state and federal government that paved the way for many of these energy efficiency successes.

Department of Energy (DOE) rulemakings spurred dozens of national energy efficiency standards for appliances and equipment since 1987.

ACEEE found that these existing standards will provide net savings of $1.1 trillion through 2035, while also reducing carbon pollution by the equivalent amount of taking approximately 118 coal-fired power plants offline by that same year.

In fact, in 2010, overall U.S. electricity use was 7% lower than it would have been without these existing standards.

However, Mr. Chairman, it is important to note that the ACEEE study also found that "the prospect for future improvements is large."

In fact, the report estimates that additional energy efficiency efforts could reduce U.S. energy use by 42–59% over current projections, which would create over a million jobs and increase U.S. GDP by $100–200 billion by the year 2050.

So, Mr. Chairman, it is important that the federal government does not abdicate its leadership role or responsibility of promoting, encouraging, and enticing interested stakeholders to continue with the progress that has already been made in energy efficiency technologies so that we keep moving the nation forward.

Energy efficiency has proven to be the low-hanging fruit that may indeed bring both sides together, legislatively, while also making our country safer, more secure, and more attentive to the impacts of climate change.

So I look forward to hearing from today's panel of expert witnesses on the successes and opportunities in energy efficiency technologies, and with that I yield back the balance of my time.

Mr. WHITFIELD. Well thank you, Mr. Rush.

At this time, I recognize the chairman of the full committee, Mr. Upton, for a 5-minute opening statement.

OPENING STATEMENT OF HON. FRED UPTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. UPTON. Well thank you, Mr. Chairman. I want to thank both of our senators for being here. Thanks for crossing the Capitol this morning to provide your perspective on energy efficiency innovation. Energy efficiency is not only a bipartisan issue, but as your presence here today demonstrates, there is bicameral interest as well.

You know, for an economy to thrive, it does need energy. In fact, increased energy consumption is often a harbinger of economic growth, a very good thing by any measure. When we talk about energy efficiency, I believe our goal is to maintain and enhance our economic growth by finding ways to maximize the ways that we use energy, to get the most bang for the buck. Energy efficiency measures are some of the simplest and most affordable ways to address U.S. energy demand. The U.S. has steadily improved its energy productivity as a result of advances in technology driven by private sector innovation. Reducing waste and consuming less energy are common sense strategies to cut costs, which is why the industrial and manufacturing sectors have undertaken significant efforts to improve efficiency and reap the resulting economic benefits. But significant energy efficiency opportunities remain, and we will hear about some of those opportunities, as well as the challenges, from our distinguished panelists today.

We have got to remember that as the sequester takes center stage this week, that the Federal Government is the Nation's largest user of energy, and sensibly utilizing energy-saving techniques can significantly reduce the amount of taxpayer dollars spent on federal energy costs.

So on behalf of all of our colleagues, I welcome both of you here, and yield the balance of my time to Mr. Gardner.

[The prepared statement of Mr. Upton follows:]

PREPARED STATEMENT OF HON. FRED UPTON

I want to welcome Senator Murkowski and Senator Shaheen—thank you for crossing the Capitol this morning to provide your perspectives on energy efficiency innovation. Energy efficiency is not only a bipartisan issue, but as your presence here today demonstrates, there is bicameral interest as well.

For an economy to thrive, it needs energy. In fact, increased energy consumption is often a harbinger of economic growth—a very good thing by any measure. When we talk about energy efficiency, I believe our goal is to maintain and enhance our economic growth by finding ways to maximize the ways we use energy—to get the most bang for the buck. Energy efficiency measures are some of the simplest and most affordable ways to address U.S. energy demand. The U.S. has steadily improved its energy productivity as a result of advances in technology driven by private sector innovation. Reducing waste and consuming less energy are commonsense strategies to cut costs, which is why the industrial and manufacturing sectors have undertaken significant efforts to improve efficiency and reap the resulting economic benefits.

But significant energy efficiency opportunities remain, and we will hear about some of those opportunities—as well as the challenges—from our distinguished panelists today. We must also remember, as the sequester takes center stage this week, that the federal government is the nation's largest user of energy, and sensibly utilizing energy savings techniques can significantly reduce the amount of taxpayer dollars spent on federal energy costs.

On behalf of all my colleagues on the Energy and Commerce Committee, I want to again thank Senators Murkowski and Shaheen—and all of our panelists—for taking the time to be with us today, and we look forward to working together on these issues in the 113th Congress.

Mr. GARDNER. Thank you, Mr. Chairman, and thank you, Chairman Whitfield and Ranking Member Rush, thank you for holding this hearing today. Over the past 2 years, I have become increasingly more interested in this topic of energy efficiency, and look forward to hearing our witness's testimony this morning.

There is a lot more that the Federal Government in particular could be doing to become more energy efficient, since we truly are the largest energy consumer in the Nation. That is why I have partnered with Mr. Welch of Vermont, who also serves on this committee, to form a caucus solely focused on advancing energy efficiency in a way that helps the environment and the taxpayer. Our caucus focuses on performance contracting, whether they be energy savings performance contracts, or utility energy service contracts. ESPCs and UESCs allow private companies to perform energy upgrades by taking on all the risks associated with those improvements. The company only gets paid when the monetary savings materialize. They are a win-win for government and the taxpayer, creating private sector jobs along the way.

I truly believe that energy efficiency is an issue that Republicans and Democrats can come together on, as we have done in Colorado. And during times when this city can seem so partisan to the rest of the country, I think we should jump at this opportunity to do so. I will point out, however, that there is one minor impediment to moving forward with ESPCs, and in the way that many of us in this room would like to do so. While OMB does not score ESPCs, CBO does. Even though it saves money, it has no appropriated dollars with it. It is unfortunately restricting our ability to utilize a tool that makes complete sense during an economic downturn, and during a time when the Federal Government is trying to find a way to save money.

I look forward to working with everyone on this issue, and the others in this room as we discuss what we can do to encourage energy efficiency here in Congress.

Thank you, Mr. Chairman. I yield the remainder of my time.

Mr. WHITFIELD. Well thank you, Mr. Gardner, and at this time, I recognize the ranking member of the full committee, the gentleman from California, Mr. Waxman, for 5 minutes.

OPENING STATEMENT OF HON. HENRY A. WAXMAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. WAXMAN. Thank you, Mr. Chairman.

At its heart, energy efficiency is about reducing waste. Doing more with less. This frees up energy supplies, saves money, and reduces dangerous carbon pollution.

Energy efficiency is good for consumers, good for business, good for our economy and job creation, and good for fighting dangerous climate change.

A recent report from the International Energy Agency highlights the critical role of energy efficiency in slowing dangerous climate change. IEA concluded that if the world does not take action to reduce carbon pollution by 2017, then the energy infrastructure existing at that time will make it impossible to limit warming to 2 degrees Celsius. In other words, we have just 4 years to take serious actions to reduce carbon pollution, or we will be locked into a path forward that will lead to devastating climate change. But if we invest now in energy efficiency, we can give ourselves more time.

According to the IEA, the rapid deployment of energy efficiency measures would give the world at least 5 additional years to develop long-term solutions. IEA also found that there are huge efficiency opportunities available. Cost effective energy efficiency measures using technology available today could reduce expected future energy use by over 40 percent. These measures, of course, would save consumers and businesses over $11 trillion through 2050. Two-thirds of the potential energy efficiency savings remain untapped.

Existing efficiency standards will provide net savings of over $1 trillion through 2035, while reducing annual carbon emissions by 470 million metric tons. That is equivalent to the annual emissions from over 100 coal-fired power plants. Without these existing standards, a typical household's electricity use would be about 35 percent higher.

Buildings account for about 40 percent of our total energy consumption, and there is a lot we can do to make them more efficient. Tools for improving efficiency include building efficiency codes, performance goals, information disclosure, technical support, innovative financing approaches, and reduction of market barriers.

We are going to hear today from two very distinguished members of the Senate. Senator Shaheen worked together with Senator Portman on a bipartisan bill that includes many good ideas. Senator Murkowski in the last Congress worked with Senator Bingaman on a package of consensus energy efficiency standards. We should build on both of these bipartisan efforts.

We need to be ambitious. Study after study has identified a myriad of ways we could save energy, save money, and reduce dangerous carbon pollution.

I look forward to hearing the testimony from our two senators and other witnesses today, and working on a bipartisan basis to do something that I think is in the best interest of the American people. Yield back the balance of my time.

[The prepared statement of Mr. Waxman follows:]

PREPARED STATEMENT OF HON. HENRY A. WAXMAN

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Mr. WHITFIELD. Thank you, Mr. Waxman, and that concludes the opening statements, so it is my pleasure now to introduce our first panel of witnesses. They have already been introduced, but I will do it again. We have Senator Lisa Murkowski, a U.S. Senator from Alaska, who is the ranking member of the Senate Energy and Natural Resources Committee, and we have the Honorable Jeanne Shaheen, U.S. Senator from New Hampshire, and as has already been stated, both of you all have worked on these issues and in a very bipartisan way, and so we welcome you to this committee. It is my understanding that when you finish your opening statements, that you both have some other responsibilities, so we will not be asking you any questions, but do look forward to your testimony, and Senator Murkowski, I will start with you and recognize you for 5 minutes.

STATEMENTS OF HON. LISA MURKOWSKI, A UNITED STATES SENATOR FROM THE STATE OF ALASKA, RANKING MEMBER, SENATE ENERGY AND NATURAL RESOURCES COMMITTEE; AND HON. JEANNE SHAHEEN, A UNITED STATES SENATOR FROM THE STATE OF NEW HAMPSHIRE

STATEMENT OF HON. LISA MURKOWSKI

Senator MURKOWSKI. Thank you, Mr. Chairman, Ranking Member Rush, Mr. Waxman, Mr. Upton, thank you for the opportunity to be here this morning to focus on an energy efficiency specifically. I don't know how you do this, but the fact that you actually have your cups this morning that talk about energy efficiency—I don't know if you do this for every hearing over here, but kudos to the committee here for being on subject.

You note in your introduction of me that as the ranking member on the Energy Committee, I would obviously have an interest in this, but coming from the State of Alaska, as I do, where in some of our remote, rural communities, Alaskan families are spending up to 47 percent of the family's budget on energy. There is every reason to be efficient. There is every reason to squeeze everything that you can out of the energy that comes our way, so I have taken a very keen interest in it, and as a consumer of energy, as we all are, we should all be focused on energy and what we can do to make a difference.

Before I get into the specifics of energy efficiency, I want to offer some context for it in the position of a broader, more comprehensive look at energy policy. I brought with me today one of the Hill's best sellers, this is Energy 20/20, a brilliant piece of 115 pages focusing on all things energy. And it is not very often around here that we actually see 200 recommendations on energy policy come out, a focus on energy as the bigger picture in terms of what we can do to strengthen our economy. I would commend it to you. It is available on my Web site. But let me give you the Reader's Digest condensed version. It starts with a simple premise that energy is good. You can distill it in a bumper sticker, but it—think about it. It provides the basis for modern society. It allows us to lead happy and productive lives. It allows us to produce food, to manufacture, to communicate, to move. It is all good.

And to give you five easy principles when we talk about energy, we should strive to make energy abundant, affordable, clean, diverse, and secure. And to accomplish all this, again, I outline about 200 different recommendations, but as we think about energy policy here in this Congress and how to move forward in an area that really can help us be more efficient in our use, just think of it in context of these five attributes as a way to evaluate legislative actions that affect energy. And I would hope that taken together, we can agree that these are the attributes that should allow our policies to advance.

Now, as your focus on American energy security and innovation reminds us, energy—efficiency is more than just driving energy consumption down. As I say in the blueprint here, using energy more efficiently is akin to developing more fuel. It also encompasses the more efficient production of energy.

Now, we must do more. We must do more to discourage the inefficiencies that I think we see oftentimes with regulation and how that is introduced into our energy supply chain. Our aim with energy efficiency policies should be to require less energy per unit of gross domestic product, and it is worth emphasizing that what we want is a rising GDP here as a measure of increasing prosperity.

To underscore for the discussion of efficiency, we must never lose sight of the fact that we want our Nation—in fact, we want the world to be more prosperous, and we know prosperity is an aid to peace and human development, and energy is an aid to prosperity, so the title for the hearing today reminds us that we must see efficiency within the context of energy security and innovation.

I am honored to be here with Senator Shaheen, who has been a leader on efficiency during her tenure on the Energy Committee with me. She continues to work with Senator Rob Portman on their version of a comprehensive energy efficiency bill. It was, and it thankfully remains, a bipartisan effort to make progress in an area where you all have pointed out, agreement is imminently possible, and I think that we saw this as the last Congress waned down. We managed to pass an efficiency bill, the American Energy Manufacturing Technical Corrections Act. There were only two Members of Congress that voted against that, so again, when you think about those things that we can do together, we should be looking to efficiency.

So where do we go on efficiency this year as we look at ways to boost the efficiency of everything that we are doing, whether it is from the buildings here, our vehicles, our appliance, everything? The bill that Senator Shaheen and Senator Portman will offer, I think provides a promising path that is worthy of our consideration. You will see, complements of their work with reports from private sector associations like the Business Roundtable, the National Association of Manufacturers, the Alliance to Save Energy, we must continue to encourage outside stakeholders to reach these voluntary consensus agreements so that efficiency does not become synonymous with this top down approach of mandates that are issued by the Federal Government. I think given the constraints on federal finances that has been mentioned and the failure of mandates to deliver on certain promised results, those of us in the Federal Government should also put our own House in order. And as a start, I am going to be calling upon the GAO to review current funding and past performance of residential, commercial, and industrial energy efficiency programs within DOE, and then propose new authorization levels based on this review.

Now finally, you have appropriately called attention with this hearing to private sector successes and opportunities, and as private—as President Reagan's Administration reminded us more than 25 years ago, the greatest gains in energy efficiency come from the private sector in a growing economy. So here, the government's priority should be the removal of barriers that stand in the way of their investments and the economic growth that make them possible.

Again, I thank you for the opportunity to come over. I think it is important that we share our ideas between the two Houses, certainly amongst members and our parties, and I welcome the opportunity for future dialogue on energy efficiency and all things energy.

Thank you for the opportunity to be here this morning.

[The prepared statement of Ms. Murkowski follows:]

Testimony of Senator Lisa Murkowski of Alaska
House Committee on Energy and Commerce
Subcommittee on Energy and Power
February 26, 2013

Chairman Whitfield, Ranking Member Rush, distinguished members of the Subcommittee on Energy and Power, thank you for the invitation to testify this morning. I appreciate your continued commitment to American energy security and innovation – and your decision to include energy efficiency in your discussion of these critical issues.

My interest in efficiency is drawn from three related roles. I am the Ranking Member of the Senate Energy and Natural Resources Committee, which has jurisdiction over the Department of Energy and its efficiency-related programs. I am a Senator for the great State of Alaska, the true energy capital of our nation, but also a place where some of our rural families are spending up to 47 percent of their income on energy. And finally, like everyone in this room, I am a consumer of energy – and therefore a beneficiary of all that it makes possible in our daily lives.

Before I delve into specific approaches on energy efficiency, I want to first offer some context for its place in a broad, rational, and coherent national energy policy.

Earlier this month, I released a blueprint entitled *Energy 20/20: A Vision for America's Energy Future*. It's the result of a year of thinking about the policies of the past and the trends we're now seeing. It's intended to provoke a new and more thoughtful discussion of energy, and to recognize how bright our future can be if we produce our resources and prioritize innovation.

Energy 20/20 is driven by a simple insight: energy is good. Energy provides the basis of modern society and allows us to lead happy and productive lives. It allows us to produce food, to manufacture and communicate, and to transport ourselves and our cargo around town and around the world.

Based on the observation that energy is good, I developed five key principles: we should strive to make energy abundant, affordable, clean, diverse, and secure. And to accomplish that, my blueprint – which I respectfully request be entered into the record of this hearing – offers some 200 recommendations, ranging from the immediate approval of the Keystone XL pipeline to an advanced energy trust fund that is paid for with the revenues from new production.

Please consider the recommendations in *Energy 20/20*, including the ones directed toward energy efficiency, but, more important, think of those five attributes – abundant, affordable, clean, diverse and secure – as a way to evaluate legislative actions that affect energy. I hope we can agree that, taken together, those are the attributes our energy policies must advance.

As your focus on American energy security and innovation reminds us, efficiency is more than just driving energy consumption down. As I said in my blueprint: "using energy more efficiently is akin to developing more fuel." It also encompasses the more efficient production of energy.

I know that bringing this message here is somewhat like "taking coals to Newcastle." But, as part of our efforts on energy efficiency, we must continue to discourage the inefficiencies that overreaching regulation is introducing into our energy supply chain. Our aim with efficiency policies should be to require less energy per unit of gross domestic product. And it is worth emphasizing that we want a rising GDP, as it is a measure of increasing prosperity.

To underscore for the discussion of efficiency: we must never lose sight of the fact that we want our nation – and the world, for that matter – to be more prosperous. As we know, prosperity is an aid to peace and human development, and energy is an aid to prosperity. So, as the title for today's hearing reminds us, we must see efficiency in the context of energy security and innovation.

I am honored to be testifying today with my colleague, Senator Jeanne Shaheen, who was a leader on efficiency during her tenure on the Energy Committee, and continues to work with Senator Rob Portman on a new version of their comprehensive energy efficiency bill. It was and thankfully remains a bipartisan effort to make progress in an area where agreement is eminently possible. This was evidenced in the waning days of the 112th Congress, when we managed to pass an efficiency bill, the American Energy Manufacturing Technical Corrections Act, into law – with a total of just two members of Congress voting against it.

So where do we go on efficiency this year, as we look at ways to boost the efficiency of everything from our buildings and vehicles to our appliances and DVRs? The upcoming bill offered by Senators Shaheen and Portman will offer a promising path that is worthy of our consideration. Complementing their work are reports from private sector associations such as the Business Roundtable, the National Association of Manufacturers, and the Alliance to Save Energy. And we must continue to encourage outside stakeholders to reach voluntary consensus agreements, so that efficiency does not become synonymous with top-down mandates issued by the federal government.

Given the constraints on federal finances and the failure of mandates to deliver the promised results, those of us in the federal government should also put our own house in order. As a start, I will soon be calling upon the Government Accountability Office to review current funding and past performance of residential, commercial, and industrial energy efficiency programs at DOE – and then propose new authorization levels based on this review.

Finally, you have appropriately called attention with this hearing to *private sector successes and opportunities*. As President Reagan's Administration reminded us more than 25 years ago, the greatest gains in energy efficiency come from the private sector in a growing economy. Here, the government's priority should be the removal of barriers that stand in the way of their investments and the economic growth that makes them possible.

Thank you very much for providing me an opportunity to be part of this hearing. I am confident that I am joined by my colleague, friend, and Chairman Senator Ron Wyden when I say that our Committee looks forward to working with yours in this new Congress. Together, we can advance sound energy policy for the benefit of the American people.

# # #

Mr. WHITFIELD. Well Senator Murkowski, thanks so much for your testimony and your continued leadership, and welcome, Senator Shaheen. We—at this time, I would like to recognize you for 5 minutes for your opening statement.

STATEMENT OF HON. JEANNE SHAHEEN

Senator SHAHEEN. Thank you very much, Mr. Chairman, Ranking Member Rush, and the members of the committee. Thank you for holding this very important hearing today. I am especially pleased to be joined by Congressman Waxman, the ranking member of the full committee, and I was pleased to see Chairman Upton here as well.

I share the views, I think, of all of you that we have just heard from that energy efficiency is a win-win-win. We can save energy, save pollution, we can protect our national security, and we can also create jobs. And so it is a great place to start, and it has bipartisan support.

I am also pleased to be joining my former ranking member. I served for 4 years on the Energy Committee with Senator Murkowski, and I know what great leadership she has provided on this issue, as well as so many other energy issues. She pointed out that with the assistance of this committee, last session we passed the American Energy Manufacturing Technical Corrections Act, which is a mouthful, but it included many energy efficiency provisions, including several from the Shaheen-Portman legislation that really helped to lay a foundation, I think, for further discussion about energy efficiency.

I want to talk a little bit about the legislation that Senator Portman and I have introduced, but I want to begin by putting it in a little bit of context, as Senator Murkowski did. I think all of us would agree that we need a comprehensive national energy policy. We remain overly dependent on foreign oil. We remain reliant on an outdated energy infrastructure that harms American businesses and gives our overseas competitors an advantage. I think we have to utilize a wide range of energy sources, including natural gas, oil, nuclear, and renewables, like wind, biomass, and solar to address our future energy needs, and that this gives us an energy future that is more stable and gives us a stronger economy.

As you all will highlight in today's hearing, we can't just talk about the supply side of energy; we also have to talk about how we consume energy once we have it. Efficiency, as we all know, is the cheapest, fastest way to deal with our energy needs and our economy's energy independence.

I wanted to start with a couple of examples that I think are important as we think about the successes we can achieve through energy efficiency. One of the most well-known is the recent makeover of the Empire State Building, which reduced energy costs by $4.4 million a year. It created 252 jobs, and it is estimated to have saved 4,000 metric tons of carbon emissions. They did things like install 6,500 new windows, a chiller plant retrofit, new building controls, and a web-based tenant energy management system.

I had the opportunity not too long ago to visit a New Hampshire company called High Liner Foods, which is in Portsmouth, on the seacoast of New Hampshire. It is an energy-intensive seafood processing plant that requires a tremendous amount of energy to operate. At one point, the 180,000 square foot facility consumed roughly 2 megawatts of power at any given time during normal operations. So next to the cost of personnel and fish, their biggest cost was energy. But by installing efficient lighting, new boilers, and various demand response techniques, the company has made great strides in reducing its energy consumption, which allows them to expand their business footprint in the State, and be more cost effective in their production.

We can also benefit from those companies that are producing energy efficiency technologies. We have a company in New Hampshire called Warner Power that has made the first breakthrough in transformers in over 100 years. It is called the hexaformer, and if we look at the—where we lose power, about 5 percent of all electricity generated in the United States is lost through inefficiencies in transformers. So with wide scale use of this transformer, the company estimates that 1.5 percent of all transformer energy losses could be eliminated, saving the country 60 terawatts of electricity per year. Now, you all may know more about terawatts than I do, but I translate that into five times New Hampshire's annual electricity consumption, so significant savings.

As Senator Murkowski pointed out, energy efficiency enjoys diverse support among industry advocates. Because too much of our debate around energy has been fossil fuels versus alternatives. It has been about whether we benefit in the Northeast versus who benefits in the South or the West or Alaska, and everybody benefits from energy efficiency. It is one of the great places where we can really come to some common agreement.

Senator Portman and I have done that over the last couple of years. We introduced legislation last year. As I pointed out, some of those provisions were signed into law as part of the Act. Those provisions required federal—the DOE to utilize advanced metering tools, the Department of Energy to study and better understand the barriers to the deployment of industrial energy efficiency. And we are reintroducing the legislation this year. It will include provisions around buildings that are voluntary, not mandatory, but critical because it will provide incentives, and as we all know, buildings use about 40 percent of our energy each year. It will assist the manufacturing sector, which consumes more energy than any other sector of the U.S. economy, and it will require the Federal Government, as you all pointed out, the single largest energy user, to adopt more efficient building standards, smart metering technology, and Congressman Gardner, I certainly agree. We need to do more to make sure that people can take advantage of performance contracting. The bill will have a real measurable benefit to our economy and our environment. A study by the American Council for an Energy-Efficient Economy found that last year's version of the bill would have saved consumers $4 billion by 2020, and helped businesses add 80,000 jobs to the economy. It would also cut carbon dioxide emissions by the equivalent of taking five million cars off the road. And in the process, it would nothave increased the deficit of this country at all.

We passed in the committee last session the Shaheen-Portman legislation with broad bipartisan support. We had more than 200 endorsements from a wide range of businesses, environmental groups, think tanks, and trade associations, from the U.S. Chamber of Commerce to the National Association of Manufacturers, and the Natural Resources Defense Council, not usually a coalition that comes together around legislation. These are the kinds of nontraditional alliances that allowed us to make progress. I think we have the opportunity working together, both in a bipartisan way and a bicameral way, to build on the success of the last session, and to do something significant around energy efficiency.

I thank this committee very much for the opportunity to be here, and for the work that you are doing, and look forward to partnering with you.

[The prepared statement of Ms. Shaheen follows:]

Testimony of
The Honorable Jeanne Shaheen
United States Senator, New Hampshire

Before the

U.S. House Energy and Commerce Committee
Subcommittee on Energy and Power
February 26, 2013

Hearing on "American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies"

Chairman Whitfield, Ranking Member Rush and Members of the Subcommittee:

Thank you for the opportunity to speak today before the Subcommittee on Energy and Power about the benefits of energy efficiency, an effective and affordable policy approach for improving energy security and creating private sector jobs today.

I am happy to be here at the invitation of the Committee and to participate in this important discussion about our national energy priorities. Today I am going to talk about how energy efficiency legislation like the bipartisan bill I co-authored last year with Senator Rob Portman of Ohio, The Energy Savings and Industrial Competitiveness Act, can foster and spur private sector growth across a number of key economic sectors.

Senator Portman and I were pleased that several of our provisions were signed into law last year as part of the American Energy Manufacturing Technical Corrections Act, with the assistance of this Committee. But we are not finished and plan to reintroduce a similar version of the legislation soon.

The United States Needs a Comprehensive National Energy Policy
The United States continues to face very serious energy problems. We remain overly dependent on foreign oil and reliant on an outdated energy infrastructure that harms American businesses and gives our overseas competitors an unfair advantage.

The need for a comprehensive national energy policy that offers solutions to these problems is clear. The world is on the verge of a significant economic transformation that will be built on fundamental changes in the way we produce and use energy. Millions of new jobs will be created in this modern energy economy as new technologies and techniques are developed and deployed in homes, office buildings, power plants and factories.

I am excited about these opportunities, but Congress must play a role to ensure that the United States is positioned and ready to take advantage of this awesome opportunity. China, Germany and even Brazil are aggressively vying to lead the charge and secure these new jobs.

I want to make sure we are taking the lead to seize this great potential. That's why I support a national policy that will create the necessary incentives for industry to innovate so we can position the United States as a world leader in energy once again.

We must utilize a wide-range mix of energy sources, including natural gas, oil, nuclear and renewables like wind, biomass and solar, to address our energy needs. This will make our energy future more stable and our economy stronger.

The Important Role of Energy Efficiency in a National Energy Policy
However, as today's hearing will highlight, we can't just talk about the supply side. We also need to address how we consume the energy once we have it. Efficient energy consumption is an integral component of any truly effective energy policy. If we make energy efficiency technologies commercially available, we will immediately begin reducing costs across our economy.

Efficiency is the cheapest and fastest approach to improving our nation's infrastructure and our economy's energy independence. Energy saving techniques and technologies lower costs and free up capital that allows businesses to expand and our economy to grow.

We can start improving our efficiency now by installing ready and proven technologies such as modern heating and cooling systems, smart meters, computer-controlled thermostats and low-energy lighting. There are substantial opportunities that exist across all sectors of our economy to conserve energy and create good-paying private sector jobs.

Energy Efficiency Success Stories
There are countless examples of energy efficiency success stories in the private sector, both in my home state of New Hampshire and across the country.

One of the most well-known is the recent eco-friendly makeover of the Empire State Building, which reduced energy costs by $4.4 million a year and created 252 jobs. These savings were achieved through a number of initiatives, including the refurbishment of all 6,500 windows and the installation of items including a chiller plant retrofit, new building controls and a web based tenant energy management system.

Not only is the Empire State Building more energy efficient now, but it is also estimated to have saved 4,000 metric tons of carbon emissions.

In New Hampshire, businesses are currently implementing efficiency upgrades and reaping the benefits of these decisions. For example, High Liner Foods in Portsmouth is an energy-intensive seafood processing plant that requires a substantial amount of energy to operate successfully. At one point, the 180,000 square foot facility consumed roughly 2 megawatts of power at any given time during normal operations. By installing efficient lighting, new boilers and various demand response techniques, the company is making great strides in reducing energy consumption, which allows them to expand their business footprint in the state.

We also have private companies in New Hampshire who manufacture the types of energy efficient technologies that are being successfully deployed across the country. Last year, I attended the ribbon cutting of Warner Power's new facility in Hollis, which is dedicated to the development and manufacture of a high efficiency distribution transformer. The equipment the company makes represents the first major advancement in transformers in over one hundred years.

As you may know, studies have shown that inefficiencies in transformers result in a loss of five percent of all electricity generated in the United States. With the wide-scale use of Warner Power's transformer and their control system technology, the company estimates that 1.5 percent of all transformer energy losses could be eliminated. This would save the country 60 terawatts of electricity per year, which is equal to 5 times New Hampshire's annual electricity consumption.

Energy Efficiency Enjoys Diverse Support Among Industry, Advocates and Labor Groups
While disagreements remain about the right comprehensive approach to fixing our nation's energy policies, energy efficiency has emerged as an excellent example of a bipartisan and affordable opportunity to immediately grow our economy and improve energy security.

In recent months, my staff and I have met with a number of trade associations and organizations that have released reports describing their energy policy priorities. These include the Alliance to Save Energy's National Commission on Energy Efficiency Policy, the National Association of Manufacturers' Energy Efficiency Task Force on the building sector and the Business Roundtable's *Taking Action on Energy: A CEO Vision for America's Energy Future*. I have also heard from labor organizations and the environmental community about their policy recommendations for transforming the United States to a modern energy economy.

These groups represent different sectors of the economy and different interests within each, but their energy efficiency proposals are similar and all aim to enable domestic businesses to leverage private capital, reduce business risk from energy price volatility, spur economic growth and create jobs.

One of the more difficult tasks we have as legislators is to find consensus on not just policy recommendations like the ones found in these reports, but on actual legislative language. I am proud to say that last Congress Senator Portman and I were able to find this broad support for our legislation by working with all interested stakeholders to craft common sense and effective provisions.

An Overview of Shaheen-Portman Legislation
Shaheen-Portman provides a bipartisan roadmap to create and implement a national strategy to increase the use of energy efficiency technologies in the residential, commercial and industrial sectors of our economy.

As I mentioned earlier, last year's passage of the American Energy Manufacturing Technical Corrections Act shows that Congress can work in a bipartisan and bicameral fashion to pass efficiency legislation. Among the Shaheen-Portman provisions signed into law as part of this

Act are requirements for the federal agency government to utilize advanced metering tools and for the Department of Energy to study and better understand the barriers to the deployment of industrial energy efficiency.

While this was a step in the right direction, there is still much more to be done and that's why Senator Portman and I plan to introduce similar legislation again this year. Highlights will include:

- *Buildings:* Providing incentives and support (not mandates) for residential and commercial buildings to cut energy use. This is important because buildings consume nearly 40 percent of all energy in the United States;
- *Industrial:* Assisting the manufacturing sector, which consumes more energy than any other sector of the U.S. economy, implement energy efficient production technologies; and
- *Federal Agency:* Requiring the federal government, the single largest user of energy in the country, to adopt more efficient building standards and smart metering technology.

Our bill will have a swift and measurable benefit to our economy and our environment. A study by experts at the American Council for an Energy Efficient Economy found that last year's version would have saved consumers $4 billion by 2020 and help businesses add 80,000 jobs to the economy. It would also cut carbon-dioxide emissions by the equivalent of taking *5 million cars* off the road.

In addition, it's important to note that our bill didn't increase the deficit at all. Rather, it authorized new programs that could be funded when we decide on the budget. Even there, we were careful to offset that authorization by reallocating authorizations from existing programs. We remain committed to this approach.

Shaheen-Portman passed the Senate Energy and Natural Resources Committee in the last Congress with a broad bipartisan vote and had more than 200 endorsements from a wide range of businesses, environmental groups, think tanks and trade associations, from the U.S. Chamber of Commerce and the National Association of Manufactures (NAM) to the Natural Resources Defense Council (NRDC). These are the types of non-traditional alliances that have allowed us to make significant progress, and I know we will continue to build on this momentum.

Conclusion

Again, thank you for the opportunity to contribute to today's discussion. It is clear to me that the tide is with us, both on and off the Hill, for continuing to pursue energy efficiency legislation.

I look forward to working with each of you on the Subcommittee to continue crafting the right policies that will reduce the barriers to energy efficiency investments and maximize private sector job growth.

Mr. WHITFIELD. Well Senator Shaheen, thanks very much, and once again, I want to thank both of you for coming over. We look forward to continuing a dialogue and working with members of the Senate in coming up with some solutions to these problems, and we look forward to working with you in the future. So thank you very much, and good luck in getting back over to the Senate.

Senator MURKOWSKI. That is the hardest part of our job.

Mr. WHITFIELD. At this time, I would like to call up the witness on the second panel, and that is the Honorable Dr. Kathleen Hogan, who is the Deputy Assistant Secretary for Energy Efficiency, the Office of Energy Efficiency and Renewable Energy, at the Department of Energy. So Dr. Hogan, if you would please step forward?

Dr. Hogan, welcome. Thanks so much for taking time to join us this morning. Before I introduce you, I just want to make one comment. You know, we have these hearings and we really value the testimony that is provided to the committee, and we do have a rule that we try to follow, being able to receive the testimony 2 days prior to the hearing, and unfortunately, we received yours last night around 7:00 p.m. I know that you have a very busy schedule, but I hope that in the future if you all testify here, that you might be able to get here a few days early on this testimony so we have an opportunity to really look at it.

But thank you for being with us today. We do look forward to your testimony and your expertise, and I will recognize you for 5 minutes for your opening statement.

STATEMENT OF HON. DR. KATHLEEN HOGAN, DEPUTY ASSISTANT SECRETARY FOR ENERGY EFFICIENCY, OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

Dr. HOGAN. Thank you, Chairman Whitfield, Ranking Member Rush, and members of the subcommittee for inviting me to testify today on behalf of the Department of Energy. As noted by many that have spoken already, energy efficiency is a large, untapped resource in the United States. It offers important benefits for the country, improved competitiveness, billions in consumer savings: growth in domestic jobs, greater reliability of our energy systems, and reduced reliance on foreign oil, as well as environmental benefits.

This year's State of the Union address included a goal to cut energy wasted by our homes and businesses by half over the next 20 years, and to double our energy productivity. The Department of Energy's energy efficiency portfolio is making important contributions towards these goals, including helping to ensure the long-term competitiveness of the United States, though much more needs to be done. We can start by looking at our homes and buildings. They consume about 40 percent of U.S. energy at a cost of about $400 billion a year, and there are many savings opportunities. DOE R&D has advanced new technologies, lighting, heating and cooling systems, windows that offer significant savings. Our work with leading home builders offers new homes with 50 percent savings over typical homes, as well as good indoor air quality and durability. We are working with organizations, and a number of them, on home upgrade programs to address the large number of existing homes, most built before modern codes, and these programs offer savings of 15 to 30 percent. We have recently reached the major milestone of weatherizing more than a million low income homes since 2009, helping these families save hundreds of dollars each year. We have also partnered with over 100 commercial, industrial, and public sector organizations representing billions of building square feet, and $2 billion in financing. They have taken the President's Better Buildings Challenge, with a goal of saving 20 percent or more on their energy bills by 2020, and then showcasing for others how to do it. Our minimum energy conservation standards that we implement now span more than 60 categories of appliances and equipment, and are currently saving consumers and businesses tens of billions of dollars each year. And as we have heard a lot of discussion this morning, as the Nation's single largest user of energy, the Federal Government does continue to lead by example. We have reached large energy savings, water savings, and renewable energy goals, and are on target to meet the President's challenge to implement $2 billion in performance-based contracts by December 2013, investments, as we have heard, that will reduce our energy use at no cost to the taxpayer.

Turning to manufacturing, we are working on next generation technologies, processes, and materials that offer substantial improvements in efficiency, and which will position U.S. competitively for the future. In the State of the Union address, President Obama called for a network of manufacturing institutes that would help address cross-cutting challenges and help accelerate progress across the country. DOE is a partner in these efforts, for example, through a new pilot effort on additive manufacturing in Youngstown, Ohio, and we have recently announced a new energy innovation hub on critical materials at Ames Laboratory to develop solutions to domestic shortages of rare earth materials and other materials critical to U.S. energy security. We also have a strong track record with combined heat and power, which now has new market opportunities with lower cost natural gas, and we are supporting the President's goal of 40 new gigawatts by 2020.

Finally, DOE manages a diverse transportation research portfolio that spans many technologies and addresses light duty passenger cars to heavy duty trucks. Building on past DOE research successes, the President has launched the EV Everywhere Grand Challenge to spur American innovation and to make electric vehicles more affordable and convenient to own and drive than today's gasoline-powered vehicles within the next 10 years. Electric vehicles do offer the potential for $1 a gallon gasoline equivalent, as well as a number of consumer conveniences, and the U.S. needs to continue to lead in this marketplace.

So we are pleased to be part of meeting these challenges and contributing to a more secure, resilient, and competitive energy economy. We look forward to see what more we can do together with you, and thank you again for the opportunity to be here today. I am happy to answer any questions.

[The prepared statement of Dr. Hogan follows:]

Statement of

Dr. Kathleen Hogan

Deputy Assistant Secretary for Energy Efficiency
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

Before the

Subcommittee on Energy and Power
Committee on House Energy and Commerce

February 26, 2013

Chairman Whitfield, Ranking Member Rush, and Members of the Subcommittee: thank you for inviting me to testify today on behalf of the Department of Energy (DOE) regarding energy efficiency. As Secretary Chu has said, energy efficiency is not just the low hanging fruit. It is the fruit that's lying on the ground. That is because investment in energy efficiency offers increased energy productivity, improved U.S. competitiveness, consumer savings, domestic jobs, greater reliability of our energy systems, and positive impacts on the environment.

As Deputy Assistant Secretary for Energy Efficiency in the Office of Energy Efficiency and Renewable Energy (EERE), I am responsible for overseeing DOE's portfolio of energy efficiency research, development, demonstration, and deployment activities. I am pleased to be here today and look forward to working with Congress, and this Subcommittee in particular, to talk about how we can use energy efficiency as a tool to help address our Nation's energy challenges.

Today, I will discuss the Department's efforts and recent achievements to help the American people and businesses save money by lowering utility bills in buildings, to enhance American competitiveness and energy productivity through advanced manufacturing, and to reduce fuel consumption and lower the cost of transportation.

1. Homes and Commercial Buildings

Improving energy efficiency in our buildings offers a tremendous opportunity to create well-paying jobs, save money for businesses and consumers, and make our air cleaner. In the U.S., homes and buildings consume 40 percent of the Nation's total energy with an annual energy bill of more than $400 billion.[1] These energy bills can be cost-effectively reduced by 20-50% or more through various energy efficiency approaches.[2]

DOE uses a portfolio approach to pursue the potential energy savings in buildings. Research and development (R&D) on next-generation building technologies will lead to advances in building components, including efficient lighting that is cost-competitive in today's market, new technologies in heating and cooling, and windows that decrease energy demands and improve comfort. Some highlights:

- R&D on solid-state lighting under DOE's multi-year program plan has the potential to reduce lighting energy usage by one-fourth, saving businesses and consumers $15 billion annually.[3] Already, new technology developed with DOE support has led to a bulb that lasts roughly 25 times longer than traditional incandescent bulbs with lower life-cycle costs.

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[1] *Buildings Energy Data Book*, U.S. Department of Energy. March 2012, http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=1.2.3.

[2] See, for example, DOE/ASHRAE's *Advanced Energy Design Guides* for commercial buildings (http://www1.eere.energy.gov/buildings/commercial/aedg.html) and DOE's Building America program (http://www1.eere.energy.gov/buildings/residential/ba_index.html)

[3] BTP ET Program Information Sheet: Solid-State Lighting, August 10, 2011.

- New heat pump water heaters offer households large savings on water heating, more than 50% in many cases. As a nation, we spend $33 billion[4] each year on energy for water heating, and heat pump water heaters could free a large percentage of that cost to meet other household expenses. The first of these innovative water heaters that use a hybrid of electric heating and heat pump technologies are commercially produced here in the United States.
- Efficient windows pioneered with EERE funding have played a critical role in the market shift toward double-pane windows with low-emittance coatings, which insulate three times better than typical single-pane windows. More recently, EERE has helped develop and commercialize technology to create better, more efficient windows for cold climates that will allow in more energy than they lose.

R&D focused on whole buildings moves us toward next-generation buildings, including homes that are durable, enable smarter energy management, and offer substantial energy savings. Our recently introduced Challenge Home program is a new and compelling way to recognize builders for their leadership in increasing home energy efficiency and incentivize incorporation of such technologies, which would improve indoor air quality, and make homes zero net-energy ready. DOE Challenge Homes are verified by a qualified third party and are at least 40-50% more energy efficient than a home built to recent model energy codes.[5]

To address the large stock of existing homes, we are working with organizations to demonstrate upgrade programs that offer savings of 20% or more for single family and multi-family residences. We are also developing new rating tools to help consumers understand the efficiency of their buildings and the opportunities for improvement. In addition, between 2009 and late September 2012, EERE reached the major milestone of weatherizing more than one million homes occupied by low-income families across the country, while supporting tens of thousands of jobs in local communities. Since the Weatherization Assistance Program began in 1976, more than 7.9 million homes have been weatherized, saving eligible families hundreds of dollars on their heating and cooling bills annually. Each year, these programs train thousands of workers in both the public and private sectors, boosting their ability to serve the home retrofit market and helping to grow the clean energy workforce. To ensure the consistency and quality of this U.S. workforce, the Department is leading efforts to define Standard Work Specifications for Energy Efficiency Upgrades in residential weatherization and building a foundation for the home energy industry through professional training and certification.

To accelerate the development and deployment of energy-saving solutions for commercial buildings, DOE established the Energy Efficient Buildings Hub, a Regional Innovation Cluster headquartered at the Navy Yard in Philadelphia. A key feature of the Hub is the availability of a unique set of buildings as a test bed, including a 30,000-square-foot building that will be used

[4] "Annual Energy Review." EERE Buildings Data Book, 2011, http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=2.3.5.
[5] For more information on DOE Challenge Home methodology, see http://www1.eere.energy.gov/buildings/residential/pdfs/ch_label_methodology_1012.pdf.

to demonstrate advanced energy retrofits of commercial and multi-unit residential buildings. The tools developed, lessons learned and best practices from the Hub will ultimately help enable wide-scale deployment in similar climate zones and building types nationwide.

In addition to R&D and deployment efforts, the Department implements minimum energy conservation standards for more than 60 categories of appliances and equipment. As a result of these standards implemented since 1987, energy users are estimated to have saved tens of billions of dollars on their utility bills in 2010. Since 2009, 16 new or updated standards covering more than 30 products have been issued, which will help increase annual savings even further over the coming years.

Strategic collaborations across the public and private sectors are central to achieving energy efficiency goals. DOE supports lead-by-example programs across the Federal government, the development of energy efficiency-enabling state and local policies, and the establishment of replicable energy efficiency models from market leaders.

The U.S. Federal government is the Nation's single largest user of energy and has both a tremendous opportunity and an acknowledged responsibility to lead by example in saving energy. DOE has played a critical role in providing technical assistance to Federal agencies to increase understanding and accelerate cost-effective adoption of energy-saving technologies and strategies. In December 2011, President Obama signed a Presidential Memorandum directing the Federal Government to enter into a minimum of $2 billion in performance-based contracts over the next two years for energy retrofits on Federal buildings. Agencies have identified a pipeline of over $2 billion in energy efficiency projects for Federal buildings that will be contract awards by December 31, 2013. These projects will use energy savings to pay for project implementation costs, achieving substantial energy savings at no net cost to the American taxpayer. More than $500 million in projects have already been awarded, which will also help agencies meet the government's goal to reduce Federal building energy consumption per gross square foot by 30% from 2003 through 2015.

The Better Buildings Challenge (BBC) is a signature partnership effort, with over 110 partners across the commercial, industrial, and public sectors. Together, these partners represent approximately 2 billion square feet of commercial and industrial space, 300 manufacturing plants, and approximately $2 billion in private sector financing. As partners advance toward meeting their individual goals, the BBC website[6] will highlight their commitment and progress, including information on showcase projects and hundreds of replicable implementation models.

This year's State of the Union address included a goal to cut the energy wasted by our homes and businesses by half over the next 20 years. The President proposed to work with the states to achieve this goal, with Federal support for the states with the best ideas to create jobs and lower energy bills through energy efficiency in buildings. The Department is ready to support

[6] The BBC website address is www.betterbuildings.energy.gov/challenge.

this challenge, building on the success of existing partnerships with the public and private sectors.

2. Advanced Manufacturing

In the United States, manufacturing represents about 12% of the gross domestic product and 12 million high-paying jobs.[7] The Department's investments in advanced manufacturing are geared toward developing next-generation technologies, processes, and materials that offer substantial improvements in efficiency across a product lifecycle and at costs competitive with current technologies. We are also assisting industry with strategic energy management and combined heat and power (CHP) solutions. This portfolio will enhance the competitiveness of U.S. manufacturing now and for the longer term.

In the State of the Union address, President Obama called for a network of manufacturing innovation institutes that will help to support investment in U.S. manufacturers' competitiveness and accelerate innovation in manufacturing. The Department of Energy is a partner in the pilot institute, the National Additive Manufacturing Innovation Institute (NAMII), located in Youngstown, Ohio. NAMII is bridging the gap between basic research and product development for additive manufacturing, providing shared assets to help companies (particularly small manufacturers) access cutting-edge capabilities and equipment, and creating an environment to educate and train workers in advanced additive manufacturing skills. Additive manufacturing techniques create 3-D objects directly from computer models, depositing material only where required. These new techniques, while still evolving, are projected to exert a profound impact on manufacturing for high-value products. They can give industry new design flexibility, reduce energy use, and shorten time to market. To realize the full potential of additive manufacturing, the technology will need to be integrated into broad manufacturing solutions. In applications where additive manufacturing is competitive, DOE estimates that 50% or more energy savings could be realized.

Last month, the Department announced the selection of Ames Laboratory to establish an Energy Innovation Hub that will develop solutions to help address the domestic shortages of rare earth metals and other materials critical for U.S. energy security. The forthcoming Critical Materials Institute (CMI) will bring together leading researchers from academia, Department of Energy National Laboratories, and the private sector. CMI will focus on technologies that will enable the U.S. to make better use of available materials as well as eliminate the need for materials that generally must be imported from overseas and are subject to supply disruptions. These critical materials, including many rare earth elements, or the development of feasible substitute technologies are essential for American competitiveness in the clean energy industry; many materials deemed critical by the Department are used in modern clean energy technologies such as wind turbines, solar panels, electric vehicles, and energy-efficient lighting.

[7] Bureau of Labor Statistics, Nov. 2012, Industries at a Glance, Workforce Statistics, http://www.bls.gov/iag/tgs/iag31-33.htm.

In addition to investments in advanced process and materials R&D, the Department has active technical assistance programs aimed at reducing manufacturing energy intensity by 25% over ten years by engaging a diverse set of industry partners in effective business models, continuous improvement in energy efficiency, modeling key processes, and supporting third-party services. For example, the DOE Superior Energy Performance certification program that uses the ISO 50001 energy management standard provides verification of energy performance improvement and therefore validates the benefits delivered by third party energy service providers. DOE technical assistance also supports the achievement of the national goal set by President Obama in an Executive Order last August of developing 40 gigawatts of new, cost-effective industrial CHP by 2020.

3. Transportation

EERE's Vehicle Technologies Office (VTO) accelerates the development of advanced, energy-efficient, environmentally-friendly transportation technologies that reduce petroleum consumption and lower greenhouse gas emissions without sacrificing vehicle performance. The VTO portfolio reflects a mix of near- and long-term technologies including advanced batteries, power electronics and electric motors, lightweight materials and propulsion materials, advanced combustion engines, advanced fuels and lubricants, and vehicle systems and enabling technologies. Program activity covers technologies applicable to a broad range of vehicles from light-duty passenger cars to heavy-duty trucks.

The Department's Clean Cities initiative, a community-based transportation deployment activity, provides technical assistance to fleets and informational resources to help consumers save money on their personal transportation, whether they are looking for a new car or tips for increasing the fuel efficiency of their current car.

In tandem with the Administration's historic new light-duty fuel economy and medium- and heavy-duty fuel efficiency standards, DOE's work in all of these areas will help enable the continued reduction in vehicle fuel consumption, provide consumers with a variety of choices to save money at the pump (or avoid the pump altogether), and strengthen our national energy and economic security by reducing our dependence on oil.

While we embrace the portfolio approach, given the potential for significant benefit to our nation and individual consumers, the Department has placed increased emphasis on vehicle electrification. Plug-in electric vehicles (PEVs) – both plug-in hybrid electric vehicles and all-electric vehicles – make sense for a number of reasons:

- Electricity is cheaper than gasoline for powering a vehicle (at about $1 per gallon equivalent gasoline price),
- PEVs allow for convenient charging at home at night, or potentially at work,
- PEVs can potentially offer the same or better driving performance compared to today's gasoline powered vehicles, and
- PEVs will reduce America's dependence on petroleum, protecting consumers from price spikes and keeping the money Americans spend on energy here at home.

Last year, the Administration launched the *EV Everywhere* Grand Challenge to bring together America's best and brightest scientists, engineers, and businesses to work collaboratively to make electric vehicles as affordable and convenient to own and drive as today's gasoline-powered vehicles within the next 10 years. In January, Secretary Chu announced the Workplace Charging Challenge, an initiative that brings us one step closer to fulfilling the *EV Everywhere* vision. The challenge aims to increase the convenience of owning a PEV by expanding drivers' access to charging stations in cities across America.[8]

Conclusion

Energy efficiency is a large, low-cost, but underutilized U.S. energy resource. Through R&D, deployment, and collaborations at all levels of government and the private sector, the Department of Energy aims to capitalize on the opportunities that energy efficiency affords. The Department's efforts to lead in next-generation building and vehicle technologies, advanced manufacturing, and energy efficiency best practices will result in a more secure, resilient, and competitive energy economy.

Thank you again for the opportunity to speak to this important issue, and I would be happy to answer any questions.

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[8] For more information, see the "*EV Everywhere* Grand Challenge Blueprint," January 2012, http://www1.eere.energy.gov/vehiclesandfuels/electric_vehicles/pdfs/eveverywhere_blueprint.pdf.

Mr. WHITFIELD. Well, Dr. Hogan, thanks so much for your comments. We appreciate, as I said, your being here, and I will recognize myself for 5 minutes of questions.

I know you have a large portfolio of responsibilities, and certainly one of them does relate to the energy savings performance contracts. Would I be accurate in saying that part of your responsibility is working with other agencies of the Federal Government to encourage them to identify ways to be more efficient in their areas of responsibility? And do you know how many existing energy savings performance contracts are active at this time?

Dr. HOGAN. So you are accurate in saying that my portfolio includes the Federal Energy Management Program that does work with the other agencies to help them achieve a variety of energy, water, and renewable energy targets, and to help them with energy savings performance contracts. Currently, there are over 250—perhaps 270, 280 performance contracts in place, driving investment of more than $2.5 billion in building improvements.

Mr. WHITFIELD. Right, and my understanding, the private companies that get these contracts, they provide the financing for this and the government simply pays it back over time with a nominal interest charge. Is that correct?

Dr. HOGAN. Energy savings, yes. So there is a sort of shared savings mechanism.

Mr. WHITFIELD. And generally, how long do these contracts—what is the repayment terms on the contract, the length of time?

Dr. HOGAN. They can vary based on what is necessary so that it works for the performance contracting firm. It can be 10, 15, 20 years.

Mr. WHITFIELD. Well, recently I attended a luncheon, and there were a large number of company representatives there, and all of them were uniformly excited about this program and very optimistic and positive about it. And I left that luncheon excited myself, because they were talking about all the great accomplishments they had made. And then, really to my surprise, about 3 days later, a group of employees at a federal installation came into my office, and they were complaining about a contract that had been completed on their installation and they were talking specifically about some sensor detectors that did not work right and some impact that it had on boilers, and it ended up costing a lot more money. And they had to bring people in on overtime to take care of these problems, and they ended up even disconnecting some of the systems. And we all know that you can find something that didn't work correctly, but generally speaking, what sort of oversight do you have to ensure that at least those experiences are minimal?

Dr. HOGAN. So I have the Federal Energy Management Program under my purview, and we do work with all the federal agencies around best practices to be following up with their energy service contracts. There are best practices for how to do evaluation, measurement, and verification on what is being achieved with these contracts, and we are happy to work with any sort of issues that address and help those agencies work them through so that we are getting the bang for the buck that ESPCs have to offer.

Mr. WHITFIELD. So they can always come back to you all and say hey, we have got—this is really not working the way it is supposed to be working.

Dr. HOGAN. Absolutely.

Mr. WHITFIELD. OK. Well, I have no further questions at this time. Mr. Rush, I will recognize you for 5 minutes of questioning.

Mr. RUSH. I want to thank you, Mr. Chairman, and Secretary Hogan, it is certainly a pleasure to have you before the committee again here. I am proud of the many accomplishments that you have made and that your agency—the Department has made.

I want to just focus on an area that centers on low income households. It has been well-established that low income households pay a disproportionate amount of their paychecks on energy bills, and many urban constituents, those who live in my district, the First Congressional District of Chicago—Illinois, rather, live in older homes and older buildings that are less energy efficient, and therefore, they are more expensive in the summer to cool and in the winter to heat. This leads to higher energy bills, and so my question to you is of the many programs that President Obama has implemented, many of his proposals on energy efficiency, I would like to know which ones do you think that are most important, that will have the most impact on our urban and low income communities? And so which one of the programs do you think that would happen?

Dr. HOGAN. Well certainly the weatherization assistance program has had a large impact in lowering the energy bills of low income households. That is a several-decade old program at this point that has weatherized six million or so homes over this period of time, a million or so since the Recovery Act was put into place, and it is helping these households at this point save billions of dollars. We are doing a lot with that program to try and expand its use so it can be more effective in multi-family housing and engage with the owners of those buildings that need different mechanisms with which to engage with the Federal Government. So that has just been a very powerful program that way.

Mr. RUSH. And the public housing-owned apartments, rental units, do you have any segmentation of the energy costs and are they—especially in newer public housing developments, are they meeting energy standards—our higher energy standards? Are you monitoring those, and what is going to be effective of those rental units and public housing?

Dr. HOGAN. Yes, so newer buildings certainly are meeting higher efficiency levels than the vast number of the older buildings that are out there, and we continue to work with HUD around standards for federally-owned buildings, and work to continue to engage with building owners of tenant-occupied space.

Mr. RUSH. I have—I think that in order to have a more vibrant and effective energy policy and energy culture more into the future, it is important that we frame—it is important that we introduce—it is important that we teach young people, even in the early grades of grammar school or grade school, the importance of energy. Do you see that as being a part of what you have done and what you plan to do in the future in terms of working with the school systems across the Nation?

Dr. HOGAN. Yes. We have done a number of educational initiatives with students in schools around energy challenges and other means so that we can educate people about energy in the school, energy at home, and create such a culture. I am happy to engage with you more on those topics.

Mr. RUSH. Well, I would like to work with your office to identify the different types of programs and incentives that exist for lower income constituents.

Mr. WHITFIELD. Gentleman's time is expired.

Mr. RUSH. Thank you, Mr. Chairman.

Mr. WHITFIELD. At this time, I recognize the gentleman from Illinois, Mr. Shimkus, for 5 minutes.

Mr. SHIMKUS. Thank you, Mr. Chairman. I am going—I will be real brief.

The original mission of the Department of Energy was to decrease our reliance on imported crude oil. The mission statement that I pulled up recently has changed a little bit. There are reports today that we have actually imported more crude oil from Saudi Arabia over the last month than we have in the last previous years. So put me down as a skeptic about the benefits of parts of the Department of Energy.

Having said that, Mr. Chairman, I would like to put into the record a press release from the National—from the Consumer Electronics Association and National Cable and Telecommunications Association—announced today these companies, Comcast, DirecTV, DISH, Time Warner Cable, Cox, Verizon, Charter, AT&T, Cablevision, Bright House Networks, and CenturyLink, and Manufacturers Cisco, Motorola, and EcoStar Technologies, and Aris, they have come to an agreement to obviously establish set box—set top boxes that have—are energy efficient, use the same technology as some of the electronics, you know, the sleeping modes and stuff. This is an example of the industry doing it without government assistance or help. I also believe in the consumers, and I am also concerned that if we push environmental standards and rules and regs on the individual homeowners, that folks in the poorer regions of this country can't afford the more expensive homes that require new technology, versus homes that they want to purchase and live in.

So with that, Mr. Chairman——

Mr. WHITFIELD. Without objection.

[The information appears at the conclusion of the hearing.]

Mr. SHIMKUS. And I yield back my time.

Mr. WHITFIELD. Gentleman yields back his time.

I recognize the gentleman from California, Mr. Waxman, for 5 minutes.

Mr. WAXMAN. Thank you, Mr. Chairman.

Dr. Hogan, I want to ask you some questions about the national energy efficiency standards for appliances and equipment, but before I turn to that, I want to briefly discuss a DOE rulemaking under Section 433 of the Energy Independence and Security Act. Section 433 requires new and substantially rebuilt federal buildings to meet strong efficiency performance standards to reduce the use of energy generated from fossil fuels. DOE issued a proposed rule in 2010, but it lacks sufficient detail for stakeholders to evaluate how the standards would operate in practice.

Last summer, Senator Bingaman and I wrote to Secretary Chu requesting DOE to issue a supplemental notice of proposed rulemaking to address issues raised by stakeholders and allow for additional public comment. Your response indicated willingness to issue such a proposal, but we have been waiting since last August.

Dr. Hogan, is DOE committed to issuing a supplemental proposal for implementing Section 433, and if so, by when?

Dr. HOGAN. I am happy to be here to be able to relay that, indeed, we are committed to issuing a supplemental proposed rule. We actually do have that supplemental proposed rule at this point with the Office of Management Budget under review, which is part of our process before it can be shared with stakeholders. So if you rolled back the clock just a few weeks, if you looked at the OMB system, it would have shown that there was a final rule under review and now it will show that there is a proposed rule under review.

I think also in the letter that we sent to you, we indicated that we did understand some of the issues that were being raised, both by federal agencies and stakeholders, and things that needed to be reconsidered, such as using renewable energy credits potentially to meet some of the requirements, how to define a retrofit or renovation, as well as how to deal with CHP and those are the types of issues that we will be addressing in this supplemental notice.

Mr. WAXMAN. Will this proposal address the concerns stakeholders have raised regarding how to define major renovation that potential use of energy credits for compliance and clarifying the treatment of combined heat and power?

Dr. HOGAN. Yes.

Mr. WAXMAN. Section 433 was intended to reduce carbon pollution by promoting energy efficiency and renewable energy in government buildings in a common sense and reasonable manner. For example, it directs the Secretary to consider whether there are significant opportunities for substantial improvements in energy efficiency in determining whether a renovation is major and subject to the standards. Dr. Hogan, will you commit to work closely with the stakeholders throughout the rulemaking process to ensure that the rule is practical, reasonable, and effective?

Dr. HOGAN. Absolutely we will make that commitment.

Mr. WAXMAN. Thank you. Dr. Hogan, in your testimony you referenced the tremendous effectiveness of energy efficiency standards for appliances and equipment. Could you please elaborate on that?

Dr. HOGAN. Sure. So the Department of Energy implements an appliance standards program. We implement them under congressional authorization to do so. I think there is always an interesting conversation around these standards. One of the ways to look at it is we are typically given authority to implement these standards when different states are taking different approaches, which creates a patchwork effect across the country that is very difficult for manufacturers to deal with. That is typically when they go to the Congress and ask for the Department to have such authorities.

Mr. WAXMAN. Dr. Hogan, as I understand, the Department implements minimum energy conservation standards for more than 60 categories of appliances and equipment. As a result of these standards implemented since 1987, energy users are estimated to have saved tens of billions of dollars on their utility bills in 2010. Is that right?

Dr. HOGAN. That is right. These standards that create a minimum level for the products that can be sold in this country are saving tens of billions of dollars.

Mr. WAXMAN. I understand there are at least five proposed or final efficiency standards that have been sitting at OMB for over a year, and I understand that DOE has missed the rulemaking deadlines for another four standards that have not yet gone to OMB. I assume this is correct? Am I right?

Dr. HOGAN. That is in the ballpark, yes.

Mr. WAXMAN. Well, it makes no sense. These standards save money, strengthen our economy, and reduce pollution. I urge the Administration to move forward and get them finalized.

Thank you so much for your——

Dr. HOGAN. Thank you.

Mr. WAXMAN [continuing]. Participation in the hearing. Thank you, Mr. Chairman.

Mr. WHITFIELD. Thank you, Mr. Waxman.

I might just say that in the spirit of all of the above energy policy, many of us would like to get rid of Section 433, because it certainly discriminates against area of energy supply.

At this time, I would like to recognize the gentleman from Louisiana, the vice chairman, Mr. Scalise, for 5 minutes.

Mr. SCALISE. Thank you, Mr. Chairman. I appreciate you being with us, Ms. Hogan, and you know, as the chairman referenced, Section 433—and I think the ranking member of the full committee just was talking about that, too, and the rulemaking process. Can you tell me what kind of concerns you all have heard about these supplemental rules being developed?

Dr. HOGAN. What we hear is stakeholders are looking for a fair amount of flexibility in the implementation of the standards. So some of the questions that have been raised are around the definition of a major renovation, so what actually triggers these significant savings requirements, whether or not you can use renewable energy credits to meet some of these savings targets, and how it is that CHP would be counted. Those are the types of issues that we think we can address through a notice of proposed rule and effectively engage stakeholders in getting to resolution.

Mr. SCALISE. And it is something that concerns a lot of us, you know, just that section in general, you know, and I think we will be looking at it some more.

The Federal Government is the largest user of electricity and fuel in the country, so I would like to know what steps you are taking to actually go throughout federal agencies and achieve real efficiencies and savings in the Federal Government.

Dr. HOGAN. So the Federal Government currently is subject to a number of savings targets, either through congressional action or through executive orders.

Mr. SCALISE. Which ones are actually saving taxpayers money? I am not talking about objectives and goals down the road years from now. How are you saving the tax—I mean, when we came in 2 years ago into the Majority, we said we need to start controlling spending, because 40 cents of every dollar is borrowed money, and we started with ourselves. We actually cut our own budgets here in the House. We cut the budgets for congressional offices, because we felt like you have to put your money where your mouth is. So, you know, as you all are going around telling everybody else to change their lifestyles, what kind of things are you doing within the Federal Government to save taxpayers money in terms of——

Dr. HOGAN. Sure. So take energy, the energy intensity of the Federal Government has been reduced by approximately 15 percent over the last 10 years or more. Also on water savings, we are meeting significant savings targets there as well. Both of those lead to substantial dollar savings across the federal fleet.

Mr. SCALISE. I think a lot of us would say if you just, you know, turned out all the lights over at, you know, some of these agencies that are putting radical regulations in place that are costing us jobs and making families have to pay more for food and for electricity and for gasoline, you would probably not only become more efficient, you would help families and get this economy moving again.

I just throw one suggestion out there as we are talking about efficiency, you know, the President today and every day for the last couple of days has sequesters going around. He has been flying around on Air Force One all around the country, trying to scare people about the effects, many of which are not even accurate on this sequester. I think you could probably be a lot more efficient, you might want to call the White House to tell him, just park Air Force One. I mapped it out. It is only less than 2 miles for the President just to drive right down here to the Capitol and sit down and let us work this thing out instead of flying all around the country, tens of thousands of miles, and using who knows how much fuel. You know, just park Air Force One and go the maybe 2 miles down here and just sit around a table and figure this thing out. But that might be a way to save a lot of energy. I am not sure if you want to pass that on to the White House. It might be a good idea.

With that, I yield back the balance of my time, Mr. Chairman.

Mr. WHITFIELD. Thank you, Mr. Scalise.

At this time, I recognize the gentleman from California, Mr. McNerney, for 5 minutes.

Mr. MCNERNEY. Thank you, Mr. Chairman, and I appreciate your opinion on that, Mr. Scalise.

I thank you, Dr. Hogan, for coming and testifying today, and for your hard work in the Department. I just have a question about rate of return. What—do you have sort of an average rate of return a household might experience by investing in energy efficiency technology? How many years would it take back—to pay back a $5,000 investment in new windows or something like that, if it is just taking out of energy savings?

Dr. HOGAN. Yes, so every home can be a little bit different, but I think there is a fair number of improvements somebody in their home can make that can have a payback of 3, 4, 5, 6, 7 years.

Mr. MCNERNEY. So—and that is not including federal subsidies, or is that including?

Dr. HOGAN. That would be without any type of subsidies. That would just be based on doing insulation, windows, a more efficient furnace, et cetera.

Mr. MCNERNEY. So the homes in lower income areas are going to be less efficient than the new homes in the more affluent areas, so they would have quicker rate of return, perhaps, than the newer homes, so federal help in that would be very effective in terms of reducing energy use and saving people money?

Dr. HOGAN. Yes, I think people use incentives for any number of reasons. One is to help buy down the cost of these improvements, but also, as we know from utility programs around the country, you use some incentives just to even get people's attention, just to help get those improvements moving.

Mr. MCNERNEY. Thank you. I was very thrilled to hear you talk about water savings. You know, I am from California and we have water wars out there, and water savings is a double win, because you are not only saving water, but you are saving energy because so much energy is needed to produce and deliver water. Are there significant programs in place to incentivize western users, particularly in southern California, to save water?

Dr. HOGAN. We can look into that and get back. Certainly not at the federal level, but there is certainly the issues with water in California are being addressed by a number of the California agencies, and I know they are trying to put programs in place very similar to what the energy utilities have been doing for years.

Mr. MCNERNEY. OK, one more area of questioning. Again, I was thrilled to hear you talk about electric vehicles, but I have heard some concern about companies installing equipment that might service all kinds of vehicles. Are you working with companies to address potential concerns of these businesses for installing stations that can accommodate all vehicles? What is the plan in terms of getting this out there in the business world?

Dr. HOGAN. Yes, so we are trying to engage with organizations of all kinds around building out the right infrastructure around alternative vehicles. We have a Clean Cities Program that works with cities around, you know, helping them plan for the right infrastructure and build it out based on sort of what makes sense in their regions, and want to be doing this in as an efficient and effective a way as possible.

Mr. MCNERNEY. So we are moving forward aggressively in that?

Dr. HOGAN. Yes.

Mr. MCNERNEY. And I think the new automobile efficiency standards are going to go a long ways in terms of getting us to use less fuel, and I applaud your efforts on that.

Dr. HOGAN. Thank you.

Mr. MCNERNEY. Thank you. With that, I yield back, Mr. Chairman.

Mr. WHITFIELD. Thank you very much.

At this time, I recognize the gentleman from Texas, Dr. Burgess, for 5 minutes.

Mr. BURGESS. Thank you, Mr. Chairman. I appreciate you having the hearing, appreciate the opportunity to hear from the Department of Energy.

Let me just say for the record, I am a big believer in energy efficiency. I do think that is the low-hanging fruit. I think that is the common ground that where certainly we can meet on many of these issues. Every July, I do an energy efficiency summit in the district back home in Texas. We have had speakers as diversified as David Porter for the Texas Railroad Commission to James Woolsey, the former Director of the CIA. I have tried to construct things in my life around energy efficiency, the home we live in, the hybrid car that I drive. So I am a believer in energy efficiency. I made those decisions based upon what was right for me and my family, not based on anything that the Federal Government told me to do.

But since you are here, let me ask you a question. The number one question everyone in my district is asking is why are gas prices so high right now? Gasoline prices.

Dr. HOGAN. I guess it is based on the cost of production and the cost of moving it through our systems.

Mr. BURGESS. Well, if you are in the Department of Energy, presumably you have these discussions, correct?

Dr. HOGAN. The Department of Energy does have discussions about what we can do in the short term and in the long term to address gas prices. I think in the short term what we can do is really give people tips about how to use the gasoline that they are using as efficiently as possible, and then in the longer term, we can clearly be figuring out how to increase low-cost supply, as well as use alternative fuel vehicles and further development in that space.

Mr. BURGESS. Well, it is of concern that here we are in February, and back home in Texas right before I came up here, I filled up the hybrid with gasoline that cost $3.70 a gallon in Texas in February. That means in New York, after Memorial Day, they will be closing in on $5 a gallon gasoline. So I think this is a matter of some importance, and since the Department of Energy is involved in this, and this may have a direct effect on our economy generally. No one can forget that just before the meltdown that occurred in 2008, our gasoline prices and diesel prices were sky high, and they certainly had an effect on the economy, so I would think this would be something that you would be discussing internally and maybe even some interagency discussions. Do you ever pick up the phone and call the people at the Commodities Futures Trading Commission?

Dr. HOGAN. We do engage in conversations across the Federal Government, and we, of course, are very concerned about these prices and are doing what we can do at this point, yes.

Mr. BURGESS. What does Mr. Ginsler at CFTC tell you that he is doing that may dovetail with what you are doing with the energy efficiency in the Department of Energy?

Dr. HOGAN. We can give you a more detailed explanation, if you would like, on what the Federal Government is doing in this——

Mr. BURGESS. I would appreciate that very much, and again, I think that would be of general interest to people who are maybe watching this on C–SPAN.

Now, in answer to—or actually, Mr. Waxman made a point about that he wanted to see things that were common sense directions and applied in a reasonable manner, and I think he was talking about the Federal Energy Management Program. So you have the jurisdiction of federal buildings under your control, the energy efficiency of federal buildings? Is that correct?

Dr. HOGAN. That is correct.

Mr. BURGESS. Is this building under your control?

Dr. HOGAN. I believe this is under the Office of the Architect of the Capitol.

Mr. BURGESS. But you know, I will just say from my observation, having been in the congressional office buildings now for a few years, since 2007, 2008. Someone came in and changed all my light bulbs to CFLs. Nobody told me they were going to do it. Nobody warned me not to break one over my head one night, but there I was. I had CFLs in all the offices. Well, that is great. We are perhaps saving some energy by doing that, but no one has ever done, as far as I can tell, an energy audit of the Rayburn Building and discussed the effect of having single-pane glass on all of the windows. I have an office that faces west. In the summertime, it gets beastly hot. Is this something that your office might be interested in?

Dr. HOGAN. We are happy to have a conversation about how to do an audit of the Capitol buildings——

Mr. BURGESS. Well, I am just shocked that the architect of the Capitol has not reached to you, as part of your mission is for the energy efficiency of federal buildings, and this is a big federal building that consumes a lot of energy. You changed all the light bulbs, but maybe there were other things you should have been looking at as well.

Dr. HOGAN. Well I think if we engage the Office of the Architect, we will see that they are doing a lot more around the Capitol buildings, and probably just started with, as we were saying, the low-hanging fruit, and certainly doing those audits is a cornerstone of what we are doing across the entire federal family.

Mr. BURGESS. So can I assume that there are conversations between your office and the Office of the Architect of the Capitol as far as the energy efficiency of—the energy consumption of federal buildings, at least on the House side?

Dr. HOGAN. We have been engaged with the Office of the Architect in their plans, yes.

Mr. WHITFIELD. Gentleman's time is expired.

Mr. BURGESS. Well, Mr. Chairman, maybe if you could share some of that information with our office as well. We would appreciate that.

Mr. WHITFIELD. OK.

Mr. BURGESS. Thank you, and I will yield back.

Mr. WHITFIELD. At this time, I recognize the gentleman from New York, Mr. Tonko, for 5 minutes.

Mr. TONKO. Thank you, Mr. Chair.

Dr. Hogan, welcome, and I have a couple of questions about combined heat and power, and the President's 2012 Executive Order on industrial energy efficiency.

What role do you see for the—is the federal procurement going to play in achieving the President's goals of deploying more combined heat and power systems?

Dr. HOGAN. So certainly as the largest energy user and as a big procurer of equipment, the Federal Government has a big role to play, and we are currently trying to put together a broader strategy on what that role could look like. Though what we are doing in the immediate term is exploring extending a pilot program that we have underway in the ESPC space. We have been standing up a pilot program called ENABLE to allow the ESCOs to engage in the smaller buildings that are within the federal family that typically get overlooked, and we are looking to expand that ENABLE pilot to encourage combined heat and power or allow investments in a performance contracting way.

Mr. TONKO. Thank you, and as part of the effort to identify policy or regulatory barriers to investing in CHP, the Executive Order states that federal agencies will convene stakeholders to solicit their ideas and input. Is DOE involved in that list of agencies?

Dr. HOGAN. Yes, if I am thinking about the same. So the Executive Order encouraged us to go out and engage any number of stakeholders around how to advance CHP. We are having a set of regional dialogues on this topic, the next one in a couple of weeks in Baltimore, around the things that we can do, and then we are also engaging in a report to Congress that was part of the energy bill passed this past December to do a much more detailed analysis around the barriers in the way of CHP and the things we can do to remove them.

Mr. TONKO. I know that back in—I think it was '98, a roadmap was developed to take the—to double CHP from, what was it, 46 gigawatts to 92, in that neighborhood——

Dr. HOGAN. Yes.

Mr. TONKO [continuing]. And they somewhat met that goal, that target deadline. Where do you believe the best opportunities exist today for deployment of CHP?

Dr. HOGAN. I think we are at a very interesting point right now for CHP in that there are many, many, many opportunities, from large heat process type industries to smaller industries and into the residential and commercial sectors. I think you will hear from another panel member today on this topic, but I think also as we look at the post-Sandy period of time, there is a lot more interest in things that offer enhanced energy security linked to stave off the aftermath of these storms.

Mr. TONKO. And in the midst of all of that, do you see a particular industrial sector that might be targeted for best retrofitting to CHP?

Dr. HOGAN. So the industrial sectors that make the greatest sense are ones that have some amount of heat load, so again, that can be pretty broad.

Mr. TONKO. In the efforts of the State of the Union for the race to the top for energy efficiency, how is that going to be developed? I am asking that from my perspective in the State of New York, which has been rather aggressive about doing energy efficiency. Do we get impacted for being a progressive State in regard to a baseline that might be well in advance of other States? How would we fare in that whole race to the top?

Dr. HOGAN. So we will be happy to engage stakeholders in a conversation about how this program will be designed. At this point, the next point when there will be more information about this program will be in the rollout of the President's budget, and then after that we will be happy to engage with you more directly.

Mr. TONKO. I would just indicate a concern there that if you have done great work, you ought to be rewarded for that and continue to do more, and the consumers should not be held back or impacted—negatively impacted because of it.

I am just about out of time. I was going to go into weatherization, but then let me just make a pitch for weatherization activities. Even though the stimulus did a great deal of investment to the good, I believe there is a lot of unfinished business and would strongly encourage that opportunity. Thank you very much.

Mr. WHITFIELD. At this time, I recognize the gentleman from Nebraska, Mr. Terry, for 5 minutes.

Mr. TERRY. Thank you, Mr. Chairman, and thank you for being here today.

What is the biggest barrier to an increased use of the energy savings performance contracts by the Federal Government? The barriers that are of concern?

Dr. HOGAN. I think one of the barriers is really just getting over the hurdle of having many different agencies go down this path. It takes a fair amount of knowledge to go and do that, and that is what the Federal Energy Management Program is set up to do. But just because we offer those services doesn't mean people necessarily want them. And again, it is just because everybody is doing so much in their day-to-day jobs. And I think that is one of the barriers that the President's Performance Contracting Challenge is really helping overcome. Challenging the agencies to commit to $2 billion with energy savings performance contracting means each agency has its own goal and each agency is working through a set of projects to meet those goals. So I think we will have largely addressed that particular barrier by December 2013.

Mr. TERRY. All right. On weatherization, you may have read some stories from my district where there were several million dollars issued for weatherization in the city, and it was something like 14 or 15 homes that were actually provided the services. But yet, the money is gone. And so weatherization, at least in our area, is not a program that is held in high esteem. It is an example of the waste and fraud.

So could you point out the internal DOE structure to oversee the weatherization program and to ensure that 80 percent of it, the dollars that are provided, aren't being used for administrative purposes?

Dr. HOGAN. Sure. First let me say that issues with weatherization really were the exception and not the rule, and there is a very comprehensive set of quality assurance procedures in place, on top of the fact that only a certain portion of the dollars can be used for administrative purposes.

Mr. TERRY. And what percentage is that?

Dr. HOGAN. I think it is about 20 percent.

Mr. TERRY. Twenty percent is allowed for administrative purposes——

Dr. HOGAN. In all.

Mr. TERRY [continuing]. And then the rest has to——

Dr. HOGAN. Be put to work to improve low-income family homes. So yes.

Mr. TERRY. And so when—how would—there were several stories in our local paper outing this scam. Do those rise up to—in DOE, do people catch those so you can begin an investigation, and how is an investigation into that type of waste and fraud—well, what triggers an investigation? Can you investigate that?

Dr. HOGAN. Absolutely we can investigate that. Any time we hear of an issue, it is investigated and we do everything in our power to correct it and recoup any dollars that may have been misused.

Mr. TERRY. Will you check for me and get back to me with what you have done on the Omaha situation with the waste and fraud in that program?

Dr. HOGAN. We would be happy to do that.

Mr. TERRY. Thank you. Yield back.

Mr. WHITFIELD. Thank you, Mr. Terry.

At this time, I recognize the gentlelady from California, Ms. Matsui, for 5 minutes.

Ms. MATSUI. Thank you very much, Mr. Chairman. Thank you, Dr. Hogan, for being here.

Energy efficiency is a key component for shifting our Nation towards a clean energy economy. We have made great progress in changing the way we use and conserve energy, but we need to do much more. I believe one area where we can make a significant impact is by providing sound financing mechanisms to individuals eager to make energy efficiency upgrades to their home. In fact, last fall in my district of Sacramento, we launched a revamped public-private partnership born out of the Recovery Act funds to encourage residential energy upgrades.

The demand for residential energy retrofits is strong. Property Assessed Clean Energy, or PACE programs, are one approach to financing home retrofits. With PACE, homeowners can finance energy efficiency improvements without an upfront cost through a voluntary assessment on their property. Unfortunately, PACE programs have faced some major hurdles.

Dr. Hogan, does DOE support innovative financing mechanisms that would help homeowners make these important upgrades?

Dr. HOGAN. Yes, through our work at the Department of Energy, we are very supportive of innovative financing mechanisms and doing everything that we can to help pull out the lessons learned and share them with others, as well as working to help States and local governments continue to leverage and improve the effectiveness of the revolving loan funds that they were able to stand up with Recovery Act dollars.

Ms. MATSUI. OK, now is there a way to get PACE programs back on track through administrative means? Are you or the White House still engaging FHFA to restore this program?

Dr. HOGAN. I think what we have all heard from FHA is FHA would like more data to better understand how these loans perform, and so the Department of Energy is actively engaged in working with others to try and pull together the type of data that the finance industry needs to understand this loan performance.

Ms. MATSUI. So you are looking at probably similar approaches to facilitate this growing demand?

Dr. HOGAN. Exactly.

Ms. MATSUI. OK, great.

Dr. Hogan, some have suggested that we don't need government policies to boost energy efficiency. They say that if customers really wanted energy efficiency, the market will supply it. But my understanding is that there are a lot of market failures in this area. The classic example is the situation where the landlord has no incentive to weatherize an apartment because a tenant pays the utility bills. Dr. Hogan, could you please discuss some of the market failures that allow energy waste to persist, even when it could be cost effective to deploy efficiency measures, and are these market failures significant?

Dr. HOGAN. I think we can see from the opportunity that we all talk about over and over with energy efficiency that there is a list of market barriers that hinder people from making what might be the economically rational choice, and that can just be that some of the more efficient products do cost a little bit more up front, even if they have a very attractive payback associated with them. And some of it is just hard to get the information so that you know what that payback would look like. So those are the types of things around which policies can be very helpful in helping people get these savings.

Ms. MATSUI. Could you explain further on that what the policies might be?

Dr. HOGAN. Better information and clearly, the reason we do appliance standards as well is because we can help consumers get the savings that are there from the more efficient products whenever there is a cost effective opportunity to do so.

Ms. MATSUI. OK. I just also want to follow up on what my colleague from New York has talked about, about the race to the top for efficiency. You know, California has been involved in this a long time, since the '70s with the grandfather of energy efficiency, Art Rosenfeld, and so we don't want to be, in a sense, starting from baseline, which is artificial in a sense, so we would love to have that discussion with you.

I have no further questions, so I yield the balance of my time.

Mr. WHITFIELD. Thank you very much. At this time, I recognize the gentleman from Louisiana, Dr. Cassidy, for 5 minutes.

Mr. CASSIDY. I am going to defer to my gentleman—my colleague from Texas for a turn, please.

Mr. WHITFIELD. Gentleman from Texas is recognized.

Mr. OLSON. I than the chair, and good morning, Dr. Hogan. Welcome. I appreciate your time and expertise.

One of the instances where energy is lost, regardless of the initial source, is in transmission. The wires we use are largely copper. They lose significant amounts of energy as they travel from place to place. Many people may not realize this because Texas is the number one producer of oil and gas, but we are the number one producer of wind in America. The problem with our wind is it is generated in the panhandle in western Texas. We need it in eastern Texas, Houston, Dallas, Ft. Worth, San Antonio, Austin—in some cases, 700 miles away. But University of Houston is trying to change that. Having recently been named a Tier I research university and being led by an innovative and hands-on chancellor, Dr. Randy Coture, U of H has created an energy research park. One project that they are doing at the University of Houston energy research park is working on superconducting wires that are up to 20 percent more efficient than current wires. This is not just an academic project. U of H intends to prove this works by rewiring their main campus with these superconducting wires. In true Texas tradition, they are going all in, putting their future—and more importantly, the future of over 300,000 students—on the line. Are you aware of this project being developed at the University of Houston energy research park?

Dr. HOGAN. I personally am not, but it certainly does sound very exciting.

Mr. OLSON. Well since you are not familiar with it, I would like to offer you a chance to come down and see it. I mean, if you have got some time, we go right here to Reagan International Airport, have a direct shot on United Airlines to Intercontinental Airport down in Houston. I would love to take you down there and see the energy research park.

Dr. HOGAN. We would be very interested.

Mr. OLSON. Earlier today I had a meeting with the people from ABS, which is the American Bureau of Shipping. One energy efficiency they are looking at is natural gas, in fact, liquid natural gas for transports of maritime vehicles. In fact, Nasco, the shipbuilder, is actually building their first project where one of the big ships will be powered by LNG, going to the Caribbean area and that part of the country. What do you think about that issue for energy efficiency, natural gas as opposed to traditional fossil fuels?

Dr. HOGAN. Certainly we can have a conversation about that as well.

Mr. OLSON. OK. Well one further question for you, ma'am. I mean, again, our biggest challenge right now—one thing we have in west Texas as well, getting to the Defense Department, they are being very innovative with their energy resources, their needs. Fort Bliss in El Paso, the largest base—the largest geographic base in America, is actually doing great things with solar because they have the sun out there. In fact, they are hoping to be actually a net exporter some time, getting energy off the base and helping local communities. I mean, that is one example of what the Federal Government can do, but again, my biggest concern, what I am hearing from back home, is let the market decide what the technology is. Don't enforce some sort of technology from—so I ask your assistance going forward. Listen to the market and help us get this superconducting technology going on. Come on down and see it. I would really appreciate it.

Dr. HOGAN. Terrific.

Mr. OLSON. Thank you. Yield back the balance of my time.

Mr. WHITFIELD. At this time, I recognize the gentlelady from Florida, Ms. Castor, for 5 minutes.

Ms. CASTOR. Thank you, Mr. Chairman, and welcome. Secretary Hogan. Thank you for meeting with me a couple of months ago to advise on all the great things that are going on with energy efficiency. I think there is so much more to do all across the country for families and businesses, so I encourage you to keep at it, and we can unleash the powers of American ingenuity and really empower families and businesses, and save money at the same time.

I also wanted to thank you for your attention to the historic investments under weatherization. Under the Recovery Act, I think you said we were able to weatherize one million homes. And let me tell you what that means in my area, in the Tampa Bay area in Florida. That means that thousands of the folks that I represent are saving money on their energy bills, while at the same time, we created a lot of jobs. We created a lot of jobs in a time when the unemployment rate was really hurting families, and the legacy it has left is very important. Now our community colleges, with that investment, have ongoing weatherization training initiatives. They are still creating jobs, even though the money, the investments from the Recovery Act have tapered off. For families that struggle to get by, if they are able to save a few hundred dollars or a thousand dollars a year on their electric bill, that is very meaningful to them. That means they can do better at the grocery store, they can do better with other bills that come in. So thank you for your attention to that.

Is all of the investments under the Recovery Act for weatherization, is that all invested now, or are States across the country still rolling out any of those monies?

Dr. HOGAN. The vast majority of the Recovery Act dollars for weatherization is now spent, so yes, it is——

Ms. CASTOR. And what is the status of ongoing weatherization efforts?

Dr. HOGAN. That is a good question. Right now, given the continuing resolution that we are now under, we are working hard to give the States the information they need to go into their next program. It is a little bit complicated because of the continuing resolution which continues the weatherization budget at a level well below where it had been historically——

Ms. CASTOR. It is just such a huge payback for the federal dollars that we can invest back home in our local communities that save our constituents money, so that money comes back to them, then we create jobs, and we are still kind of stuck at this 7.9 unemployment rate, and it is just difficult to watch the Congress self-inflict a wound and set us back at a time when the economy is getting better and I see great improvements and people are hiring.

So we—that is our responsibility here, and I encourage my colleagues to think about that as these indiscriminate across-the-board cuts—this is an area that we should continue to invest in, because it has paid such great dividends across the country.

And for my colleagues that worry about gas prices, I have to say, we are fortunate to be living through a time when we have made such progress in fuel economy for our vehicles. You know, I have a member of the family that bought—is leasing one of those electric vehicles. Since October, he has not visited a gas station. He has not purchased gas. I know my friends from Louisiana and the gas producing areas, they probably don't like that, but you know how much money that is saving and how much that is saving families across the country? This is remarkable progress. It is saving consumers money. If you can buy a fuel-efficient vehicle, on average, that means that $1,700 back in the pocket of consumers where they can spend it on their families or their small businesses. It helps with climate change because the carbon dioxide from burning gasoline and diesel contributes to the—to global warming and changes in the climate. It is reducing our oil dependence costs. Dependence on oil makes us vulnerable to oil market manipulation and price shocks. It increases energy sustainability. Oil is a non-renewable resource, and we cannot sustain our current rate of use indefinitely. So using it wisely and conserving is, frankly, just smart.

Looking ahead, what are the challenges you see with fuel economy and lengthening the life of the batteries of these vehicles, and what are you optimistic about?

Dr. HOGAN. I think we are very optimistic about what we can do across a whole set of vehicle technologies. Certainly I already spoke to the new research effort around electric vehicles and what we can do there to make them much more cost competitive over the next 10 years, as well as convenient from the standpoint of the consumer, and then, of course, make available something along the lines of a dollar per gallon gasoline through electricity.

I think we are also interested in what we can do with advanced combustion. We are doing a lot more there as well, and we think we will be very well-positioned to be working with U.S. auto manufacturers to meet the CAFE AE1 standards as they continue to ramp up in the coming years.

Mr. WHITFIELD. The gentlelady's time is expired.

At this time, I recognize the gentleman from Louisiana—oh, Mr. McKinley from West Virginia for 5 minutes.

Mr. MCKINLEY. Thank you, Mr. Chairman, and thank you for your patience, Dr. Hogan.

Let us just start by saying I am very supportive of all the initiatives on energy efficiency, and as one of just two engineers in Congress, it is a delight to be able to try to work and improve that a little further.

But I have got two questions for you. The GAO came out 2 years ago with a report that said there are 11 agencies handling green buildings or 11 agencies offering 94 separate initiatives, and they said that—by their own report, they are saying that we can benefit with more collaboration. Can you share with us briefly what you have accomplished over the last 2 years in either combining them, because with budget constraints right now, wouldn't it make more sense instead of having 11 agencies handling green buildings to just a handful or fewer? Have you accomplished any of that?

Dr. HOGAN. Yes, we are doing a lot of coordination across the federal agencies——

Mr. MCKINLEY. Different than what you were prior to 2 years ago?

Dr. HOGAN. We are. I think we are getting more and more efficient as we go forward. I would also say, just going back to that GAO study, when you just count things it makes it look like there may be more duplication overlap than there may actually be, because I oversee the Federal Energy Management Program, which has an important role in engaging with each of the agencies with their senior sustainability officials around their work.

Mr. MCKINLEY. Could you get back to me, please, with some of the—what you have done to help consolidate, so that we can use the money—instead of doing it administratively, wouldn't it make more sense if we could pass that on to the consumers in some fashion by reducing those costs at the Federal Government level?

The second issue I have is a bit of a paradox. Someone at my former firm—we designed a lot of schools and a lot of public buildings, and we knew that often what the cost was for operation of an older building, because they didn't meet all the new standards, the air quality and/or air quality standards. There was a cost that you can assume in the operation, but now under the new standards, new buildings are typically—for operational costs are increasing in costs primarily because of the standards that are set for fresh air to come into a classroom where you have to have four to twelve air changes per minute—per hour, as compared to where it had been before where we had—maybe sometimes where you had an individual unit, they would close the damper and there was no fresh air coming into Johnny's classroom. So now we are introducing that. So we have a paradox. We are trying to improve our air quality and efficiency, but we are increasing costs to the consumer. How do you—how are you dealing with that?

Dr. HOGAN. We certainly understand that issue and we are working to make sure that we are looking holistically at the costs for these buildings. Certainly we want to be promoting technology that meets our national objectives, but in a way that also keeps the costs in a good space for the people that have to pay those bills, and really offer the savings that are there to be gotten. So we are looking at the O&M costs.

Mr. MCKINLEY. You do recognize, then, that the new standards—and I subscribe to them. I am in agreement with them because they are improving our indoor air quality, but they are raising the cost of operation.

Dr. HOGAN. When you need mechanical ventilation there is a cost there, but I think when you look across everything that is going on in these buildings, you see that that can be done in a very low cost way. So you are delivering a much more lowe-cost building for people to be living in.

Mr. MCKINLEY. Do you see—with these standards, do you accept—I guess I am building back off that same premise, because I am glad we are providing fresher air into that, but do you acknowledge that perhaps the old buildings—in some of these buildings, the indoor air quality wasn't as good as it is today by what we are doing, by bringing in fresh air?

Dr. HOGAN. I think that is a complicated question that requires a longer conversation.

Mr. MCKINLEY. Stop by. I am over in Cannon. Let us see if we can't follow up with that, because I think we have a dilemma here in Congress about indoor air quality versus outdoor air quality, and I would like to make sure we have a good discussion about that so when those asthma attacks that people refer to often perhaps are being caused by our indoor air quality and the fact that we are not adhering to the various codes and standards that have been set forth. So if you could please stop, I would like to do that very much.

Thank you very much. I yield back my time.

Mr. WHITFIELD. Gentleman's time is expired.

Mr. Griffith, do you have any questions? Mr. Gardner? Dr. Cassidy? Dr. Cassidy is recognized for 5 minutes.

Mr. CASSIDY. Good afternoon.

Young families want the most square footage they can get in the place with the best school district. For them to invest in energy saving things which have only a payoff over 10 years really defeats that purpose, and so the way they are trying to scrape money together, how can I get the best square footage in the best school district if I invest $3,000 in which the payoff is only over 10 years, that is that many fewer square feet I can purchase. Does that make sense? You look quizzical, so I am not sure I am being clear.

Dr. HOGAN. I understand what you are saying.

Mr. CASSIDY. So really if we are talking about market mechanisms, it seems like much of what we discuss almost is by fiat, almost by definition, because really under the current way we finance mortgages, that family, again, has to make that tradeoff, less square footage or not as good a school district in order to have some of these things which we all agree would be wise for energy efficiency. Again, does that make sense?

Dr. HOGAN. Yes, I think the way we have been looking at some of these home purchases is through the total cost of ownership, so if you look at the cost of a mortgage plus the cost of the energy bill——

Mr. CASSIDY. Now that, though, right now—we have investigated this. The cost of energy bill is not currently used by mortgage underwriters in terms of discerning someone's ability to get a mortgage. So when you look at it, is that really impacting that young family with three kids trying to get the better home sort of thing?

Dr. HOGAN. Yes, there is an issue as to where that young family is and how large a mortgage they can get and whether they are at that maximum level of a mortgage. But I think what we have seen in recent years is that hasn't been the biggest barrier.

Mr. CASSIDY. Now, I will tell you, when I saw—this came to mind last year because of Senators Isaacson and Bennet put forward their SAVE Act, we have been thinking the same concept, but when I spoke to bankers, they really do not include the energy cost in a mortgage, or somebody's suitability. Frankly, we can't talk about market mechanisms until we address this if we are thinking of that young family. Would you concede that, and if so, how do we proceed?

Dr. HOGAN. Well I think we can proceed in a number of ways. One is let us continue to have the conversation on the role of energy bills, because certainly a lower energy bill does give a household more money to spend——

Mr. CASSIDY. But again, if the payoff is 10 years for that energy saving intervention, really, that family doesn't look at that 10-year savings. Does that make sense?

Dr. HOGAN. You mean because it is——

Mr. CASSIDY. They are on a cash flow basis. It is not as if they have got a lot of money in the bank that they can invest and see the payoff over 10 years. They are just now meeting their bills, and anything that pays off over 10 years is probably not uppermost in their mind.

Dr. HOGAN. There is the standpoint from the family. There is the standpoint from the banker, right, but from the standpoint of the family, if you have a more efficient home and you had to pay a little bit extra and it is rolled into your mortgage, as an example——

Mr. CASSIDY. Yes, but that doesn't occur right now.

Dr. HOGAN. But it can. Those mortgages are available. Energy efficient mortgages are available. Part of it is an access and awareness issue as opposed to——

Mr. CASSIDY. I would love to see that, because when I spoke to the bankers—we had some people come in because we were pursuing this—and the bankers said listen, we have a proprietary mechanism by which we determine if somebody is eligible—it is proprietary to our bank, not industry-wide, and we do not include this and we are not quite sure how.

Dr. HOGAN. OK.

Mr. CASSIDY. So if you have those, we would love it if you could see that.

Do you have awareness of Isaacson and Bennet's SAVE Act?

Dr. HOGAN. I do.

Mr. CASSIDY. What are your thoughts about that?

Dr. HOGAN. I think in general we are very supportive of the goals of the proposals that can help motivate home improvements.

Mr. CASSIDY. So let me just switch subjects. When I speak to home builders, they look at the regulations put out by DOE and they feel that sometimes something that is proscribed for one place wouldn't apply in another. And little things, for example, in my State, in Louisiana, if you plant an oak tree on the west or south side, frankly, you will get a heck of a lot of benefit, but there is no kind of calculation in terms of that, in terms of the overall cost efficiency of a home. Their suggestion was that you bring in stakeholders coming up with metrics so that someone could pick and choose, saying listen, insulation really works well here. It is worth bang for the buck, and this other intervention cost me a heck of a lot of money, but I am not going to get a payoff for 20 years. Probably I will have sold the home by then. Any possibility of that sort of thing?

Dr. HOGAN. I think there is a robust conversation ongoing through the codes organizations about a more performance-based path to get to an outcome in the least costly way. I think people are always interested——

Mr. CASSIDY. So they feel as if your DOE regulations, though, are not outcomes based but rather they are sort of you put in this amount of foam and this amount of this, and their criticism—and I have learned to say what I have been told, not what I know, so Dr. Hogan, you may say oh my gosh, you are totally wrong on this, but their criticism is that your standards are less performance-based and more "you shall put in 6 inches of foam" sort of thing.

Dr. HOGAN. And both pathways are there. There are performance-based provisions in the codes. I wouldn't quite call them our codes. These are codes that are created by model code authorities and the Department of Energy's role has been to do an energy savings determination relative to those codes to show that they do offer meaningful savings over the prior code, so they are a stakeholder-driven process to which the Department of Energy will also bring technical information to the table for consideration, which is why there is an ongoing venue through which we can have all of these conversations.

Mr. CASSIDY. Thank you. Thank you, and I yield back.

Mr. WHITFIELD. Gentleman's time is expired.

At this time, I am going to recognize the gentleman from New Hampshire as a valuable member of the Energy and Commerce Committee. He doesn't happen to serve on the Energy and Power Subcommittee, and so he has waited patiently until the end, and now he is recognized for 5 minutes for questions.

Mr. WELCH. Mr. Chairman, I thank you very much, Mr. Ranking Member. By the way, having this hearing on efficiency this early in our congressional term is tremendous, so I want to thank you and I think all of do.

In listening to this and talking to my colleagues, a couple of things. Number one, there does seem to be strong bipartisan cooperation and leadership on efficiency, and then second, there is really three questions that this committee has got to sort through, I think. Number one, what can the government do on its own. Congressman Gardner and I are really focused on these energy saving performance contracts, and I want to come back to this, but that is completely within the ability of government on its own to do useful things to save the taxpayer money, and also make a contribution to cleaning up our environment.

Second, there is a question of what can private citizens and companies do on their own? And I know Congressman Burgess has been very much—on his own personal situation, very much focused on energy efficiency and has some skepticism about steps that government takes that are either unnecessary or get in the way. Those are fair questions, and I hope our committee will ask those so that it ends up that we do is helpful and doesn't get in the way of what private sector folks can do on their own.

But then third, there are areas where it is possible for the private sector and the public sector to cooperate and then leverage the partnership to be successful. Congressman McKinley and I are working on efforts to try to provide incentives to homeowners to be able to do things that otherwise they would not be able to do.

So this is really just a plea to some extent to our committee that even though there will be a lot of legitimate questions raised on a practical level about what is the government role, what is the private role, what is the partnership role, I hope we will sort through those questions to have as the outcome, Mr. Chairman, productive steps that will allow the taxpayer and a company and the individual to save money. And this initial hearing is really helping us on our way.

I do want to talk to you about the energy saving performance contracts that I mentioned Mr. Gardner and I are really quite focused on. The President had a goal of $2 billion. I mean, what is better than being able to get a company to sign up and be paid essentially by sharing in the savings? How is that coming along, and is it possible, if this is successful, that reports I hear, that there could be up to $20 billion in savings that we could expand this effort?

Dr. HOGAN. Yes, so this was announced a little over a year ago, $2 billion, and then each agency took on a goal that adds up to that $2 billion, and the agencies are moving forward to put those projects in place and sitting here today, we are on track to meet that $2 billion savings goal by December 2013, which indeed is very exciting, and I think that will allow the agencies to step back and work with the White House to hopefully come up with a phase two to this effort, but it is probably a little premature to say what that would look like.

Mr. WELCH. And how about the utility performance contracts, the private sector efforts by our utility companies?

Dr. HOGAN. So this challenge by the President included both ESCOs as well as the utility energy savings contracts, and those are in this mix as well.

Mr. WELCH. OK. Dr. Cassidy has left, but I was listening very carefully to his concern about performance-based approach. Vermont does have—I think we are the only State that has an energy savings utility, and it is because there has been a sense in Vermont that the best—the cheapest electricity and the—is the unit of electricity that we don't utilize. But the performance-based approach does seem to make an awful lot of sense to the Vermont electricity efficiency utility. How about to you?

Dr. HOGAN. So I think performance-based approaches really do make sense for all the reasons that people were raising earlier. You are not trying to pick a technology, you are trying to get to an outcome. So I think conceptually it really does make sense.

I think the flip side of it is when builders are building a home, a lot of them say we just want to know what to do in this region that is going to meet that performance-based approach. They don't want to be doing detailed——

Mr. WELCH. So you would be glad to work with the committee or folks like Dr. Cassidy to focus on that performance-based outcome?

Dr. HOGAN. Yes.

Mr. WELCH. OK, thank you.

Thank you very much, Mr. Chairman. I yield back.

Mr. WHITFIELD. Peter, I knew you were from Vermont. I am sorry, I said New Hampshire.

Mr. WELCH. Well, that is OK, but——

Mr. WHITFIELD. We are glad you are here.

Mr. WELCH. Thank you. It is good to be here.

Mr. WHITFIELD. Well, that concludes the testimony of Mrs. Hogan and questions for her, so Dr. Hogan, thank you so much for being with us today. We look forward to working with you as we continue forward.

At this time, I would like to call up the third and final panel. On the third panel, we have Mr. Kevin Kosisko, who is Vice President Service, North America ABB, and he is testifying on behalf of the National Electrical Manufacturers Association and the Industry Energy Efficiency Coalition. We have Ms. Britta MacIntosh, who is Vice President of Business Development, NORESCO, who is testifying on behalf of the Federal Performance Contracting Coalition.

We have Mr. James Crouse, Executive Vice President of Sales and Marketing, Capstone Turbine Corporation, who is testifying on behalf of the U.S. Combined Heat and Power Association. We have Ms. Ellen Burt, Senior VP and Chief Customer Officer, Pacific Gas and Electric Company. We have Mr. Neal Elliott, Associate Director for Research, American Council for Energy Efficient Economy, and we have Mr. Ted Gayer, Co-Director, Economic Studies and Joseph Pechman Senior Fellow at the Brookings Institution.

So I would like to welcome all of the members of this panel. Thank you for your patience, and thanks for agreeing to join us today to give us your views, thoughts, and expertise on this important subject. As you know, each one of you will be given 5 minutes for your opening statement, and I would remind you to just be sure that your microphone is on. You will notice a couple of boxes on the table in which—when it is green, it means talk. When it is red, it means stop, but we frequently go over, so—but anyway, welcome and we will begin with you, Mr. Kosisko.

Mr. KOSISKO. Kosisko.

Mr. WHITFIELD. Kosisko. We will begin with you, and you are recognized for 5 minutes.

STATEMENTS OF KEVIN C. KOSISKO, VICE PRESIDENT SERVICE, NORTH AMERICA, ABB, INC., ON BEHALF OF NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION AND INDUSTRIAL ENERGY EFFICIENCY COALITION; BRITTA MACINTOSH, VICE PRESIDENT, BUSINESS DEVELOPMENT, NORESCO, ON BEHALF OF FEDERAL PERFORMANCE CONTRACTING COALITION; JAMES CROUSE, EXECUTIVE VICE PRESIDENT OF SALES AND MARKETING, CAPSTONE TURBINE CORPORATION, ON BEHALF OF U.S. COMBINED HEAT AND POWER ASSOCIATION; HELEN A. BURT, SENIOR VICE PRESIDENT AND CHIEF CUSTOMER OFFICER, PACIFIC GAS AND ELECTRIC COMPANY; R. NEAL ELLIOTT, ASSOCIATE DIRECTOR OF RESEARCH, AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY; AND TED GAYER, CO–DIRECTOR, ECONOMIC STUDIES AND JOSEPH A. PECHMAN SENIOR FELLOW, THE BROOKINGS INSTITUTE

STATEMENT OF KEVIN C. KOSISKO

Mr. KOSISKO. Chairman Whitfield, Ranking Member Rush, and members of the subcommittee. Thank you for allowing me to testify on the successes and opportunities for energy efficiency in the industrial sector.

I am Kevin Kosisko, Vice President of Services for ABB in North America. I oversee services for asset management, process safety and industrial energy efficiency, as well as maintenance operations for ABB in the U.S., Canada and Mexico.

By way of background, ABB is a Fortune 500 producer of power and automation products and services. We employ 147,000 people in over 100 countries, providing energy efficient solutions for our industrial, utility, and government customers.

I am honored to be here representing the National Electrical Manufacturers Association (NEMA) and the Industrial Energy Efficiency Coalition (IEEC).

NEMA is the trade association of electrical equipment and medical imaging manufacturers. Its member companies produce everything from power transmission and distribution equipment to lighting systems, factory automation and controls and medical diagnostic imaging systems.

The IEEC is a coalition of six of the largest global industrial automation and control system companies. Those companies are Eaton Corporation, GE, Rockwell Automation, Schneider Electric, and Siemens, in addition to ABB. We are technology providers that industry uses to make their processes more energy efficient, reduce costs and increase competitiveness.

ABB and IEEC believe that energy efficiency is the cheapest, cleanest alternative fuel. It drives competition and industrial success, and the good news is that there are proven, available technologies that are already having an impact. My written statement offers examples of energy efficiency successes and case studies from each member of the IEEC. Yet together, our examples barely touch the breadth of current deployments and future possibilities.

A recent survey of manufacturing executives demonstrates their understanding of the importance of energy efficiency and the impediments to its use. Executives report basing their energy efficiency investment decisions on cost benefit analyses and the price of energy far more than other considerations. Regulatory compliance was a distant third. Yet fewer than 40 percent of those surveyed had invested in efficiency in the past 3 years. In the U.S., the situation is even starker with only 21 percent having invested in equipment to improve energy use in the last 3 years. The majority of those were in highly energy-intensive manufacturing industries such as mining, metals, chemical production, and petroleum refining. This gap between awareness and action was attributed to three key factors. Nearly half of the respondents cited the lack of clear business case as a reason for inaction. Twenty-eight percent identified inadequate funding or financing as a critical barrier, and a lack of adequate information on efficiency options was reported as the third greatest obstacle by 27 percent of those executives surveyed.

These responses point to the need for further education, benchmarking, and identification of available technologies and/or application, and to the importance of access to funding or financing to enable investments.

Encouraging the efficiency enhancements needed to ensure our competitiveness will require both industry's and government's involvement. We must supply the missing information and provide the necessary funding. At ABB and the IEEC, we are striving to do just that. We work continually to educate manufacturers on available technologies and industrial best practices. We train engineers, assessors, and finance teams to provide accurate, reliable energy audits, and estimates on return on investment. We provide directly or assist in securing necessary financing, and we invest in ongoing research and development to continue innovation.

In the areas of industrial energy efficiency, government has historically focused on reducing consumption in energy-intensive industries. While these industries represent a major portion of potential energy savings, the public sector has the ability to expand the visibility of conservation opportunities to industrial players both large and small. Hearings like this, well-informed Department of Energy and Environmental Protection Agency activities, and federal support for research, audit, and deployment programs all raise awareness of the availability and value of energy saving technologies. This is particularly true for the small and mid-sized companies with less knowledge of or expertise in newer efficiency tools. Tax policies and other incentives can encourage investment. Advanced systems that deploy networks of sensors, controls, and automation to achieve significant energy savings can benefit from incentives to provide a faster rate of return.

Government is unique in its ability to support basic science and energy research, and State governments have the principle role in setting the grid investment policies and utility rate structures that enable deployment of critical line loss reduction, power quality management, and grid reliability technologies like Volt/VAr optimization.

There is no doubt of the ability of the U.S. industry to compete and succeed. America's competitive edge is the high level of productivity of our workers and the technologies and processes we deploy to secure greater output from fewer resources, including energy. At ABB, at NEMA, and at the IEEC, we work daily to support that effort.

Mr. Chairman, thank you for the opportunity to testify. I would ask that a copy of our latest energy efficiency white paper be included in the record, and I am happy to answer any questions the committee might have.

[The prepared statement of Mr. Kosisko follows:]

Statement of

Kevin Kosisko

Vice President, ABB North America

on behalf of the

National Electrical Manufacturers Association

and the

Industrial Energy Efficiency Coalition

before the

Subcommittee on Energy and Power of the

Committee on Energy & Commerce

February 26, 2013

Kevin Kosisko, ABB
Statement Summary

1. Energy efficiency is the cheapest, cleanest alternative fuel. It drives competition and industrial success.

2. Proven, commercially available energy efficiency technologies are already having an impact, particularly in the highly energy-intensive industrial sectors.

3. Manufacturing executives understand of the importance of energy efficiency, but there are impediments to its use.
   - Companies base their energy efficiency investment decisions primarily on:
     - cost-benefit analyses (59%), and
     - the price of energy (58%).
     - Regulatory compliance is a distant third consideration (27%)

4. The gap between awareness of the need and taking action has three main causes:
   - Lack of a clear business case for investment (42%)
   - Inadequate funds or financing (28%)
   - Lack of information on efficiency options (27%)

5. There is a need for further education on available technologies, their return on investment, and access to funding or financing to enable investments.

6. Both industry and government have a role.
   - Industry must continue to educate on available technologies, provide reliable costs benefit analyses and provide financing.

   - Government can -
     - provide visibility
     - encourage energy efficiency investment through tax policy and other incentives
     - support the basic science and energy research
     - establish electric grid investment expensing policies and incentives to enable deployment of more efficient and reliability enhancing technologies

Chairman Whitfield, Ranking Member Rush, I would like to thank you and the members of the subcommittee for inviting me to testify on the private sector's successes and opportunities for energy efficient technologies in the industrial sector.

I am Kevin Kosisko, Vice President of Services for ABB North America. In addition to directing lifecycle services for products and systems, I oversee consulting services for asset management, process safety and industrial energy efficiency, as well as maintenance operations for ABB in the U.S., Canada and Mexico.

By way of background, ABB is a Fortune 500 producer of power and automation products and services for utilities, industry and government. With advanced global research and design and local manufacturing, we employ 147,000 people in over 100 countries. We work to provide energy efficient solutions to meet our utility and industrial customers' needs today and for the future.

I am honored to be here representing the National Electrical Manufacturers Association (NEMA) and the Industrial Energy Efficiency Coalition (IEEC).

NEMA is the trade association of electrical equipment and medical imaging manufacturers. Its member companies produce the full range of electric products from power transmission and distribution equipment to lighting systems, factory automation and controls and medical diagnostic imaging systems. Worldwide annual sales of NEMA-scope products exceed $120 billion.

The Industrial Energy Efficiency Coalition is a coalition of six of the largest global industrial automation and control systems companies. We are the technology providers that manufacturers and others in the industrial sector use to make their processes more energy efficient, reduce costs and increase competitiveness.

Like other members of NEMA and the IEEC, ABB is bullish on America. In fact, the U.S. is ABB's largest growth market. Through organic growth and recent investments, ABB's U.S. employment has increased from under 10,000 in 2009 to nearly 20,000 today. We are leaders in grid and industrial efficiency, as well as energy application research and development. We offer a diverse portfolio of equipment, software and services to support utilities, infrastructure and industrial automation.

Energy Efficiency is Driving America's Future

At ABB we recognize that energy efficiency is the cheapest, cleanest alternative fuel. Conservation has long been touted as win-win, yielding benefits in the form of both lower costs and reduced environmental impact. But those benefits are just the beginning. Reliability is critical to business success, and conservation and reliability are frequently linked.

As reported in research by my panel colleagues at the American Council for an Energy-Efficient Economy (ACEEE) regarding energy efficiency improvements, "we typically see non-energy savings benefits being three to five times the value of energy savings."

The good news is that there are myriad technologies—proven and commercially available—which are already having a significant impact. The following are examples of projects that have led to industrial energy efficiency improvements and cost savings.

Examples of Industry Investments in Energy Efficiency

1. Mr. Chairman, you probably know of Arkema, a world-class producer of industrial chemicals with global processing facilities. Their Calvert City, Kentucky processing plant recognized the need to improve its boiler operations and lower its energy use. Arkema sought our help in conducting an assessment to diagnose their system inefficiencies. The resulting sustainable improvements ABB implemented on four industrial boilers have lowered the facility's energy costs by $300,000 per year.

2. A major pulp and paper mill in South Carolina needed to upgrade its manufacturing. Their decision to install quality and distributed control systems and to replace the

steambox on a corrugated cardboard processing machine resulted in the company's lowering its steam consumption by 40 percent and lowering its energy costs by $672,000 per year. The success of that effort led the company to recently invest in a new $75 million biomass/cogeneration boiler which will produce 16 MW when it becomes operational in the fourth quarter of 2013.

3. A cold food storage customer was looking to increase energy efficiency of their refrigerated warehouses. After assessing their needs, we installed variable speed drives to their compressors and fans. The result was 35 percent energy cost savings and more precise control over the company's ability to cool or thaw products, enhancing their product quality. The investment payback, as is typical for industrial drives, was just six months.

4. The Dow Chemical Company has made energy efficiency investments that have contributed to total cost savings of well over $9 billion in the past decade. As Dow's Vice President of Energy and Climate Change notes, "Energy efficiency is a gift that keeps on giving." In addition to saving energy and lowering fuel costs, Dow reports a variety of benefits from its investments including:
   - lower plant downtime and longer maintenance cycles
   - improved productivity
   - better product quality
   - compliance with building and environmental codes
   - improved employee health and safety; and
   - benefits around research and innovation

5. New sensors, processes and controls are remaking the energy-intensive data center industry. Advanced technology helps data centers actively monitor their energy use and automatically respond to potential increased charges. By reducing load to avoid establishing a new peak, shifting load to other locations or complying with demand-response requests, we save both energy and money. These same control systems allow operators to monitor and manage asset health to improve center performance and reduce maintenance and replacement costs.

   And this technology is not limited to data centers. Similar distributed control and energy management systems can be applied in manufacturing, mining, utilities and other industries, allowing them to capture energy savings and enhance operations.

The list goes on. But industry is not alone in benefitting from current technology.

- The Southeastern Pennsylvania Transportation Authority (SEPTA), the nation's sixth largest public transit organization, is deploying a software optimization system that will allow SEPTA to recycle the energy created from the regenerative braking of trains and trolleys at a high use substation in Philadelphia. This innovative demonstration of waste energy will in turn improve power quality, produce energy savings and generate revenues for the transit authority.

- The Beloit Water Pollution Control Facility in Wisconsin was worried about the energy drain from aeration blowers at its waste water treatment plant. Their decision to upgrade operations through installation of a variable speed drive has lowered energy use by 1 million kilowatt hours a year – a reduction of more than 30 percent, saving the city utility $75,000 a year.

- The University of Illinois wanted to reduce the operating costs of its coal-fired power plant. The University's plant operator decided to replace inefficient inlet vanes with a new pump drive system that resulted in energy savings of 25 percent and reduced maintenance costs by $10,000 per year. This new system provides 98.5% efficiency and full payback on the investment took under a year.

- The ABB Azipod is a unique family of electric propulsion systems that are fixed to the outside of ships to provide both thrust and steering functions. By dual purposing the ships' electric system, we increase its energy efficiency, maneuverability and the space available on board. The Azipod is now system of choice in the cruise industry, has been utilized by the U.S. Coast Guard, and is under review by the U.S. Navy.

- Similarly, our breakthrough Direct Current (DC) electric ship technology is changing marine power. In traditional electrical propulsion vessels, multiple DC connections are made to thrusters and propulsion drives from an alternating current (AC) circuit. This accounts for more than 80 percent of the ship's electrical power consumption. Our Onboard DC Grid represents a step forward in optimized propulsion by distributing power through a single DC circuit to provide significant power savings.

- Technologies to manage and improve our electric grid are well known and widely adopted. Although many identify the smart grid with demand response capabilities, it is much more. Volt/VAr optimization, which uses sensors and controls to narrow the variance in energy flow across transmission and distribution lines, reduces line losses by up to 10 percent solely through automated utility controls – no user engagement is required. In addition to increasing line capacity, Volt/VAr systems improve grid reliability. And with tighter tolerances on nominal voltages, the operation of inductive loads is enhanced to provide further energy savings and operational enhancements – this time to end users.

Attached to my testimony are more industrial energy efficiency case studies from each member of the IEEC, including Eaton Corporation, GE, Rockwell Automation, Schneider Electric, and Siemens.

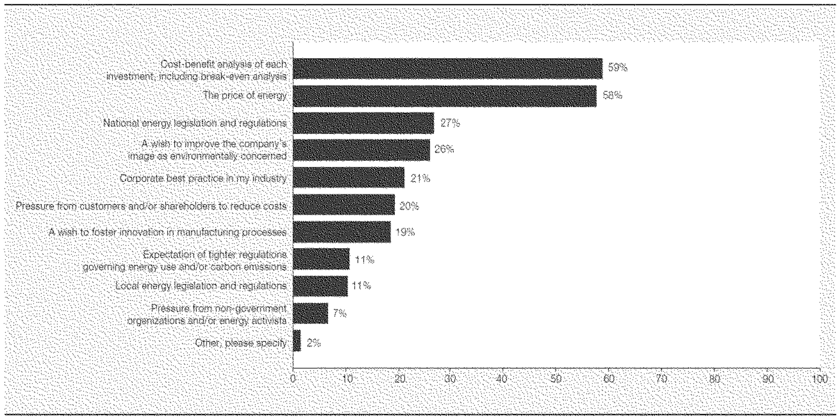
Given all these innovations and their benefits, efficiency upgrades should be widely adopted. But there are challenges to securing the improvements needed to advance our nation's energy efficiency and industrial competitiveness.

The Challenge to Efficiency

According to a 2011 survey conducted by the Economist Business Intelligence Unit, corporations are well aware of the importance of energy efficiency. Fully 88 percent of corporate executives recognize it as a critical success factor for their business over the next 20 years.

Most survey respondents focused on cost savings and "remaining competitive" as drivers for improving fuel efficiency. They based their efficiency investments on cost-benefit analyses (59 percent) and the price of energy (58 percent) far more than other considerations. Regulatory compliance was a distant third at 27 percent.

Figure 2: What are the main factors that will influence your company's investment in industrial energy efficiency over the next three years, in your view? Select up to three.

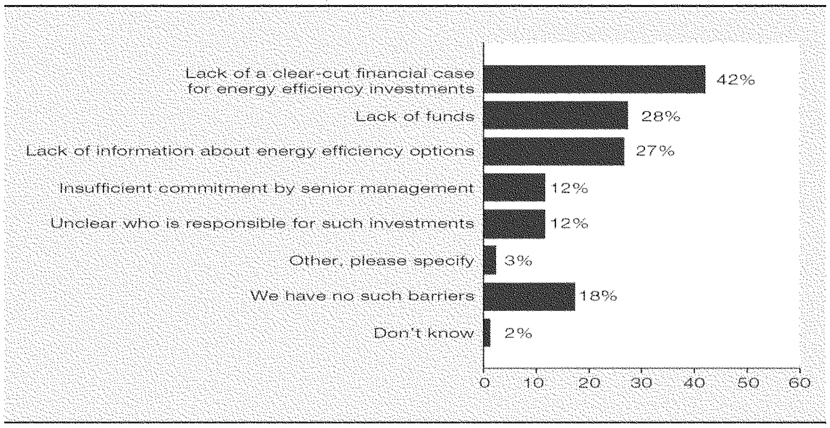


Those decision dynamics may partially explain why, despite its many benefits, industry has not yet embraced energy efficiency on a widespread basis. Fewer than 40 percent of the companies surveyed had invested in efficiency within the past three years. Only half had energy management systems in place, and just over a third had ever conducted a company-wide energy audit.

In the U.S., the situation is even starker with only 21 percent of companies having invested in equipment to improve energy efficiency in the past three years, the majority of those in the highly energy-intensive manufacturing industries such as mining, metals and chemical production and petroleum refining.

This gap between awareness and action is attributed to three primary factors. The largest group of survey respondents (42 percent) cited the lack of a clear business case as reason for inaction. Twenty-eight percent identified inadequate funds or financing as a critical barrier. A lack of adequate information on efficiency options was reported as the third greatest obstacle by 27 percent of surveyed executives.

Figure 6: What, if any, are the main barriers to investment in industrial energy efficiency in your organization? Select up to two.



These responses point to a need for further education, benchmarking and identification of available technologies and their application, and to the importance of access to funding or financing to enable investments.

Motivating Action

Encouraging the efficiency enhancements necessary to advance manufacturing and industrial success will require industry and government to address these gaps. We must supply the missing information and provide the needed funding. We at ABB, at NEMA, and at the IEEC, are striving to do just that.

We work continually to educate manufacturers on available technologies and industry best practices. We train engineers, assessors and finance teams to provide accurate, reliable energy audits and estimates of return on investment. We provide directly, or assist in securing, necessary financing. And we invest in ongoing research and development to continue the innovation of better technologies.

There is also a role for government. Historically for industrial energy efficiency, that effort has centered on reducing consumption in power-intensive industries. While these industries represent a major portion of potential (and realized) energy savings, the public sector has the ability to expand the visibility of conservation opportunities to industrial players large and small.

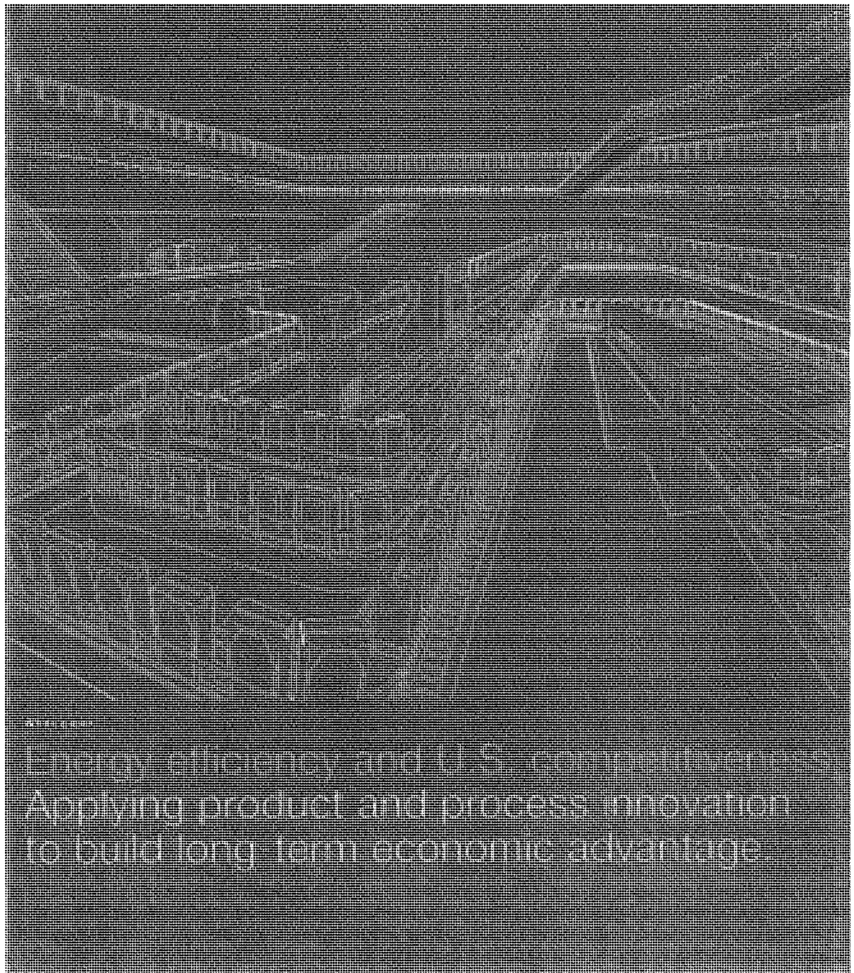
The federal government has demonstrated leadership in the development of voluntary programs that helped industry benchmark energy use by industrial process or factory type. This visibility and awareness has been a key factor in the reduction of energy use and the overall competitiveness of many of our energy intensive industries. To achieve the next level of efficiency and competitiveness we need to encourage all manufacturing facilities to instill continuous improvement programs focused on energy management. This is similar to what was done with quality in the 1980's. The federal government can play a strong role by encouraging all their manufacturing and supply chain partners to establish these types of continuous improvement programs. They could also provide assistance to the industry through training, education, and regional pilot programs.

Tax policies and other incentives can also encourage investment in energy savings. While the basic efficiency tool of a variable speed drive has a standard pay-back of less than one year, advanced systems that employ networks of sensors, controls and automation to achieve much deeper energy efficiency can benefit from incentives to provide a quicker return on investment.

Government is unique in its ability to support the basic science and energy research that industry then transforms into the technology of tomorrow.

And the federal and state governments have the principal role in setting grid investment expensing policies and utility rate structures to enable—or hinder--the deployment of critical line loss reduction, power quality management and grid reliability technologies like Volt/VAr controls.

In closing, let me reiterate our confidence in the ability of U.S. industry to compete and succeed. America's competitive edge is the high-level of productivity of our workers and the technologies and processes we deploy to provide greater output from fewer resources – including energy. At ABB, at NEMA, and at the IEEC we work daily to support that effort.



Power and productivity
for a better world™

Executive summary

ABB Inc. presents this white paper to broaden the national discussion on energy efficiency by identifying near-term opportunities that could elevate the competitiveness of the United States while saving energy and protecting limited resources. While much of the domestic energy-efficiency dialogue focuses on individual consumption and single-point innovations, no method has as much potential for immediate payback as applying widely available products and processes to established infrastructure.

Energy efficiency is mandatory for the United States to maintain continued economic leadership in a global economy for multiple reasons, including:

- Demand for electricity and fuel to drive commerce is increasing.
- Our energy supply model is costly, inefficient and uncompetitive.
- Keeping up with growing nations as domestic growth flattens requires infrastructure investment.
- Efficiency upgrades feed private-sector job growth by creating new jobs and keeping cost structures for businesses down.

The biggest opportunity lies in how electricity is transmitted, distributed and managed; but such opportunities require the encouragement of private-sector investment. The national energy network, or grid, is too complex and expensive to realistically consider a wholesale upgrade. It involves multiple owners, hundreds of regulatory agencies and other public entities, and thousands of financial investors. It is also very capital intensive, so assets must be used over long periods of time to recover their upfront costs. Solutions must include finding ways to make the existing system more reliable and efficient. This paper discusses some of those solutions, such as HVDC, Combined Heat and Power, Volt/VAr and Demand Response.

Similarly, the U.S. industrial and building sectors could extend the use of their still-productive assets while improving energy efficiency by investing in technologies that make it easier to manage energy use. These include variable-speed drives, motor-control systems, high-efficiency motors and building-systems automation, among others.

Certainly, energy efficiency is a big challenge and needs "big ideas" considering the world's energy needs increase daily. However, capital investment cycles and other political and economic realities also call for "big ideas" on how to make the transmission, distribution and management of energy immediately more productive. Such proven "ideas," which are already in the market as available products and processes, need to be part of the larger discussion in order to make energy efficiency a reality for today and not just a dream for tomorrow.

Introduction: Make immediate action part of the conversation

Discussion about energy efficiency is as omnipresent as energy itself. It can be heard every day in schools, libraries, city halls, statehouses, and on Capitol Hill as groups and individuals with varied interests promote energy efficiency as key to our country's economic competitiveness and long-term success.

Unfortunately, most of the discussion centers on concepts that — taken on their own — are either too general or too specific to reap immediate and/or significant impact on how we generate, deliver and consume electricity in the United States. Teaching consumers about energy-saving choices is important, for instance, but it will take generations of incremental behavioral change for this alone to make a difference. Likewise, single-point inventions such as all-electric vehicles have the potential to substantially reduce dependence on carbon-based inputs; but timelines for the widespread adoption needed to deliver on promised rewards are lengthy and uncertain.

Therefore, any serious discussion about improving energy efficiency in the United States must include ideas on what can be done today with existing technology, economic models and infrastructure that could provide the biggest returns in the shortest time. History tells us that, while government has a role, private-sector businesses are best suited to take on such a challenge. Industry is more nimble, innovative, responsive — and better funded — than both the government and non-profit sectors. From sparking the Industrial Revolution to leading the country out of The Great Recession, business-led innovation applied to product and process has repeatedly paved new paths to progress and prosperity in the United States.

This is not to say that non-profit organizations, regulatory agencies and elected officials are not a crucial part of the solution. They are. This white paper's intent is to broaden the energy-efficiency discussion by identifying near-term opportunities that are both wide enough and deep enough to elevate the competitiveness of the United States while saving energy and protecting limited resources. Specifically, this paper begins by describing the role of energy efficiency in global economic competitiveness, and then provides a deep examination of opportunities to improve energy grid efficiency and reliability. Following that are examples of current technologies that are already improving energy efficiency in factories and buildings.

Opportunities in these areas are plentiful and have the potential to provide significant improvements in energy efficiency on a national basis in a relatively short time. Additionally, they can be accomplished through support of activities that are bipartisan, beneficial to all Americans and driven largely by private-sector investment.

Any serious discussion about improving energy efficiency in the United States must include ideas on what can be done today with existing technology, economic models, and infrastructure that will provide the biggest returns in the shortest time.

Energy efficiency and global economic leadership

By 2035, heavy-duty trucks alone will consume the equivalent of 2.8 million barrels of oil each day, an 18 percent increase from 2010.

We strongly agree with those who see ongoing efforts to improve the energy efficiency of the United States as mandatory for continued economic leadership in a global economy. Reasons include:

Demand for electricity and fuel to drive commerce is increasing.
The growth rate of energy consumption is expected to slow from 2010-2035, but overall electricity consumption will grow 23 percent over this period in both the developed and undeveloped world.[1]

At the same time, manufacturing output will grow 47 percent, driving up consumption of transportation fuels as suppliers and finished goods producers move chemicals and medicines, farm goods and packaged foods, autos and auto parts, industrial machinery and equipment, construction tools and materials, and other products to consumers. By 2035, heavy-duty trucks alone will consume the equivalent of 2.8 million barrels of oil each day, an 18 percent increase from 2010.[2]

Additionally, home and workplace energy demand is expected to expand exponentially as we become a more technologically enabled society. Electricity consumption totaled nearly 3,884 billion kilowatt hours (kWh) in 2010 and wes more than 13 times greater than electricity use in 1950.[3]

Our energy supply model is costly, inefficient and uncompetitive:
Over the past 20 years, U.S. businesses have become the world's experts on cost and cash flow management. Just-in-time inventory management, technology investments and other efficiency efforts have powered vast improvements in labor and process productivity, and have dramatically improved cash-to-cash cycles. Unfortunately, the cost model to produce energy has not kept pace with other efficiency gains. The dollars U.S. companies spend filling their energy demand with current processes provide an uncompetitive return on investment. Investing in new equipment and processes could close this gap and return immediate cost savings to companies, consumers, governments and the economy at large.

"On average, an additional dollar invested in more efficient electrical equipment, appliances and buildings avoids more than two dollars in investment in electricity supply." — International Energy Agency's World Energy Outlook.[4]

Keeping up requires infrastructure investment:
Global population projections point to flat or shrinking growth in the developed world over the next 40 years just as populations and middle-class wages in developing countries explode.

Already, China, India and other countries with the world's highest-growth economies are investing billions of dollars annually in infrastructure — utilities, factories, office buildings and public facilities ranging from school buildings to water-treatment plants. This intense investment is happening without the weight of legacy infrastructure, which in most cases is comparatively less energy efficient but not yet at the end of its useful life.

This reality puts the United States at a marked disadvantage when it comes to producing, delivering and consuming energy because the growing economies will be using the newest, most efficient technology, structures and systems while older-but-still-valuable capital remains in use here. The gap goes beyond power grids and utility substations: Everything from houses to steel plants will need far less energy to operate, giving the emerging economies a huge economic advantage.

"Globalization has upended the way we think about America's place in the world... It has become painfully apparent that U.S. infrastructure, once the envy of the world, is now strained and aging, while other nations are constructing bullet trains, cutting-edge broadband networks, public transit systems, modern ports, and energy delivery systems, while making significant investments in alternative energy." — *Jobs for America: Investment and Policies for Economic Growth and Competitiveness*, Milken Institute.[5]

Efficiency upgrades feed private-sector job growth:
Investment in energy efficiency offers more than short-term construction and engineering jobs — although these would be in the thousands; it also facilitates the transition of all industries into more modern efficient growth engines through private-sector wealth creation. Jobs created by this dynamic are generally well paying, full-time and long lasting.

First, let's take a look at how investing in energy efficiency would create thousands of jobs in the very near term. Considering infrastructure investment alone, energy-sector modernization through expansion of smart grid and clean coal technology, renewable resources and nuclear energy could create nearly 1.5 million new jobs over two years, according to the Milken Institute. Improving natural gas infrastructure and capacity would add even more.

Summary of Economic Impact By Infrastructure Project (2010-2012)

	Investment (US$B)	No. of Jobs, direct impact	Earnings, direct impact (US$B)	No. of Jobs, total impact	Earnings, total impact (US$B)	Output, total impact (US$B)
Smart grid	24.0	219,578	9.1	649,627	25.1	82.0
Nuclear energy	15.0	139,145	6.1	397,271	15.6	48.7
Renewables (solar, wind, biofuels)	14.5	115,874	4.8	337,558	13.1	44.3
Clean coal technology	2.55	24,018	1.1	66,127	2.6	7.9

Source: Jobs for America: Investment and Policies for Economic Growth and Competitiveness, Milken Institute

As for long-tarm jobs created by these investments, consider the potential for monetary savings described in the next three sections. Along with the rate of consumption (i.e., cost) of energy throughout our economy, the potential for reinvestment of savings in private-sector innovation and capital is enormous. And these investments, of course, are the true catalysts to long-term job creation.

Moreover, efficiency upgrades improve cost competitiveness and make it more economically viable to retain domestic manufacturing over the allure of lower-cost foreign sourcing.

Utilities: Increasing efficiency and reliability with existing infrastructure

Businesses in retail e-commerce rely exclusively on electronic signals to make and fulfill sales. Without power, they have no way of doing business and would immediately start losing sales to competitors. Online customers are loyal to reliability, not nationality.

An important aspect of increasing energy efficiency is simultaneously increasing energy reliability. This reduces one of the greatest risks to modern U.S. commerce: power interruptions.

Power outages are a mere nuisance to many people, but can be devastating for businesses of all types and sizes. It's another example of how our methods of energy creation, delivery and consumption have not kept up with efficiency advances elsewhere in the economy. Business leaders consider loss of power to be a major risk to sales and profitability. They spend millions of dollars annually trying to avoid interruptions and ensure against them, and for good reason. According to researchers (Ernest Orlando Lawrence Berkeley National Lab, September, 2004), the annual cost of power interruptions could be as high as $135 billion.[6]

In modern goods-producing industries, information powers the flow of inventory. It's common for a series of electronic signals passed from company to company to be the impetus for all of a supply chain's activity — from the ordering of raw materials to payment for finished goods. If those signals can't circulate for lack of power, activity stops, orders go unfilled and sales grind to a halt. Bills go unpaid.

Likewise, online retail sales continue to grow and reached $51.4 billion in the final quarter of 2011, a 5.8 percent increase over the 2010 final quarter.[7] Businesses in retail e-commerce rely exclusively on electronic signals to make and fulfill sales. Without power, they have no way of doing business and would immediately start losing sales to competitors. Online customers are loyal to reliability, not nationality.

Yet, the infrastructure system that delivers energy to these businesses and their customers is faltering. The national energy network is too complex and expensive to realistically consider a wholesale upgrade. It involves multiple owners, hundreds of regulatory agencies and other public entities, and thousands of financial investors. It is also very capital intensive, so assets must be used over long periods of time to recover their upfront costs.

Discussions about how to make the U.S. energy supply more valuable, then, must include finding ways to make the existing system more reliable and efficient. This provides benefits to all stakeholders. Some technologies that are doing this are at work behind-the-scenes, while others empower energy consumers to control their own consumption. Here are some examples:

HVDC: Electricity-delivery processes that use existing technology and reduce the amount of electricity lost in transmission.

High-voltage direct current (HVDC) transmission is an increasingly attractive option because less electricity is lost in its transmission than with transmission of conventional Alternating Current (AC). In addition, HVDC requires fewer transmission lines, meaning that less land needs to be cleared. Because special equipment is needed to convert electricity from AC to Direct Current (DC), HVDC is cheaper only over long distances. But, with demand for long-distance transmission growing as use of renewable energy sources expands,[8] HVDC is an attractive efficiency multiplier.

Another advantage of HVDC is that it can be used to more efficiently connect different AC networks. HVDC allows electricity flow to be controlled rapidly and accurately in terms of both the power level and the direction. It can compensate for fluctuations in the power flow, making HVDC the ideal technology for linking wind farms, for example, where uneven production could otherwise disrupt the reliability of the overall network.

Substation communications: More effective and less vulnerable to outages.
Benefits of continued investment in substation technology include the ability to transmit and distribute large amounts of electricity to increasingly crowded cities, using as little space as possible.

Improvement in communication technology is an example. ABB has played a leading role in the development and implementation of IEC 61850, the first global standard for the control and protection of substation equipment that enables real-time, open communication between substation devices — regardless of the manufacturer. The new standard has significantly enhanced substation performance and enables just a few fiber optic cables to replace thousands of interconnecting copper wires.

Volt/VAr: Enabling utilities to increase grid capacity and efficiency.
Through technology that enables them to more efficiently balance loads, utilities can make their existing grid infrastructure work more productively. Through coordinated and integrated Volt/VAr control, utilities can make near real-time adjustments of power settings, increase distribution capacity and reduce capital expenses, have greater insight into the health of their equipment, reduce loss of energy during distribution, and increase reliability through better systemic load flow management.

Customer-incented load reduction and grid optimization techniques are among the most promising initiatives to reduce demand.

Combined Heat and Power (CHP): On-site production provides sustainable model.
Combined heat and power (CHP) is an integrated set of technologies for the simultaneous, on-site production of electricity and heat. CHP is energy efficient, making use of heat produced during power generation and avoiding generation and transmission losses. CHP solutions provide efficient, reliable, and more affordable power for businesses and institutions. CHP is now installed at more than 3,500 commercial, industrial and institutional facilities across the nation.

CHP systems today represent almost 9 percent of the nation's total electricity capacity. A recent study by Oak Ridge National Laboratory[9] has found that significant benefits would accrue by raising the CHP share to 20 percent.

Demand Response: Managing peak load makes current assets more efficient.
Managing peak load is one of the most critical drivers in the utility industry, even though the slow economy has resulted in flatter load growth. With rising fuel and construction costs, as well as the long lead time required to plan for and build generation resources, many utilities are concentrating on using a smarter grid to help delay or even eliminate constructing new plants. In fact, the majority of smart grid projects coming online are focused on reducing peak load and using a variety of technologies — including distributed renewables and energy storage.

In addition, customer-incented load reduction and grid optimization techniques are among the most promising initiatives to reduce demand. As smart metering and building technologies proliferate, demand-response (DR) programs are growing in number and sophistication. Some utilities have implemented advanced distribution management systems (DMS) to optimize the network for voltage and VArs using a technique called distribution system DR (DSDR) to reduce peak demand.

These two approaches try to address the peak load problem by starting from different points. DR works from the demand side, while DSDR seeks to make the supply side more efficient. Each method can be effective at limiting peak load.[10]

Industrial sector: Lower energy costs, more R&D and more jobs

Regular plant energy audits are most effective when they are part of a strategic corporate energy management program.

The U.S. industrial sector uses more energy than any another other sector in the United States to produce goods and ship them to market. Energy-efficiency improvements within the industrial sector have the potential to return huge economic rewards to the country at large, not only because of the immediate cost savings but because those savings would likely be invested directly in research and job creation.

"Manufacturers perform 50 percent of the research and development in the United States and are the leaders in developing and deploying innovative solutions across the manufacturing economy. No segment of American society has as much to gain from efficiency and waste reduction measuras as the manufacturing sector and the consumers they serve... It is widely acknowledged that process and building system energy efficiency and conservation offers immediate and cost-effective opportunities to cut these costs."[11]

Whereas the energy-delivery network addressed in the prior section is made complex by its multiple ownership, manufacturers generally control their own facilities and therefore can relatively easily improve energy efficiency by making investments that begin returning savings immediately.

An invaluable first step in industrial energy efficiency is conducting a plant/building energy audit, which can compare energy performance with "best practices" and reveal opportunities for savings.[12] The audits can be self-assessments or conducted by an outside party. According to the U.S. government's EnergyStar program energy audits help managers to:

- Identify actions for improving energy performance;
- Prioritize projects; and,
- Track progress.

"Regular plant energy audits are most effective when they are part of a strategic corporate energy management program. Corporate energy programs are ideal for replicating the savings opportunities identified through plant energy audits at other facilities. Through the corporate energy network, information can be shared, and savings multiplied."[13]

Often, manufacturers can achieve efficiency by adding energy-saving equipment and solutions such as variable-speed drives and motor-control systems. Adoption of industry-accepted best practices also helps to capture tangible energy efficiency benefits and often with minimal capital expenditure.

Variable-speed drives: Untapped opportunity to improve the efficiency of existing motors in a variety of industries.

A variable-speed drive regulates the speed and rotational force — or torque output — of an electric motor. There are millions of motors in use in industry and offices around the world. They operate sewage and irrigation pumps, milking machines and ski lifts, paper machines and power-plant fans, sawmill conveyors and hospital ventilation systems. We estimate that ABB drives in operation worldwide save about 115 million megawatt hours of electricity every year, the equivalent of 14 nuclear reactors. In terms of CO^2 emissions avoided, the amount is greater than that produced each year by the entire country of Finland.

Motor-control systems: Reducing energy consumption while maintaining flexible capacity.

The vast majority of the world's industrial motors are oversized and inefficient because companies commonly buy more powerful motors than are actually needed to protect themselves from power spikes and uncontrolled overload.

An intelligent, or software-based, motor-control system allows businesses to manage the status, condition and energy consumption of all the motors in a plant. This enables the installation of smaller, correctly specified motors that consume far less energy and reduce greenhouse gas emissions. Replacing an oversized, 37-kilowatt motor with a 30-kilowatt motor would save a typical medium-sized site with 200 motors about 180,000 kilowatt hours a year, and avoid the generation of 90 metric tons of CO^2 emissions.

Replacing an oversized, 37-kilowatt motor with a 30-kilowatt motor would save a typical medium-sized site with 200 motors about 180,000 kilowatt hours a year, and avoid the generation of 90 metric tons of CO^2 emissions.

Commercial building upgrades: Savings through automation

Commercial and residential buildings account for about 38 percent of global end-user energy demand, mainly for heating, cooling and powering electric appliances. These systems also are among the top three contributors to CO^2 emissions in the United States and increasingly are subject to state, local and federal mandates to improve energy efficiency.

Indeed, some groups are calling for the federal government to require all commercial buildings to post energy-efficiency disclosure labels, similar to home appliances. These advocates[14] say such a policy could:

- Create more than 23,000 net new jobs by 2015 and more than 59,000 jobs by 2020, resulting from increased demand for energy efficiency services and technologies, and from the reinvestment of energy cost savings by consumers and businesses into the economy.
- Reduce energy costs for building owners, consumers and businesses by approximately $3.8 billion through 2015 and more than $18 billion through 2020.
- Generate more than $7.8 billion in private investment in energy efficiency measures through 2020, yielding $3 to $4 in energy cost savings for every dollar invested.
- Reduce annual energy consumption in the U.S. building sector by approximately 0.2 quadrillion BTUs by 2020, equal to taking more than 3 million cars off the road each year.

Additionally, there is evidence that having a strong energy-management practice increases business value in the real estate marketplace.

"The value of strong energy management as a proxy for overall organizational management is increasingly recognized by financial analysts. Recent studies by Innovest Strategic Value Advisors found that leaders in energy management achieved superior stock and financial performance over laggards in energy management."[15]

Conclusion: Keep talking, but start doing

We believe that there is no singular solution for achieving global competitiveness through energy efficiency; and that while moderating consumer consumption and entirely new energy models are part of the equation, so is immediate investment in existing infrastructure with widely available technology. Such investment holds the promise of results and can be most easily implemented as the responsibility falls largely on the private sector.

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Industrial Energy Efficiency Case Studies

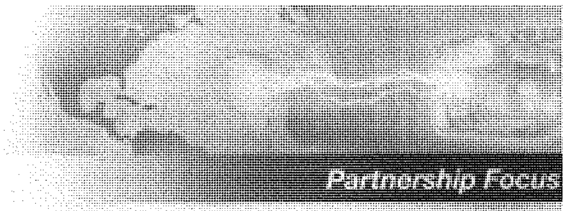
Submitted by Kevin Kosisko, ABB, on behalf of the
Industrial Energy Efficiency Coalition

February 26, 2013

Administered by

NEMA

Results-Driven Automation



Success Stories
Plastics & Rubber

Drive retrofits of extruding lines at Cantex Plastics are optimizing production of Poly Vinyl Chloride (PVC) pipes

Upgrading PVC extruding lines with ABB ACS800 DTC/ Direct Torque Control drives is helping Cantex Plant Manager Ron Berry wring the maximum production from his plant's existing machinery as cheaply as possible.

Benefits

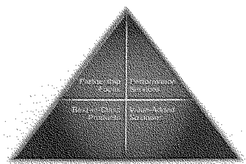
- Immediate Production Increase
- Upgrade Cost is 1/8 of New Installation Cost
- No Need for Encoders
- Reduced Downtime
- Minimized Scrap
- Blower (& Noise) Eliminated

Cantex is a leading producer of PVC (Poly Vinyl Chloride) pipes in the U.S., with plants in Texas, Ohio, Florida, Mississippi and Nevada. The Reno, Nevada plant turns out PVC pipes of varying diameters and lengths for customers that include utilities, municipalities and construction markets/applications. Cantex, to date, has upgraded two of 18 extrusion lines at the plant with ABB's ACS800 adjustable-speed, direct torque control (DTC) drives, and is working on upgrading a third line.

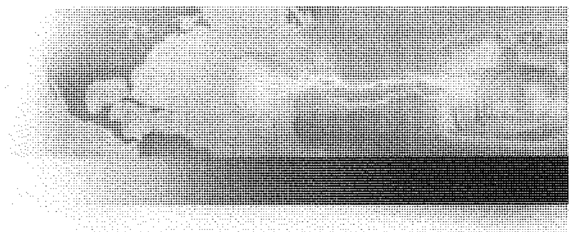
Production Increase is Immediate

A 100 HP ABB ACS800 drive retrofit of the motor powering the mixing screws on one of the extrusion lines was started up this past Christmas Eve. It has already increased production by 30 percent. The AC ABB drive and motor replaced the ageing DC technology on these augers, which move the plastic pellets from the hopper tanks into the pipe extruder. Cantex uses the line to produce electrical PVC up to four inches in diameter for customers such as Home Depot and Lowes.

Intec also has started up a 150 HP ACS800 drive on a line used to extrude up to six-inch PVC. Following that, a number of puller motors will be retrofitted with ABB drives and motors. And just like the puller motors with the printer motors, the hopper motors and the mixing screw motors will be integrated, to optimize production and throughput.



Results-Driven Automation



Success Stories

Very Smart Investment: New Line Capacity for 1/8th the Cost

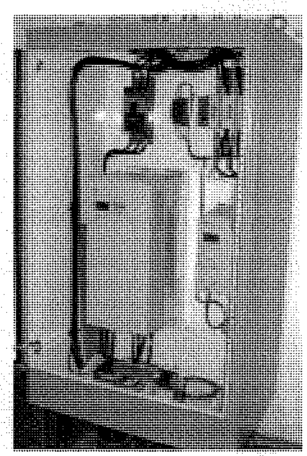
Berry says upgrading an existing extrusion line with ABB drives is one-eighth the cost of building a new one, and production in the upgraded lines has "increased by hundreds of pounds of PVC per day. We've basically added the capacity of one more extruder, without having to put a new line in." ABB's ACS800 drives provide precise, unmatched motor control for injection molding machines, extruders (single-, double- and multi-machines), melt pumps and pelletizers.

The ACS800's proprietary, open-loop, DTC technology eliminates the need for encoders (electrical disks placed at the motor/load end that provide specific information about load changes and motor speeds), and enables drives to calculate motor torque and flux 40,000 times per second. The open-loop speed and torque control is so precise, the drives can adapt to and handle changes in load immediately. That means full torque (twisting power) at zero motor speed, and high-operating torque at low speeds. Such speed control has eliminated all the previous speed variation of the DC equipment, which has reduced downtime and minimized scrap. Such new drive and motor combinations have eliminated any need for replacing DC motor brushes and maintaining them; the blower (and noise) that kept the DC motor cool has been eliminated, too.

Technology Becomes New Standard

In addition, the ACS800 drives are quieter, which is important for a plant in a residential area. Cantex has standardized on ABB drives, and Reno is one of a number of plants the company owns and operates.

"This plant operates 24/7," Berry notes, and adds, "ABB's system is the difference between noon and midnight." The upgrades mean the Cantex Reno plant can produce more product from existing equipment, rather than building an expensive new extruding line.



ABB

Improve Your Bottom Line and Environmental Stewardship with Energy Management Solutions from Eaton

Energy Management is a continual improvement process involving measurement, analysis and implementation of programs to reduce usage and costs. No longer is energy considered a fixed cost of doing business; today's technology and energy market dynamics make this one of the most promising opportunities for cost reduction and environmental stewardship.

The Environmental Protection Agency (EPA), in collaboration with a financial services firm, researched the impact of Energy Management on a company's bottom line. The results are encouraging: companies that have implemented effective Energy Management programs are not only strong environmental performers, but they are also strong financial performers, outpacing the competition by 20 to 30 percent. *

Many companies, however, require additional expertise and resources to develop an effective Energy Management program that identifies and fully capitalizes on every opportunity to conserve energy and save money. By outsourcing this critical cost-out responsibility to Eaton - Electrical Services & Systems (E-ESS), you can be confident that every conceivable option will be explored. Our experts will perform a complete Energy Management needs assessment and submit a comprehensive report of the findings and recommendations. In most cases, implementation of the measures recommended by E-ESS results in a payback period of two years or less.

Getting Started

An E-ESS Energy Reduction Review team will become familiar with your facility, your staff and your business objectives. They will analyze historical reports and energy bills and do a physical analysis of the facility and equipment. The following will be included in the needs assessment and report as applicable:

- HVAC Systems
- Lighting Systems and Controls
- Compressed Air Systems and Controls
- Paint Processes
- Motor Applications
- Utility Bills, Rates and Riders
  - Power Factor
  - Demand Control and Peak Shaving
- Building Automation Control Systems
- Plant and Office Operations

The final report will contain recommendations that can be implemented by E-ESS, resulting in improved energy efficiency and a healthier bottom line.

A full Power Quality Assessment can be added at the time of the Energy Reduction Review.

A Look at the Numbers

Example 1

A partial needs assessment was conducted at a facility that manufactures heavy-duty, on- and off-road Class 8 trucks. The results indicated potential cost savings surrounding compressed air usage, so the compressed air connectors, hoses and other associated parts were upgraded. The plant realized an eight-month payback. The following is a single measure of this program:

- Material cost $23,000
- Labor cost $10,000
- Total investment $33,000
- Annual savings $48,000

Simple payback period = 8.25 months

Example 2

A commercial building in Pittsburgh, PA had a low Power Factor (PF) and was penalized $1,932 per month by the utility. A $12,000 Power Factor Correction Capacitor Bank, expertly installed by E-ESS, corrected the PF to 0.95 and eliminated the penalty, resulting in a payback period of approximately six months.

Facility Profile

- 1500 kVA transformer
- 1146 kW demand
- PF range = 0.86 to 0.88

Utility Charges

- $12/kW demand charge (kWD)
- Penalty below 0.95 PF
- PF penalty multiplier = 1.14 (PFM)
- 1307 kW (billed) — 1146 kW (actual) = 161 kW (penalty)

ROI Calculations

- Billing kW based on PFM x kWD = 1.14 x 1146 kW = 1307 kW
- Penalty based on cost of 161 kWD = $12 x 161 kW = $1932/month

Simple payback period = $12,000/$1932 = 6.2 months

A Case Study in Savings

E-ESS engineers applied their knowledge to Eaton facilities to identify cost-saving measures via effective Energy Management practices. Listed below are just some of the savings identified in this ongoing project:

- **Transmission Plant** — Process change. Annual savings: $75,000.
- **Fluid Power Plant** — Water, lighting, compressed air and process change. Annual savings: $150,000.

- **Automotive Plant** — Lighting and compressed air improvements. Annual savings: $126,000.
- **Aerospace Plant** — Lighting, compressed air, cooling tower operation and meter consolidation. Annual savings: $177,000.

To date, annual savings in excess of $500,000 have been identified, and there's much more to come. Contact your local E-ESS office today to learn how you can benefit from the Energy Management expertise of E-ESS engineers.

ENERGY STAR®

Eaton is an ENERGY STAR partner, solidifying our commitment to providing energy-efficient products and services. To earn the ENERGY STAR, we must meet strict energy efficiency criteria set by the US Environmental Protection Agency and the US Department of Energy.

A strategic approach to Energy Management can produce dual benefits — for the bottom line and the environment. EPA's ENERGY STAR partnership offers a proven Energy Management strategy that helps in measuring current energy performance, setting goals, tracking savings and rewarding improvements.

As an ENERGY STAR partner, Eaton has access to tools and resources that help identify the value of improved energy performance and its impact on profitability.

- Uncover opportunities for improvements and set performance goals
- Justify projects in powerful financial terms
- Set energy performance goals for new buildings
- Demonstrate project success
- Gain recognition

Integration Solution Summary

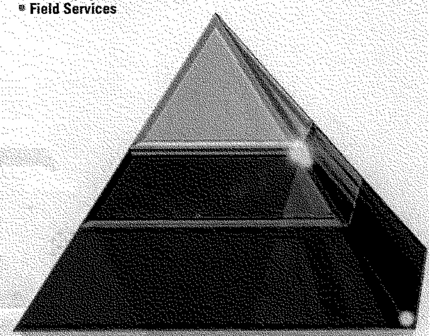
Highly trained E-ESS engineers can implement improvements identified via the Energy Management needs assessment. Services include procurement, installation and commissioning of all power systems products in support of the recommendations.

Examples of efficiency and cost reduction measures include, but are not limited to, the following:

- **Power Factor Correction Capacitor Banks** — Correct low power factor to reduce or eliminate utility penalties and typically provides a two-year or less payback period.
- **Energy Information Services** — Internet-based, real-time tools to help you better understand and reduce your energy costs on an ongoing basis.
- **The Instant Response Center℠** — Integrates existing power management assets with the latest predictive diagnostic technologies, and then provides this information in real-time to our knowledge experts via a secure Internet connection, mitigating or avoiding unplanned outages.
- **Variable Frequency Drives** — Conserve energy by reducing the horsepower for applications when excess horsepower is not needed.
- **Reduced Voltage Soft Starters** — Eliminate the inrush of electricity when starting motors, impact demand and extend the equipment life.
- **Lighting and Load Control Solutions** — State-of-the-art lighting technologies to reduce energy costs and improve the overall lighting systems.
- **Power Management Systems** — Manage energy costs, troubleshoot power quality problems, and ensure the reliability and integrity of your electrical distribution system from the convenience of your PC.
- **Compressed Air Systems** — Reduce energy by optimizing the demand and supply sides of the compressed air system.
- **HVAC Control Systems** — Reduce energy and improve the plant and office environment.

Integrated Solution Summary

- **Asset Optimization**
- **Knowledge Management**
- **Integrated Project Solutions**
- **Power Systems Engineering Solutions**
- **Power Systems Modernization**
- **New Equipment Services**
- **Field Services**



For further information, please visit our Web site at: www.EatonElectrical.com and click on Support, then Services & Systems, or contact your nearest Eaton - Electrical Services & Systems office.

For emergency service, call 1-800-498-2678 and ask for the office nearest you.

* ENERGY STAR — The Power to Protect the Environment through Energy Efficiency, EPA 430-R-03-008, July 2003.

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EATON

GE
Energy

case study

Aluminum Manufacturer Productivity Increase

Process improvements and controls upgrades improve reliability and profitability at one of the industry's largest North American facilities

Results

Improved profitability

- Estimated profit increase of nearly $1.5 million annually
- Customer payback on $750K investment in six months

Upgraded controls and improved diagnostics

- Upgraded DC power bridges to digital drive control
- Upgraded analog control to digital controller platform
- Reduced the electrical maintenance
- Improved operator set-up and line diagnostics

Increased tension level line productivity

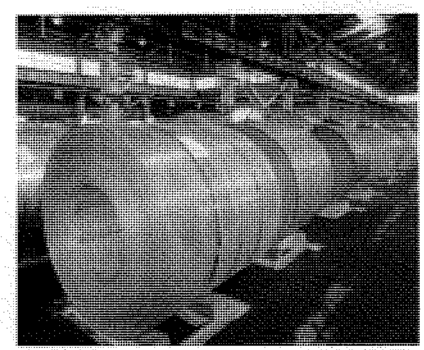
- Increased line speed by 50%
- Increased electrical reliability
- Decreased scrap from off-flat material
- Reduced material requirements by 129 feet per coil

Greater Productivity with Lower Material Cost

The original need to increase tension level line productivity results in wide-ranging process improvements for higher profitability

A leading manufacturer of common-alloy aluminum sheet from recycled metal, with advanced technology mills operating across the U.S., provides a variety of alloys and products for diverse industries—including metal distribution, transportation, building and construction, and consumer durables. As an industry leader in manufacturing superior quality coated aluminum products, the company operates coating lines at some of its plants—including its showcase plant, which is one of the largest such facilities in the U.S.

It was at this U.S. facility that the company began experiencing a number of product returns due to off-flat material. The aluminum manufacturer identified a need to increase their tension level line productivity—and to reduce the number of off-flat returns from their customers.



case study

Responding to the query from the aluminum plant's Finishing Electrical Engineer, the GE Drives and Controls Field Engineering team was able to conduct a productivity study that determined a range of process improvements GE could provide to the plant.

Working closely with the customer's engineering and production teams, GE proposed a controls upgrade that could increase line speed, improve reliability, reduce scrap, and improve the drive system's limited diagnostics.

Installation in Just Ten Days

By implementing the project in stages—a pre-work phase and a system-conversion phase, GE's Drives and Controls field engineers were able to complete the upgrade within a ten-day outage time.

GE's team of specialists upgraded the aluminum sheet manufacturer's existing Siltrol+ power bridges to DC-2000 controls and upgraded the GE Directamatic II analog control to a GE Innovation controller. These upgrades resulted in dramatic improvements, including:

- **Increased yields.** Tension level line speed was increased by 50%, allowing the number of aluminum coils produced to rise from 17 to 20 coils per shift. This resulted in a total increase of 3000 coils per year for a profit of $1.3M.
- **Increased productivity.** GE's new strip transport technology included auto payoff reel stop and digital elongation control—yielding material savings of 120 feet per coil for additional savings of $200K.
- **Increased quality.** The new process greatly improved the quality of the end product—resulting in fewer customer complaints, returns, and business that otherwise might have been lost due to off-flat material.

Extending the Life Cycle and Reducing Maintenance

In addition to extending the life cycle of the Siltrol+ drives, the upgraded equipment eliminated the need for difficult-to-obtain spare parts—such as analog drive/control printed circuit cards, field terminal board assemblies and field exciters.

Payback in Six Months

Within six months of GE's project completion at this mill, the plant was able to achieve payback of their $750K investment. Since completion of the project, the tension level line is continuing to operate with the high reliability required by the customer, and occasional routine service is provided by GE.

Along with this successful installation, GE has worked closely with the customer to complete several additional projects in the same area of this plant.

For more information about GE Industrial Services and our Drives and Controls offerings, contact your GE representative.

GEA-16092 (06/08)

Ann Arbor Municipal Water Treatment Plant Develops Strategy, Adopts Technology to Reduce Electricity Costs

Rockwell Automation power monitoring equipment helps facility reduce energy consumption by up to 10 percent.

Solutions

Energy Management

- Allen-Bradley® PowerMonitor™ 3000 and Rockwell Software® RSPower™ Plus software obtains real-time energy usage via Ethernet to reduce peak demand charges

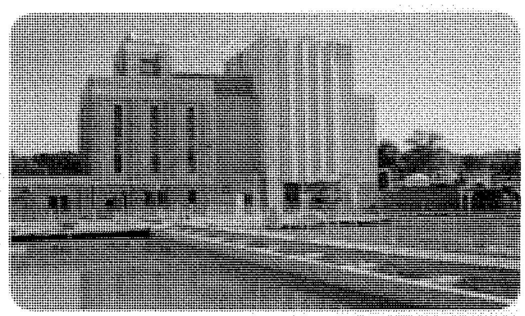
Results

Reduced Costs

- Saved up to an estimated $40,000 per year by precisely tracking and controlling energy usage
- Reduced energy consumption by up to 10 percent

Improved Sustainability

- Reduced energy consumption has resulted in a more sustainable operation



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Background

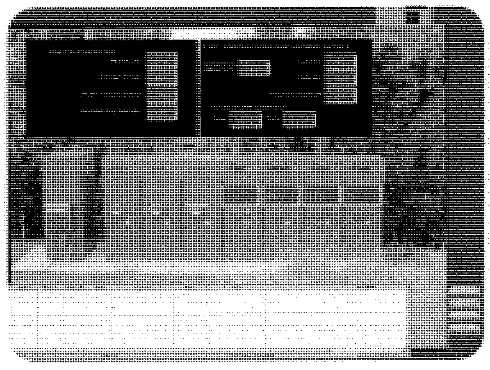
With state and local budgets shrinking, and the cost of electricity rising, municipalities need to shave utility costs wherever they can. As major energy consumers, water treatment plants are a natural place to start.

Operators at the water treatment plant in Ann Arbor, Mich., developed a strategy to help significantly lower the electric bill with a simple solution – monitoring and controlling power use to avoid the high charges that come with operation during peak demand times.

Every day, the Ann Arbor plant processes an average of 14 to 15 million gallons of water, and distributes it to 25,000 homes and businesses in the city and beyond. The treatment process is highly complicated because of the water's source.

"Our plant is one of the most complex in the state because of the quality of our source water, which primarily comes from the Huron River," said Brian Steglitz, the plant's senior utilities engineer.

While flow through the plant is primarily by gravity, there are two locations where low head pumps are required to drive the flow though the remainder of the plant's treatment processes. In addition, the plant uses two large pumps to backwash the 26 multimedia filters that are used to polish the water. These pumps, along with the high service pumps that deliver water to several portions of the city, consume the largest quantity of energy at the treatment plant. The next largest energy demand is exhibited by the plant's ozone system which uses energy to convert liquid oxygen to ozone for disinfection.



Ann Arbor invested in Rockwell Software RSPower Plus software and four Allen-Bradley PowerMonitor devices with Ethernet, which connect the devices to the process control network.

Challenge

Like managers at most water treatment facilities, those at the Ann Arbor plant routinely paid the electric bill without scrutinizing the individual charges included. When looking to cut costs, they took a closer look at the plant's monthly bills and realized that they were paying thousands of dollars in peak energy charges that could potentially be avoided.

"The plant was being hit with high electrical-demand charges – accounting for more than half of its energy bill," Steglitz said. "Our team knew we needed to find ways to stop throwing money down the drain."

To manage costs, managers needed to know exactly how much energy they were using – and when – to avoid peak-demand charges. The first step was to understand the rate structure of the plant's electricity supplier.

Like many energy providers, the local provider for the Ann Arbor plant has different rate structures for different customers. Major energy users, like the water treatment plant, pay more for electricity during peak hours of 11 a.m. to 7 p.m. If they exceed their predetermined allotment for peak-demand energy use, they must pay additional "demand" charges.

Those charges can add up quickly. For example, if operators run the backwash pump for just 30 minutes during peak hours, the demand charges could total as much as $4,000.

"Operators needed real-time data to show them when they were approaching electrical peaks, so they could avoid nonessential tasks that would impact our demand charges," Stegliz said.

Solutions

The Ann Arbor plant invested in four power monitors to keep a watchful eye on its four substations and transfer energy-use data to the operator's computers. Unfortunately, the original power monitors were "rudimentary" Steglitz said, and the components were failing. The situation prompted plant managers to turn to Rockwell Automation, the provider of their existing control platform.

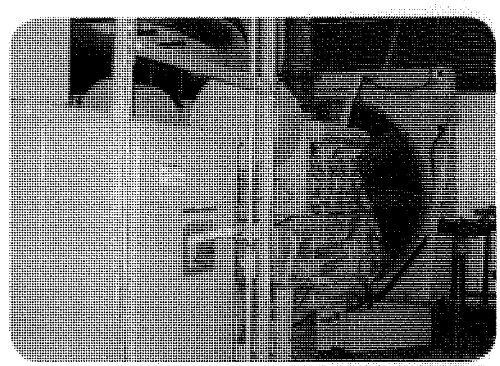
"Our history with Rockwell Automation products has shown they are extremely reliable," Steglitz said. "And when it comes to delivering clean and safe water, reliability is critical."

Ann Arbor invested in Rockwell Software® RSPower™ Plus software and four Allen-Bradley® PowerMonitor™ devices with Ethernet, which connect the devices to the process control network. Data on electrical usage is then communicated to the SCADA system, which displays real-time electrical usage information, allowing operators to make decisions that optimize energy usage. For instance, operators can postpone noncritical pumping and delay backwashing the filter until nonpeak hours.

The system also alerts operators when the plant is approaching peak limits, allowing them to quickly react and ramp down electrical usage wherever possible.

Results

The investment in the PowerMonitor devices quickly paid off. Steglitz estimates the Ann Arbor treatment plant saves between $30,000 and $40,000 per year by precisely tracking and controlling its energy consumption.



"Our history with Rockwell Automation products has shown they are extremely reliable... and when it comes to delivering clean and safe water, reliability is critical."

Steglitz expects these types of savings to increase as energy intensive water treatment technologies become more commonplace.

"Water treatment processes are becoming more energy intensive," Steglitz said, referring to the advent of disinfection methods using ozone and ultra-violet light, as well as the expanding use of reverse osmosis and other membrane technologies.

Steglitz suggested that many other municipalities could save on energy expenses – and become more sustainable – by adopting the monitoring solution that the city of Ann Arbor implemented. "Saving money is not the only benefit. Conserving energy is simply the right thing to do."

The results mentioned above are specific to Ann Arbor Municipal Water Treatment Plant's use of Rockwell Automation products and services in conjunction with other products. Specific results may vary for other customers.

www.rockwellautomation.com

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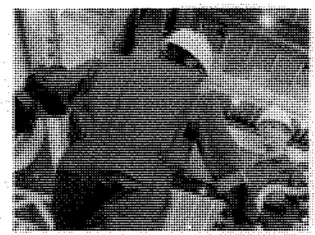
Publication WATVP-AP012A-EN-P – December 2011

solutions

Energy management solutions



Challenges

In today's industrial landscape, many businesses are facing fundamental energy management challenges including:
- **Enhancing business performance by meeting production schedules, emissions targets, and quality requirements, while also lowering costs**
- **Solve the total equation of human behaviour, processes, and technologies**
- **Optimize energy consumption while maximizing productivity**

Benefits
Efficient ★★★★
Save up to 30% energy consumption

Solution in brief

With Schneider Electric, the global specialist in energy management, you can achieve a whole new level of energy optimization, from the device level right to the enterprise level.
Our solutions provide real insight into your energy consumption, in content with your process, helping you identify energy savings while also meeting your production goals.
Optimizing energy means much more than just reducing costs, it is about improving the overall efficiency of your enterprise.

Value proposition

Proven approach
Energy Consulting Services help you to deliver energy savings through site energy audits and detailed analysis, as well as long-term recommendations and action planning.
Optimized architecture
EcoStruxure architectures are designed to optimize your plant with Schneider Electric and/or third party equipment. PlantStruxure, Schneider Electric's process automation system, connects automation and control to energy monitoring to enable production and process energy optimization.
Based on business KPIs
Our system turns energy information into key performance indicators and helps you make decisions about energy use, supplier allocation and load shedding or shifting opportunities from a single point based on business KPIs.

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Differentiation factors

- PlantStruxure, Schneider Electric's architecture, is a key building block of our comprehensive energy management portfolio, EcoStruxure, which gives us the unique capability to deliver an integrated architecture for both process management and energy management.
- PlantStruxure's automated Energy Management Libraries actively reduce energy consumption by removing energy waste at the source of overconsumption, making processes and energy more efficient.
- While the first step to reducing energy consumption per unit of production is diagnosis, it is not enough. To get results, industry customers need to invest in a long-term energy efficiency strategy to realize quantifiable gains yea-on-year.

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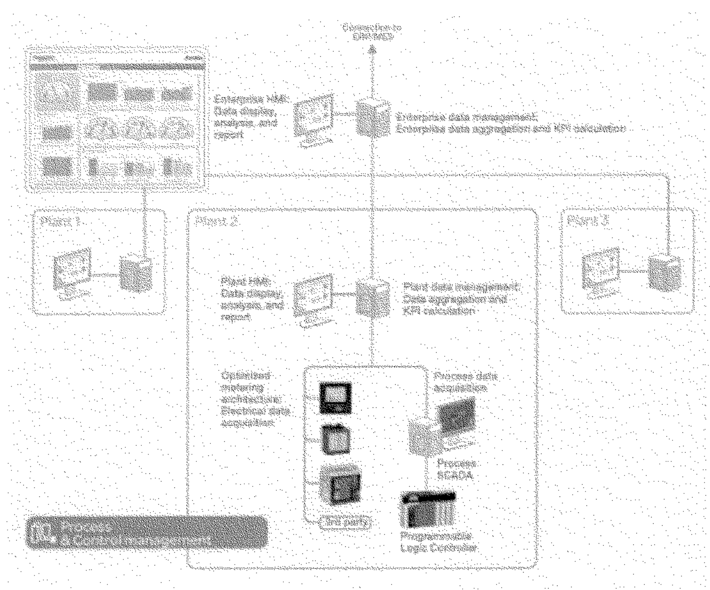
Architecture



Main characteristics

A structured and continuous approach

- **Discover energy waste throughout your process and create an action plan to deliver results.**
- **Connect automation and control with energy monitoring systems to create an intelligent, energy aware infrastructure.**
- **Automate active energy management, gain insight into energy consumption in context with production output and identify more opportunities for savings.**
- **Manage energy as a production variable and reduce waste within the process with continuous improvement initiatives.**

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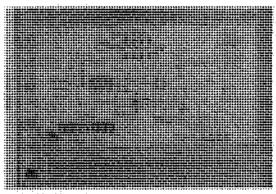
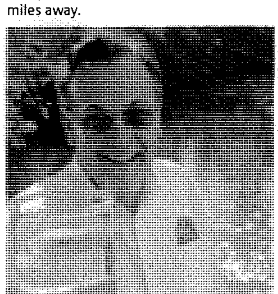
Reliable, cost-effective wastewater treatment and recycling.



Standardized on the Siemens S7-300 programmable logic controller (PLC) and Siemens PROFIBUS and Industrial Ethernet networks, the automation platform controls everything from the flow of electricity to the amount of reclaimed water being safely discharged from the plant. Treated water is sent to the Little Econ River and the Orlando Wetlands Park, while pipelines also deliver purchased reclaimed water to residential neighborhoods, golf courses, citrus groves and other customers as far as twenty miles away.

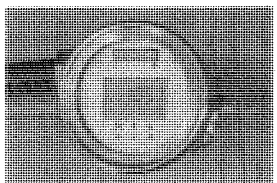


"Our daily objectives focus on keeping the toilets flushing and meeting the growing demand for wastewater treatment and reclaimed water across the region," Wood noted. "We can't reach those goals without the reliability and flexibility provided by Siemens automation and communication systems."

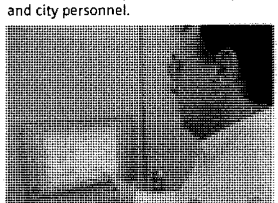
The Eyes and Ears of the Plant

Iron Bridge is a 320-acre operation – a series of treatment processes that must be closely monitored and managed. A Siemens PLC at the master pumping station reads real-time intake levels and signals variable frequency drives (VFD) when to speed up or slow down the eight 400-horsepower pumps designed to handle peak loads of wastewater rushing into the facility through an 84-inch pipe.

Halfway across the plant, Siemens flow meters are measuring the air being pumped into aeration tanks where organic waste is consumed by bacteria. A PLC controls the air flow, records and stores data produced during the intricate, five-stage biological process known as Bardenpho.



Siemens human machine interface (HMI) touch screens located inside every process station and linked to the facility-wide Industrial Ethernet network offer operators a real-time view into every layer of the plant. Siemens' WinCC supervisory control and data acquisition (SCADA) software offers that same vantage on the laptops, desktops and kitchen countertops of authorized plant and city personnel.



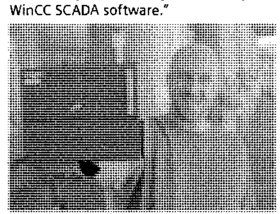
"It used to be a real juggling act for an operator to ensure that water leaving the plant through three separate exits met a variety of strict environmental standards for the river, wetlands and irrigation," explained Wood, as he clicked on the latest plant discharge readings on his office computer. "Now we trust Siemens automation to handle this once intimidating task with web-based WinCC SCADA software integrated over our S7 platform that provides reliable snapshots of our operation status and water conditions anytime, anywhere. Coupled with the operator's expertise, the PLCs have become the eyes and ears of the plant and they have changed the way we do business," Wood noted.

Lowering Operating Costs

Orlando has three advanced wastewater treatment facilities and 210 lift stations, which pump sewage away from the homes and neighborhoods to Iron Bridge or one of two other plants, Water Conserv I and Water Conserv II. Orlando, like most municipalities, treated and operated each facility autonomously for decades. To reduce costs and increase efficiency, the plants were integrated using Siemens automation, WinCC and PROFIBUS and Industrial Ethernet networks.

"Rate freezes and infrastructure, inventory, and labor requirements put a real squeeze on productivity, so we had to find a solution that would benefit all of our facilities," Wood explained. "Instead of having staff dedicated to a single plant, we now share our resources across the entire enterprise using Siemens automation."

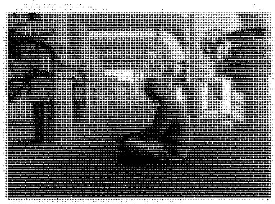
"As the treatment plant grows with the city, we simply can't continue to staff up. It's too costly," noted Guy Mecabe, wastewater systems manager, who has been instrumental in the deployment of the Siemens automation system and the PROFIBUS and Industrial Ethernet networks. "The reach of our networks has grown ten times over in the last two years, as we've expanded our ability to monitor and manage the whole system 24/7 from just about anywhere using WinCC SCADA software."



Authorized managers, operators and technicians can view the Iron Bridge plant

Reliable, cost-effective wastewater treatment and recycling.

from any one of ten onsite Siemens HMIs or a remote computer. They can also monitor and control operations at Water Conserv I, Water Conserv II or the lift stations throughout the city without leaving the Iron Bridge plant. "Secure remote monitoring means I can respond to a trouble call in the middle of the night by simply tapping into any of the treatment facilities from home or wherever I am. It's amazing," said Mecabe. "And we couldn't do any of it without the reliability of Siemens."



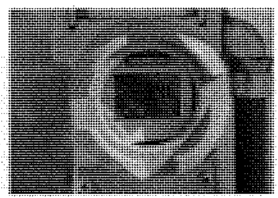
"Because we can't physically push the buttons that start, stop and reset processes, we've called on the best technology to do it automatically and reliably. It's just one of many new cost-cutting practices we've initiated that are really making a difference on the bottom line," said Wood.

Powerful Savings

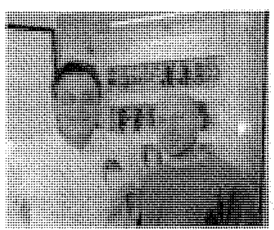
"A lightning strike could instantly cut power to this plant, but all the Siemens PLCs and networks feature UPS (uninterruptible power supply) redundancy. The controllers signal an outage, the generators come online and the plant never misses a beat," explained Wood, noting that Iron Bridge has been struck before because of its location in a central Florida region known as the "lightning capital of the U.S."

While Siemens automation is assisting in the operation of Orlando's wastewater treatment system, a full suite of Siemens generator switchgear, including breakers and protective relays, is standing by to make sure three 2800 megawatt generators never fail during emergency operation.

The Iron Bridge plant is a big consumer of power with a monthly Progress Energy bill that averages $180,000. But the question of the bill's accuracy long nagged Wood and his counterparts. As part of a re-rating plant upgrade, Siemens 9600 and 9330 utility-grade power meters were installed at the plant's power intake and at each of the facility's switchboards and MCCs (motor control centers).



"Until now, we had no way to verify the accuracy of the electric bill. The Siemens metering, linked to our networks, offers real-time consumption data and monthly peace of mind, as well as an effective way to identify the equipment power hogs in the treatment process," noted Wood, referring to the PLC-based system's ability to monitor and enhance power consumption at the device level. "That's a powerful capability that we fully plan to leverage in the months and years to come."



Code to Success

There's no secret to the successful control evolution at the Iron Bridge plant. There's no hidden blueprint. It's more like an open book. Bill Wood, Guy Mecabe and the team are more than happy to share their experience with other industry professionals like Pat Brechbill, a wastewater treatment specialist with the Cobb County system near Atlanta who recently toured Iron Bridge.

"I'm most impressed with the amount of system information and feedback reports available and how it's easily and quickly displayed using Siemens HMIs and WinCC," said Brechbill. "A single purple PROFIBUS network cable has made wiring, maintaining and troubleshooting the plant easier and faster than a conventional facility. All in all, Orlando has one of the most innovative and efficient systems I've ever encountered."

"I've seen too many treatment facilities spend lots of money on upgrades only to end up with outdated and patchwork solutions," explained Wood. "So if we can help steer a community in the right direction, why not offer them a good look at what we're doing here with automation using Siemens equipment."

What Wood and Orlando have done is design an upgraded treatment system with the future in mind. Every piece of Siemens automation and control equipment and software – from the PLCs and HMI touch screens to the WinCC that provides the graphical, insightful views into the plant – is modular in design so we can keep adding new functionality and applications along the way," explained Wood. "We could run this entire plant on two Siemens PLCs. But we've put a PLC in every process station to minimize our risk through a distributed architecture that's given us the ability to do whatever we need to do when demands change in the future."

Even the minimal hardwired functionality in the plant is future-proofed with a recent addition to the plant's automation platform – a multipurpose workhorse from Siemens called SIMOCODE. "SIMOCODE is a very flexible product," said Wood, opening a VFD cabinet in the Bardenpho process station. "We've actually changed our specifications to include a SIMOCODE in

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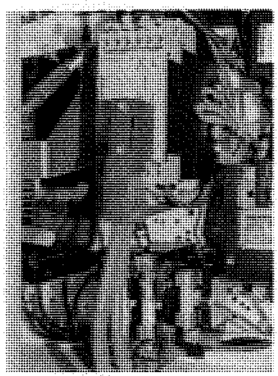
every starter bucket, so we can remotely check the status of smaller feeder breakers, as well as detect and reset faults over PROFIBUS."



Siemens SIMOCODE has dramatically reduced the wiring required in the motor control centers at Iron Bridge. "You can see how clean this cabinet is compared to the elaborate conduit chases with cables running back and forth in control rooms like this," explained Hester. "Instead a SIMOCODE has been placed in each bucket as a piece of I/O that can easily be added and viewed on the network. It's all part of a totally integrated automation solution that works seamlessly."

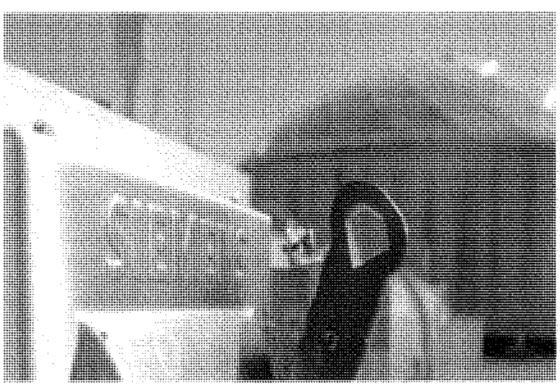
"With SIMOCODE, I have very smart switchgear," said Wood, who is just beginning to see the power savings and preventative maintenance benefits that SIMOCODE can deliver each month. "SIMOCODE enables us to make better informed, accurate operational decisions that will help us dramatically reduce operational costs across the board. That's powerful."

Community-Minded Rewards

For Bill Wood, Guy Mecabe and the Orlando team, wastewater treatment is all about protecting the community and the environment. "Most people aren't thinking about everything that goes into safely returning treated water back into the environment," said Mecabe. "It includes state-of-the-art automation that runs reliably for weeks, months and years enabling us to put clear, clean water back into the aquifer with confidence."

"This is the product of our treatment plant," Wood said, holding up a beaker full of clean water bound for the Little Econ River. "Siemens automation helps give us the confidence and information we need to secure the most important ROI of all – the return of clean water to our rivers, streams and irrigation systems across the region.

That's special treatment."



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Mr. WHITFIELD. Thank you. It will be included in the record.

Ms. MacIntosh, you are recognized for 5 minutes.

STATEMENT OF BRITTA MACINTOSH

Ms. MACINTOSH. Good afternoon, Chairman Whitfield and members of the subcommittee.

Mr. WHITFIELD. Is your microphone on?

Ms. MACINTOSH. Yes, sir. Can you hear me now?

I am Britta MacIntosh, Vice President of Business Development for NORESCO, one of the largest energy service companies in the United States. NORESCO is part of UTC Climate, Controls and Security Systems, a unit of United Technologies Corporation, a leading provider to the aerospace and building systems industry worldwide. Thank you for the opportunity to appear to you—before you today on behalf of the Federal Performance Contracting Coalition.

The FPCC is a coalition of energy services companies that, like NORESCO, implement projects that reduce federal spending on energy and maintenance using private sector funding. Our work is conducted using energy savings performance contracts, or ESPCs——

Mr. RUSH. Would you please speak into the mike?

Ms. MACINTOSH. Our work is conducted using energy savings performance contracts, or ESPCs. Since the 1990s, ESPC projects have reduced waste in federal utility bills. Across the industry, more than 570 comprehensive energy projects have been implemented by 25 federal agencies, creating $13 billion in guaranteed energy cost savings, and eliminating over 32 trillion BTUs of annual energy demand. By using performance-based contracting to upgrade facility infrastructure, we deliver energy and maintenance savings to government and private sector entities. Performance-based contracting means our company's compensation is tied to the realization of savings for the projects we install. In other words, if we don't perform, we don't get paid. At NORESCO, our projects have delivered more than $3 billion in facility improvements at more than 2,000 sites.

An ESPC redirects inefficient spending on energy into needed infrastructure improvements that conserve energy and dollars. Under an ESPC, energy services companies engineer and install upgrades for outdated and inefficient equipment financed by the energy services company and at no upfront cost to the government. An agency will repay the government over time—the company over time with funds saved on utility costs. The projected energy savings are guaranteed upfront by the company and are measured and verified during the contract period. At no time does the government pay more than it would have paid for utilities, had it not entered into an ESPC.

In 2010, for example, NORESCO, working together with the architect for the Capitol, modernized the heating, cooling, water, temperature control, and lighting systems here in the Rayburn Building, and then also in the other House office buildings. This project has cut Congress's energy and water bills by more than $3.2 million annually.

The Federal Government is the Nation's largest energy consumer, costing taxpayers over $7 billion annually. An aggressive government-wide effort to eliminate energy waste in buildings could easily cut that number by 20 percent or more.

Despite the opportunity to better steward the taxpayer's investments in public facilities, several difficult obstacles stand in the way. I would like to talk about three of those.

First, there is a lack of compliance with existing congressional mandates. In 2010, Congress directed agencies to audit their facilities to identify energy and water projects that would pay for themselves within 10 years or less. Currently, it is not clear where agencies stand on this audit process, because those comprehensive reports requested by Congress have not yet been delivered. Even less clear is where agencies stand on implementing the energy savings measures these audits have also identified. This information is critical to understanding how much taxpayer money is being wasted through inaction and inattention.

Second, there is a lack of an apples to apples comparison between the use of appropriations and private sector investment to provide agencies and Congress with the information needed to make good decisions. Oak Ridge National Laboratory has outlined in multiple studies that facilities which use appropriated funds to replace outdated equipment failed to properly budget for the ongoing maintenance of the new equipment. ESPCs require the provision of ongoing maintenance and savings verification to ensure that long-term persistence of savings and proper operation of the equipment is achieved. In 2007, Congress also directed agencies to implement a uniform approach to maintenance and savings verification to ensure that the government realizes the promised savings from any efficiency upgrades, although most agencies have appeared to ignore this direction for appropriated projects. We recommend that you ask how agencies—that you ask agencies how and when this simple requirement will be implemented for all efficiency projects, regardless of how they are funded.

Third, the current approval process for ESPC contracts is excessive, with multiple redundant layers of review in many agencies. Officials with limited knowledge of the facility, project, or recommended technologies are often required to review and sign off on projects before they can proceed. Congress should push agencies to streamline their review process, allowing more projects to begin generating savings more quickly.

In order to confirm that we are making true progress toward meeting our Nation's energy and efficiency goals, Congress needs to complete—needs complete information about available energy savings opportunities at our agency's facilities, each agency's plans for implementation, and full transparency and accountability on all spending related to efficiency projects. We recommend that you take appropriate steps to ensure that prior congressional direction on these items is acted upon.

Thank you again for your time and attention. I will be glad to answer any questions that you have.

[The prepared statement of Ms. MacIntosh follows:]

Testimony of Britta MacIntosh, Vice President of Business Development, NORESCO
On behalf of the Federal Performance Contracting Coalition
Before the House Subcommittee on Energy and Power
February 26, 2013

Chairman Whitfield and members of the subcommittee, thank you for inviting me to testify today regarding private sector mechanisms and financing available to advance energy efficiency across the Federal government.

I am Britta MacIntosh, Vice President of Business Development, NORESCO, one of the largest energy service companies in the United States utilizing performance-based contracting to deliver energy and maintenance savings and significant infrastructure upgrades to existing facilities. NORESCO is part of UTC Climate, Controls and Security Systems., a unit of United Technologies Corporation, a leading provider to the aerospace and building systems industries worldwide. NORESCO specializes in developing and implementing Energy Savings Performance Contracts for governmental and institutional clients spanning the Federal, state and municipal sectors.

NORESCO is also a member of the Federal Performance Contracting Coalition (FPCC), which is a national industry coalition of energy service companies advocating for increased federal use of Energy Savings Performance Contracts (ESPC). FPCC's members have delivered over 90 percent of Federal ESPCs. This coalition is includes companies such as Ameresco, Chevron Energy Solutions, Constellation Energy, Honeywell, Johnson Controls, Lockheed Martin, NextEra Energy Solutions, NORESCO, Schneider Electric, Siemens Government Technologies, and Trane/Ingersoll Rand.

Energy Savings Performance Contracting (ESPC)

I am here today on behalf of the FPCC to discuss how ESPCs deliver energy and cost savings to the Federal government. Specifically, I will discuss how this private sector financing mechanism provides a critical means towards reducing the energy intensity of Federal government agencies, installations and buildings.

As the nation's single largest energy consumer, the Federal government spends more than $7 billion annually on its facility energy costs. The need for comprehensive energy efficiency across the Federal government is an ongoing critical need. In 2007, the Energy Independence and Security Act required Federal agencies to perform energy audits of their facilities. Today, with only half of the buildings audited, approximately $9 billion worth of energy conservation measures with a ten year payback or less have been identified. Simply put, there exists a vast opportunity for energy efficiency across the Federal government at a time of reduced discretionary funding to make these types of investments using traditional means.

ESPCs can fill this funding gap. For over 20 years, performance-based contracts for energy savings have provided critical upgrades to Federal buildings including this Congressional building we have gathered in today. Under an ESPC awarded by the Architect of the Capitol, NORESCO installed energy efficiency upgrades throughout the Rayburn, Cannon, Longworth and Ford office buildings

Under an ESPC, a private sector company finances and installs new energy efficient equipment at no upfront cost to the Federal government. Essentially, an ESPC simply converts the money a federal facility currently spends on wasted energy into a payment stream that finances energy-saving capital improvements in the facility. Federal agencies repay this investment over time with funds saved on utility costs. The private sector contractors measure, verify and guarantee these energy savings, and private sector financiers provide the capital, which today is available at historically low interest rates. By law, and on a negotiated basis, the government never pays more than it would have paid for utilities if it had not entered into the ESPC. In addition to generating energy and dollar savings, years of deferred maintenance at Federal facilities are successfully addressed by ESPC projects at no additional cost to the taxpayers. For these reasons, ESPCs have proven to be a highly successful means to implement comprehensive energy efficiency projects.

ESPCs are used in Federal, state and municipal buildings, as well as in schools, hospitals and universities. In 1986, Congress authorized ESPC use in the Federal government and it has been actively used since the mid 1990's. In fact, during the nineties, the Department of Defense used ESPCs to achieve over 70 percent of its energy savings. Over 30 states have authorized state ESPC programs and the Energy Service Company market is estimated to exceed over $5 billion annually.

In the past twenty years, the US ESCOs delivered about:

- $45B in projects paid from savings
- $50B in energy and maintenance savings – guaranteed and verified
- 400,000 person-years of direct employment
- $30 billion of infrastructure improvements in public facilities
- 450 million tons of CO_2 savings at no additional cost

Benefits of ESPCs

ESPCs provide a number of benefits to the facility, which include:

- Guaranteed performance and cost

- Enhanced reliability and energy security
- Carbon footprint and emissions reductions
- Infrastructure improvements and modernization
- Improved indoor working environments

Regional benefits also accrue and include:

- Local job creation of approximately 10 jobs for every $1 million of investment
- Engineering, manufacturing and trade labor engagement
- Small business subcontracting opportunities

To capture these benefits more readily, the Federal government has Indefinite Delivery/Indefinite Quantity ESPC contracts that allow for their agencies to use these master contracts in developing ESPC projects. For the Federal government, both the Department of Energy and the Army Corps of Engineers have such master contracts. According to DOE's Federal Energy Management Program there have been 570 performance contract projects worth $3.9 billion awarded to 25 federal agencies. These projects reduced annual energy consumption by 32.8 trillion Btu, and resulted in energy savings valued at $13.1 billion, of which approximately $10.1 billion went to finance project investments, leaving a net saving of $3 billion to the government.

In 2009, the Department of Energy prequalified 16 Energy Service Companies for Super ESPC IDIQ contracts of $5 billion each. This represents a total potential of $80 billion in private sector financing available to the Federal government to implement ESPC projects. Today, over $78 billion remains available to Federal agencies. A study by Oak Ridge National Laboratory identified that if the entire $80 billion authority under the DOE contract were utilized the government would save an additional $20 billion. In addition, this would result in the Federal government acquiring $30 billion of new energy equipment at no up-front cost.

Most Federal ESPC contracts range from 15 to 18 years and cannot exceed 25 years. This allows for the bundling of multiple energy conservation measures; that is, the ability to pull a comprehensive package of energy saving measures together that maximizes energy and cost savings opportunities for the customer. Individual energy conservation measures (ECMs) which can make up a bundled ESPC project may include lighting, building controls, HVAC, boiler or chiller plant improvements, building envelop modifications, water savings, refrigeration, renewable energy systems, load shifting and others. The ESCO guarantees that savings accrue and is reimbursed for their investment over this period.

Challenges and Opportunities

Despite the associated benefits of utilizing ESPC, including how they provide much needed facility improvements without the need for upfront capital, the mechanism has been underutilized by the Federal government.

The barriers to increased usage are difficult to quantify but revolve mostly around the fact that performance contracting is different from traditional procurement processes. To address this, we need better education of contracting and legal personnel within agencies, in addition to stronger and focused Federal policy. Education is generally accomplished through the Federal Energy Management Program at DOE, which requires continued and stable funding to ensure that agency personnel throughout the government are well educated about ESPCs and have the technical resources that they need to enter into these agreements. The small amount of funding from FEMP leverages the billions of dollars in savings that are being delivered through private sector performance contracting with the federal sector.

In December 2011, the President released a Presidential Memorandum directing Federal agencies, among other management measures, to enter into $2 billion worth of performance-based contracting for energy savings over a two year period. Administration personnel have actively been working towards this goal by assisting Federal agencies in the contracting process. The FPCC is encouraged by this initiative and we have seen the many Notices of Opportunity (NOOs) for new projects being issued by Federal agencies and subsequent selections of ESCOs to move forward. Nearly 60 projects have been awarded representing approximately $500 million, with $1.5 billion anticipated to be selected upon by the conclusion of the performance period established by the President. Should this goal be met fully it would be quite a success, particularly in comparison to the approximately $400 million per year that is generally contracted for ESPC by the Federal government. We believe the momentum established under this initiative should be continued with aggressive ESPC targets on an annual basis just as the federal agency targets for increasing overall energy efficiency have been extended each time they have been achieved during the past two decades.

Last year, both Representatives Cory Gardner and Peter Welch led letters to the President, signed by 70 members of Congress, supporting a performance contracting goal and encouraging all actions to make it a reality. Since that time, the two Congressmen have formed a bipartisan Energy Savings Performance Caucus to further encourage more ESPCS by all levels of government.

Congress, led by this Committee and supported by this newly formed House Caucus, must keep the pressure on for the Federal government to become more energy efficient, even in the face of reduced energy and infrastructure budgets. After all, ESPCs were authorized by Congress in order to make more efficient use of limited dollars to leverage new technology and energy management practices, which is even more important in this time of fiscal constraint. The FPCC urges the committees of Congress to ask about use of these contracts during oversight hearings for all agencies to ensure that ESPCs are considered before funding is requested for energy efficiency projects. Policy levers are also available to this Committee, which can codify new energy efficiency goals for the federal government, can insist that agencies address the efficiency improvements identified in their audits, can clarify the use of ESPCs for power generation and can expand ESPC use to other areas.

Some of these could trigger a significant scoring event by the Congressional Budget Office. We note, however, that there is disagreement in the scope of the scoring liability that could be attributed to these changes. The Office of Management and Budget, on a bipartisan basis over recent Administrations, has taken a different view on the budgetary treatment of legislation that would set new goals or requirements for Federal use of ESPCs. The FCC is grateful for the support of Chairman Upton in raising the impediments posed by CBO's scoring treatment in his May 2011 letter to the Director of CBO.

In summary, ESPCs are a private sector financing mechanism that allows government to increase their energy efficiency, decrease their energy costs without upfront appropriations and the savings are guaranteed by the contractor. These contracts have delivered more than $7 billion in energy related savings to the Federal government alone and significant additional opportunities abound.

Chairman Whitfield and members of this subcommittee, thank you for the opportunity to appear before you today. I stand ready to answer any questions you might have.

Mr. WHITFIELD. Thank you, Ms. MacIntosh.

Mr. Crouse, you are recognized for 5 minutes.

STATEMENT OF JAMES CROUSE

Mr. CROUSE. Can you hear me?

Thank you. Chairman Whitfield, Ranking Member Rush, and distinguished members of the committee, my name is Jim Crouse and I am the Executive Vice President of Sales and Marketing for Capstone Turbine Corporation.

Capstone is the world's leading producer of low emission microturbine systems. A microturbine is a small, fuel-flexible, typically sized 1 megawatt and below, and can be best described as a jet engine in a filing cabinet sized box. Other forms of combined heat and power, or CHP, we are able to provide either base load or backup power to deficiencies exponentially greater than the grid.

I am delighted to be here today to testify on behalf of the U.S. Combined Heat and Power Association. USCHPA is a non-profit trade association formed in 1999 to promote deployment of CHP systems in the United States through education and advocacy.

I am going to speak today about the opportunity for natural gas-fired CHP and the barriers to greater deployment of CHP that policy makers can address.

Currently, there are 82 gigawatts, or about 7 percent of all U.S. generating capacity produced by CHP systems. The technical potential for additional CHP from existing sites in the U.S. is approximately 130 gigawatts, or 12 percent of the U.S. generation capacity. This is readily available capacity, provided policies are established to support further CHP deployment. Access to low cost U.S. natural gas resources makes supporting CHP a no-brainer, and is an easy route to lower emissions across the United States.

Microturbines and other CHP systems are used by customers throughout the world in a variety of applications. Just to name a few examples, they can be used in onshore and offshore oil and gas sites, like the many transmission sites in Mr. McKinley's district, offshore platform in Mr. Scalise's district, military applications like the one at MacDill Air Force Base, offices like our government office project in Mr. Olsen's district, multi-unit residential buildings, hospitals, like the VA hospital in Mr. Dingell's district, schools and universities like—school in Ms. Capps's district, factories like American River Packaging in Ms. Matsui's district, hotels and other commercial sites like Proctor's theater in Mr. Tonko's district, and wastewater treatment plants, like the plants in Mr. Griffith's district and Ms. McMorris Rodgers's district.

As referenced in my prepared remarks, CHP generally and Capstone specifically offers customers reliable off grid power that as witnessed during Superstorm Sandy provides critical power and thermal energy to hospitals, nursing homes, shelters, and data centers.

Despite these opportunities, our company and the CHP industry continue to encounter numerous regulatory economic barriers that prevent greater deployment. There are pragmatic, cost effective solutions that policy makers can champion to mitigate these issues.

To begin, we would like to see greater top level leadership from the government. While the recent Executive Order calling for 40 gigawatts of new CHP is helpful, we would be better served if the government were to lead by example through increased procurement of CHP to meet federal energy efficiency goals. Additionally, as the EPA implements Boiler MACT, CHP should be strongly encouraged as a compliance strategy for those currently burning coal or oil. As part of this process, facility managers faced with compliance can seek site-specific technical and cost information from the DOE's clean energy assistance centers. Similarly, we hope States will look to EPA's guidance on output-based emission regulations, which unlike input based standards, recognize both efficiency and pollution prevention benefits of CHP. Output-based standards encourage cost effective long-term pollution prevention through efficiency. Likewise, we were glad to hear FERC proposed reforms to small generator air connections. Interconnection continues to be a barrier, but we continue to work with our friends in the utility industry to demonstrate the benefits that CHP provides for the grid and for consumers as a clean, reliable, distributor resource. In addition, both States and utilities should include CHP in their energy planning policies. The CHP industry is eager to be an active stakeholder and support a fair, interconnected standards in CHP rates.

Finally, we note that there are several technologies that currently benefit from government support through various levels of an investment tax credit. We believe the lack of parity in support levels for decentralized and renewable energy technologies blur the marketplace. We support parity in the treatment of various types of clean energy sources, and would encourage a focus on performance-based measures to best spur market competition.

To wrap up, let me highlight again the opportunity exists today to generate clean, reliable power through CHP systems at existing industrial commercial sites across the United States using U.S. natural gas. We appreciate your help in overcoming these barriers that exist to greater deployment of our innovative U.S.-made technology.

Thank you for the opportunity to testify at today's hearing, and I look forward to answering any questions you may have.

[The prepared statement of Mr. Crouse follows:]

Prepared Testimony

Of

Jim Crouse, Executive Vice President, Sales and Marketing
Capstone Turbine Corporation

For the House Energy and Commerce
Energy and Power Subcommittee hearing:

"American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies"

February 26, 2013

Chairman Whitfield, Ranking Member Rush and distinguished members of the subcommittee, my name is Jim Crouse and I am the Executive Vice President for Sales and Marketing for Capstone Turbine Corporation. I am delighted to be here today to testify on behalf of the US Combined Heat and Power Association ("USCHPA") as a member of the trade association's Board of Directors. USCHPA is a nonprofit trade association, originally formed in 1999 to promote deployment of Combined Heat and Power ("CHP") systems, Waste Heat to Power ("WHP"), district energy and other distributed generation sources in the United States through education and advocacy. USCHPA's membership includes over 60 organizations and their affiliates (including several Fortune 500 companies), and more than 300 individual members, including installers, engineers and consultants.

CHP technologies produce both electricity and useful thermal energy from a single fuel at a facility located near the consumer. These efficient systems use heat energy that normally would be wasted in an electricity generator, and save the fuel that would be used to produce heat or steam in a separate unit. CHP units can generate equivalent amounts of thermal and electric energy with far less fuel input than conventional systems—resulting in lower air pollution, reduced costs, and better conservation of natural resources.

Waste heat to power (WHP) technologies capture energy that would have otherwise been vented or lost, thereby producing clean power without burning any additional fuel or emitting any additional emissions. Capturing this waste heat in the industrial sector increases manufacturing productivity and competitiveness. These technologies capture vented heat from industrial furnaces and stacks as well as from the waste energy available in pressure drops within pipelines.

The installed capacity of CHP in United States today totals 82 GW. According to the EIA, that represents about 7 percent of current U.S. nameplate electric generating capacity.[1] Industry estimates indicate the technical potential for additional CHP at existing sites in the U.S. is

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[1] http://www.eia.gov/electricity/capacity/

approximately 130 GW – or 12 percent of current U.S. electric capacity.[2] This is why USCHPA applauded the recent Executive Order by the President to accelerate the investment in industrial efficiency and to encourage the deployment of 40 additional gigawatts of new cost effective CHP.[3]

As the Alliance to Save Energy's Commission on National Energy Efficiency Policy's 2030 report noted, this investment can be made cost neutral.[4] As the report noted, the United States could double its energy production by 2030 by using CHP at a cost of around $166 billion in annual investment. However, because of the efficiencies found in CHP, this investment would return $169 billion in annual savings. In fact, the report points out that every $87 dollars made in energy efficiency investments in commercial buildings and the industrial sector would result in a net energy savings of $189 dollars.

The abundance of natural gas in United States today provides a singular opportunity for CHP deployment. The switch from coal to natural gas in power generation is the primary driver of lower CO2 emissions in the United States. The IEA noted that the United States has experienced the greatest emissions reductions of all countries or regions since 2006.

Capstone Turbine Corporation is the world's leading producer of low-emission microturbine systems, and was first to market with commercially viable air bearing turbine technology. We are a publicly traded company with our headquarters and manufacturing facilities in Chatsworth and Van Nuys, CA, near Los Angeles. We employ approximately 215 people and have annual revenues of over $100 million per year. During the past five years our revenues have grown about 35% year on year as sales of our 200 to 1000 kW products have taken off – especially in oil and gas applications where microturbines are able to run on waste gas that would otherwise be vented or flared to produce highly reliable onsite power and thermal energy.

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[2] http://www.uschpa.org/i4a/pages/index.cfm?pageid=1
[3] http://www.whitehouse.gov/the-press-office/2012/08/30/executive-order-accelerating-investment-industrial-energy-efficiency
[4] http://ase.org/resources/ee-commission-report-summaries

A microturbine is a small, fuel flexible turbine, typically sized one megawatt and below, and can be best described as a jet engine in a filing cabinet sized box. Capstone offers our customers a variety of options, with the scalability of our systems, ranging from 30 kW to 10 MW and with our largest individual microturbine consisting of a 200 kW system. Since combustion is continuous, the microturbine has extremely low emissions. A recuperated cycle allows for highly efficient electricity production. Because they are fuel-flexible, microturbines can operate using liquid or gaseous fuels, including natural gas, biogas, diesel, biodiesel, kerosene, propane and wellhead or flare gas. We have over 120 U.S. patents and continuously innovate our products.

When combined with a heat recovery unit, our systems can provide CHP and can also be configured to provide combined cooling heat and power (CCHP), with efficiencies up to 90%. Microturbines are used by customers throughout the world in commercial, institutional and industrial applications such as offices, multi-unit residential buildings, hospitals, schools and universities, factories, hotels, data centers, landfills, wastewater treatment plants, farms and in hybrid electric vehicles. We have shipped over 6,500 Capstone microturbines to customers worldwide and currently export about half of our production.

One of the benefits of CHP, and particularly Capstone's technology is its resiliency, which was recently demonstrated during the intense powers of Superstorm Sandy. While the destruction was widespread and tragic, with more than 8 million utility customers losing power, there were some instances of buildings and facilities using Capstone and other CHP technologies to "keep the lights on" during those dark days. For example:

- First, for critical services like hospitals, and senior living facilities the need for 24/7 reliable power, either from a base load or backup source is essential. Hospitals are a perfect application for combined heat and power due to consistent thermal and electric loads. Capstone is pleased to report that our installation at Christian Health

Care Center, in Wyckoff, New Jersey, only momentarily lost power allowing the nearly 300-bed facility to continue to operate on its own power system without disruption.

- Second, after a storm like Sandy there are bound to be displaced residents. Unfortunately, as we found out, in many instances the force of the storm was so great, and the path of destruction so wide, that it was difficult to find shelter with heat and power. One location that had the foresight to plan for these issues is Salem Community College in Carneys Point, New Jersey. After seeing the devastation caused by Hurricane Katrina, the Salem County Red Cross updated its disaster relief shelter agreement with Salem Community College to require the college to have a back-up power system capable of providing electricity, cooling and heating to the shelter facility in the aftermath of a massive storm. The community college installed Capstone microturbines, and due to the ability of our system to function without grid power, Capstone's microturbines were able to provide power, heating and cooling for the school and the shelter through the entire duration of the grid power outage.

- Finally, as our nation continues to increase its reliance on the cloud for its banking, commerce and other needs, there is attendant growth in the need for reliable and energy efficient data centers and server rooms. Again, this is where CHP generally, and Capstone's microturbines specifically come into play as the Public Interest Data Center in New York also maintained secure power during Sandy. Again, the data center's dual mode microturbine seamlessly picked up the data center load when the utility suddenly blacked out. Consequently, the servers never went down.

Microturbines, like many other CHP technologies, provide value to the user not only through reliability, but also through reduced utility costs, low emissions, and low maintenance, while also reducing pressure on the utility grid. We are certified by the California Air Resources Board to meet its strict emissions requirement, which we are able to achieve with no active after treatment of the exhaust, meaning that no chemicals are added to the exhaust to clean it. Our microturbine is able to eliminate nearly all SOx and NOx particulate matter emissions as well as reduce greenhouse gas emissions by nearly 40% when compared to baseline utility power for electricity and a standard natural gas boiler for heat.

The benefit from lower maintenance requirements is due to the microturbine having only one moving part, no lubricants, no cooling water and no exhaust after-treatment. A microturbine has only 6 hours of planned maintenance per year resulting in uptime of 99%. The microturbine's engine typically does not need an overhaul until 40,000 hours. In addition, we offer a Factory Protection Program covering all planned and unplanned maintenance for a fixed cost, allowing for predictable maintenance costs over the 5- or 9-year term. We have more than 95 distribution partners globally providing access to after sale support need to achieve these high levels of operational availability. Our projects support local jobs for engineers and tradesmen as distributors work directly with customers to design, install and support projects.

I want to note that we have projects all across the United States, including several projects in this subcommittee's members' districts.

- Lois Capps (D-California) – We have an installation at Carpenteria Valley Farms and with Southern California Gas Company.
- Kathy Castor (D-Florida) – We have an installation at MacDill Air Force Base, which uses 2 C30s as back up power.
- John Dingell (D-Michigan) – We have a 1 MW installation under construction at Ann Arbor VA Hospital.
- Michael Doyle (D-Pennsylvania) – In 2011, a developer transformed Old South Hills High School into a 106-unit LEED-Gold senior living facility. Capstone microturbines were combined with a solar PV array to produce power and hot water for the facility.
- Morgan Griffith (R-Virginia) – We have 65 kW microturbine installation at the town of Christianburg's wastewater treatment plant.
- Ed Markey (D-Massachusetts) – We have a 30 kW installation with

Cambridge Housing Authority, a national leader in subsidized affordable housing for low-income households.

- Doris Matsui (D-California) – We have 2 C65 microturbines recently installed at American River Packaging in Sacramento.
- David McKinley (R-West Virginia) – Dominion Transmission has 53 microturbines installed at 11 sites to provide low emission, highly reliable electricity at its remote sites. They also use CHP units for fuel gas heating.
- Cathy McMorris Rodgers (R-Washington) – We have 4 C65 microturbines at the Spokane wastewater treatment plant.
- Pete Olson (R-Texas) – We have an Uninterruptible Power Source installation at a U.S. government site. This site was commissioned in 2009 after Hurricane Katrina and Hurricane Ike each took the facility offline. The facility installed UPSource models featuring 6 C65 microturbines that generate up to 390 kW of continuous power. Heat recovery modules on each microturbine ensure production of 251,000 BTU/hr (74 kW) per microturbine of clean waste heat used to heat water for lab use. The microturbines eliminated the need for a secondary boiler system. The microturbines are not reliant on the electric utility and provide a 100% up-time solution. On average, the site demonstrates 20% savings over cost of ownership of traditional UPS in n+1 configurations due to higher efficiencies. We also have over 20 MW of microturbines installed in the Eagle Ford shale formation that reduce flaring and provide onsite power for oil and gas.
- Joseph Pitts (R-Pennsylvania) – Masonic Village is a continuing care retirement community with more than 1,700 residents. For decades, the complex's old coal plant burned in excess of 5,000 tons of coal each year to produce heat for laundry and space heating. In 2002, 5 C60 low-emission Capstone microturbines in a CHP application were installed to produce a combined 300 kW of electricity. They were upgraded to C65 CHP units in 2007 and a sixth C65 microturbine was added in 2011. Each C65 produces 408,000 BTUs an hour for a 47% increase in net heat recovered and an overall system efficiency of approximately 83%.
- Steve Scalise (R-Louisiana) – BP installed a C60 Capstone microturbine

at its Grand Isle Offshore Platform in Louisiana in 2002 to provide reliable onsite power to the platform. BP chose a microturbine for its high reliability, small footprint, low maintenance, high efficiency and low emissions.

- Paul Tonko (D-New York) – Proctors renovated the 2,700 seat theater in downtown Schenectady in 2007. Proctor's Theater had been heated with a boiler plant and cooled with various distributed cooling systems. A new central boiler and chiller plant was designed for the renovated facility. The electric capacity of the CHP plant is 240 kW (Four 60 kW Capstone microturbines) and supplies the base electric, heating and cooling load all year around, minimizing the standby charges (the CHP plant capacity represents 13.8% of the peak electric demand). The CHP facility is integrated with a new central boiler and chiller plant. The project provides a peak reduction of 240 kW, and resulted in more than $500,000 in annual net energy savings for the host site facility.

Capstone has benefitted from ongoing DOE R&D funding. From winning an initial competition to develop high efficiency CHP in the early 2000s, we have continued to value our joint partnership with DOE and are currently working with them on the development of a 370 kW product that aims to achieve 42% electrical efficiency. Currently, our microturbines provide the most energy efficient gas turbines under 4.5 MW. We are also undertaking R&D to develop systems that can run on opportunity fuels such as syngas, solar power and hydrogen.

Despite all of these positive developments, our company and the CHP industry continue to encounter numerous barriers towards greater deployment. The barriers we face in deploying greater amounts of CHP are legal, regulatory and economic. We would like to see greater top-level government leadership on specific CHP issues in the context of energy policy. For example, while the Executive Order to increase CHP is helpful in highlighting the value of the technology, active leadership in the form of federal procurement of CHP to meet federal energy efficiency goals would more clearly demonstrate support for achieving such targets. According to the Alliance to Save Energy, these types of efficiency improvements in federal facilities would save taxpayers $13 billion annually.

Beyond simply encouraging or even requiring federal facilities to take advantage of the efficiencies of CHP for the long-term savings for the taxpayer, there are other concrete steps that the Federal government can engage in to encourage the deployment of CHP technologies. For example, as the EPA implements its Boiler MACT emissions standards, CHP should be strongly encouraged as a compliance strategy for those currently burning coal or oil. DOE's Clean Energy Assistance Centers can provide site-specific technical and cost information to facility managers.

Similarly, we hope states will look to EPA's guidance on output-based emissions regulations, which recognize both the efficiency and pollution prevention benefits of CHP, unlike input-based standards. Output based standards encourage cost-effective, long-term pollution prevention through process efficiency. We also want to work with utilities to demonstrate the benefits that CHP can bring to the grid as a clean, distributed resource. Both states and utilities should include CHP in energy strategy and resource planning efforts.

Likewise, we were glad to hear FERC propose reforms for small generator (<20MW) interconnections to reduce the time and cost to process requests and allow for more efficient interconnection of distributed resources. The CHP industry is eager to be an active participant in these discussions. We hope guidance to state regulators on common and fair interconnection standards and rates for CHP will be heeded.

Finally, as Congress considers how to address the need for comprehensive tax reform, we note that there are several technologies that currently benefit from government support though various levels of an Investment Tax Credit. We believe the lack of parity in support levels for decentralized and renewable energy technologies blur the market place and does not properly encourage the deployment of the best technologies or the technologies that provide the most benefit to the system. We support parity in the treatment of the various types of clean energy sources and would encourage a focus on performance-based measures to best spur market competition.

In conclusion, Capstone and the USCHPA believe that a variety of factors, including technological advances and the abundance of cheap, domestically sourced power have combined to allow the United States to take advantage of the efficiencies of CHP. While barriers exist, we remain confident that the policy makers will eventually get it right to help facilitate further deployment of CHP in the United States and allow businesses to capture the cost savings of this transformative technology.

Thank you for the opportunity to testify at today's hearing and I look forward to answering any questions you may have.

Mr. WHITFIELD. Thank you, Mr. Crouse.

Ms. Burt, you are recognized for 5 minutes.

STATEMENT OF HELEN A. BURT

Ms. BURT. Thank you. Good afternoon, Chairman Whitfield, Ranking Member Rush. Let me begin by thanking you and members of the committee for this opportunity to testify today. I am Helen Burt, Chief Customer Officer for Pacific Gas and Electric Company.

PG&E is one of America's largest combined gas and electric utilities. We serve about 15 million people in northern and central California, and over the last 30-plus years, together with the State of California, we have helped customers achieve extraordinary benefits when it comes to energy productivity.

For us, these efforts are about being smarter when it comes to using energy. They are not about making do with less. They are about doing more with the energy we consume, helping customers get the most value of their energy dollars. Working as partners, utilities and our State policy makers have been able to support and encourage innovation and adoption of new technologies, and we have developed the most successful customer energy efficiency programs in the country.

Sometimes we are working with the end use customers like homeowners or small business owners. Other times we are moving further up the value chain, working directly with manufacturers, distributors, retailers, and contractors. The point is, we take a comprehensive approach and the results reflect that.

If you look just at PG&E since our programs began some 30-odd years ago, the customer savings have been more than $20 billion. We have also avoided the need to build more than 25 power plants, saving all our customers money and providing tremendous environmental benefits.

What is remarkable is that the potential gains look even greater today, thanks to the growing intersection between IT and energy. Technologies like SmartMeters are creating huge new opportunities. By enabling two-way communications on the grid, they are opening the door for wider adoption of advanced technologies like electric vehicles, smart thermostats, and other energy management tools. But most significantly, they are giving people more control over their energy bills. PG&E customers can now get near real time information on their energy usage. Last year, we were able to create an online tool called the Green Button, which allows them to download that data. They can then use various apps to help them understand and then come up with options to achieve savings.

As significant as the potential is to achieve further gains, we need the right policies. These include constructive tax policies, support for research, development, and deployment, supportive regulatory and rate structures, codes and standards, and programs that empower consumers and help companies share best practices. As you and others in Congress consider ways to help drive further progress, I would to highlight several areas where our experience shows you can have the greatest impact.

One is encouraging regulatory approaches that incent utilities to pursue efficiency. Many utilities still face strong disincentives, changing this one key to success. At PG&E, we now treat energy efficiency projects as a resource, just like we do new traditional generation facilities.

Another area is improving regulatory consistency. Programs work best when everyone can operate from a consistent set of policies that they can count on for longer periods of time. That way, they can make multi-year commitments to support commercialization and deployment efforts.

We also recommend encouraging consistent and clear methods for measuring and verifying the results of energy efficiency projects.

A third area is encouraging public-private cooperation between utilities and government. For example, PG&E manages energy efficiency turnkey projects for federal customers through our Utility Energy Services Contracts Program. One effort now underway at the NASA Ames Research Center is expected to save more than $1.5 million annually in water and energy costs. Nationally, UESC projects are saving taxpayers roughly $400 million a year. We should continue to encourage these efforts.

Finally, a fourth area is building codes and appliance standards. These provide a foundation for other energy efficiency efforts, and drive new technologies, programs, and practices.

Our hope is to work collaboratively with many members of this committee, who are already exchanging good policy ideas around energy productivity. New ideas and approaches will evolve just as quickly as the technology around us. As PG&E in California has demonstrated, energy efficiency can save money, spur innovation, provide consumers with more choices, and make our economy more productive and benefit the environment.

Thank you again for this opportunity. I look forward to answering your questions.

[The prepared statement of Ms. Burt follows:]

Testimony of Helen Burt
Senior Vice President Customer Care and Chief Customer Officer
Pacific Gas aud Electric Company

Before the

U.S. House Energy and Commerce Committee
Subcommittee on Energy and Power

Oversight Hearing on
"American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies."

February 26, 2013

Chairman Whitfield, Ranking Member Rush and Members of the Committee, I am pleased to appear before you to offer my views on the role energy efficiency plays in making our economy more productive, more innovative and more competitive. By investing in energy efficiency, modernizing our nation's energy system, and educating businesses and consumers on available options and technologies, we have an opportunity to get more value out of every dollar consumers and business spend on energy, creating savings that can be used in other productive ways.

I look forward to sharing with you some of the successes we have achieved at Pacific Gas and Electric Company (PG&E) and in California surrounding energy efficiency and demand response; the benefits and savings these resources have provided to our customers and state; the opportunities we believe exist to do more; and the policies needed to make an even bigger impact.

About PG&E and Our Industry

By way of background, PG&E is one of the largest combined natural gas and electric utilities in the United States. With more than 20,000 employees, the company provides natural gas and electric service to 15 million people throughout a 70,000 square-mile service area in northern and central California. We operate one of the cleanest fleets of electric generating assets in the country, including the nation's largest privately-owned hydroelectric system, which incorporates a 1,200-megawatt (MW) pumped storage facility, a 2,200 MW nuclear station, three highly-efficient and flexible natural gas plants, and more than 100 MW of photovoltaic solar generation.

We have also made industry-leading investments in innovative customer energy efficiency and demand response programs over the past 30 years. Our programs include efforts to directly educate and incentivize customers to purchase energy efficient products; working with retailers, distributors, vendors, trade professionals and contractors to increase the accessibility of high efficiency products; and partnering with manufacturers and distributors to increase the market share of higher efficiency products.

These and other initiatives developed, implemented and managed by PG&E, and encouraged by California, have saved our customers more than $20 billion and avoided more than 180 million metric tons of greenhouse gas (GHG) emissions. These successes have been instrumental in keeping California's per capita energy use flat since the 1970s, thereby avoiding the need to build approximately 25 large power plants. In fact, in 2011 alone, PG&E's programs saved 270 MW of electricity and 33.2 million therms of natural gas. These results helped save customers more than $262 million on their energy bills and avoided the emissions of nearly 840,000 metric tons of GHG.

PG&E is not alone. Utilities nationwide are working with states and customers to reduce energy demand and increase energy productivity. The power sector's record on energy efficiency demonstrates a broad commitment to—and expertise in—helping consumers use energy more wisely. According to a report expected this week from the Edison Foundation, electric utilities spent a record $5.7 billion on energy efficiency and demand response programs in 2011, and saved 107 billion kWh of electricity—enough to power nearly 11 million homes, while avoiding 75 million metric tons of GHG emissions.

Providing Innovative Energy Solutions to Our Customers

We put our customers at the center of how we design our energy management programs. In fact, we maintain a portfolio of 130 individual programs tailored to meet their unique needs. We help customers understand, actively manage and reduce their energy use. To support this goal, we are enabling new tools and technologies to spur innovation and provide customers with broader choices for rates, products and services. This includes using SmartMeter™ technology to give customers increased information and facilitate the wider adoption of advanced technologies, such as electric vehicles, smart thermostats and other energy management tools.

Improving Service and Empowering Customers with SmartMeter™ Technology

PG&E's SmartMeter™ program is critical to our efficiency efforts. It is also helping to lay the foundation for a Smart Grid. PG&E's program represents North America's largest deployment of automated metering infrastructure, with more than nine million meters installed to date. Statewide, utilities have deployed more than 17 million meters. The system's wireless communications enables us to provide more reliable service, making it possible to restore power faster after a disruption or reconnect a customer after a move to a new residence.

The technology also gives customers access to more frequent information about their energy use, which enables them to better manage their consumption and costs. One of the tools we created using SmartMeter™ technology is the Green Button. PG&E responded to a White House challenge to design a standard format for customers to access energy usage data online. The button allows customers to download their hourly usage information in an easy-to-use format.

The standardized data format also encourages third-party developers to create innovative "apps" to maximize the full potential of this information. PG&E joined with the U.S. Department of Energy and Itron Inc. in 2012 to sponsor a $100,000 competition to develop the best Web or mobile apps using the Green Button. This voluntary program is now being adopted widely across the country. As companies continue to implement the Green Button, more than 36 million customers nationally will have access to this tool.

PG&E customers can also share and compare their energy use data with friends on Facebook, using a new social energy application. The app, created by Opower in partnership with Facebook and the Natural Resources Defense Council, provides insight into individual energy use while fostering friendly energy-savings competition among participants. PG&E also provides customers with customized information and energy savings advice through our *My Energy* website and our *Home Energy Reports*. These tools allow customers to better analyze their energy usage and compare their energy use with similar homes in their area.

Comprehensive Energy Solutions for Our Customers

In addition to providing better information, we provide customers with incentives for comprehensive energy-saving improvements. Programs like Energy Upgrade California offer a suite of incentives that encourage combining multiple improvements at once to increase a home's overall energy productivity and achieve greater savings. As part of this California-wide effort, PG&E launched its Whole House Program in 2010. The effort includes extensive outreach to homeowners and training for contractors at our Energy Training Center in Stockton. This program helped facilitate improvements in nearly 1,000 homes in our service area last year.

For large business customers, we provide an energy management analytics and planning tool that enables them to determine the best mix of our products and services to maximize efficiency benefits. We can show customers how their facilities' energy use compares with one another and with industry benchmarks. We also will be providing an online survey tool for small and medium-sized businesses that identifies their largest end uses of energy and recommends comprehensive energy-saving and productivity opportunities.

Working with the Federal Government

In addition to residential and business customers, we work closely with federal agencies to help them meet their energy goals. For example, PG&E manages energy efficiency turn-key projects for federal customers through our Utility Energy Services Contract (UESC) program, which enables federal customers to partner with PG&E's team of efficiency experts. PG&E is currently completing a project for the NASA Ames Research Center, near Mountain View, California. The project encompasses more than 100 buildings and covers more than 2.5 million square feet. As a result, NASA will save nine gigawatt-hours of electricity, 1.3 million therms of natural gas and more than 15 million gallons of water annually, representing an 11 percent reduction in annual energy intensity (BTU per square foot) and a 25 percent reduction in annual water consumption. The Center will also save more than $1.5 million annually in water and energy costs.

According to the Federal Energy Management Program, UESC projects are saving taxpayers roughly $400 million a year, nationally. Since 1994, almost 1,700 UESCs have been awarded, worth more than $2.3 billion, and saving more than 14 trillion BTUs. Given this track record, and their critical role in helping government continue to cost-effectively increase its energy productivity, renewable energy and energy security goals, we believe the use of UESCs should be encouraged.

Training and Preparing for the Future

One of the keys to successfully implementing our energy efficiency programs is equipping professionals with the skills and training to support these efforts. Architects, engineers, designers and technicians are among those who all play a significant role. To develop this expertise, PG&E runs hands-on training and educational programs and facilities. For example, our Pacific Energy Center (PEC) hosts courses on energy efficiency, demand response and renewable energy. Since 2006, the PEC has provided more than 920 unique courses, 950 technical consultations and 600 outreach events. Last year alone, the center hosted about 8,000 students.

The PEC is one of three PG&E centers devoted to promoting energy-efficient building design and practices. PG&E also has a center in Stockton for residential buildings and one in San Ramon that focuses on restaurants and the food industry. PG&E's Energy Training Center in Stockton is the nation's longest continuously operating weatherization training center. Since

1978, the center has trained more than 91,000 participants who, in turn, have performed energy audits, weatherization or home performance services for more than 2 million Californians.

We also partner with others on education. For example, California requires that all new residential and commercial buildings be zero net energy (ZNE) by 2020 and 2030, respectively. As a step toward this goal, PG&E-sponsored an architectural design competition to demonstrate the potential for ZNE residential construction. We also constructed a model ZNE home at our Stockton training center, offering a hands-on experience to professionals working in the field.

Shaving the Peak, Saving Money and Using Resources More Wisely

Demand response programs provide an effective way to address periods of high energy demand and short supply, by encouraging customers to reduce or shift their energy use on days when demand is at its highest. Overall, customer participation in PG&E's demand response programs avoided the purchase of 575 MW of power generation capacity in 2011. These programs also enable utilities to avoid the costs and environmental impacts of building and maintaining additional power plants that would only be needed for relatively few hours per year, saving money for all our customers.

PG&E's demand response programs range from SmartAC™, which cycles residential air conditioning units on and off, to PG&E's Automated Demand Response program, or "AutoDR," which enables customers to automatically reduce their energy use when they receive an electronic signal from PG&E. Since 2005, PG&E has successfully demonstrated the program with a small group of customers. PG&E led the development of the Open Automated Demand Response 2.0 (OpenADR) standard, drawing on our years of work with Lawrence Berkeley National Lab. In 2011, the National Institute of Standards and Technology ratified the standard, which provides a common language for the energy industry to use for sending AutoDR signals.

Supportive Regulatory Structures and Policies Matter

While technology and innovation play significant roles in advancing energy efficiency and demand response efforts, they have been bolstered by a suite of state and federal policies. These include supportive tax policies; support for research, training, development and deployment; supportive regulatory and rate structures; codes and standards; and federal and state programs that educate consumers and provide an opportunity for companies to share information and best practices.

For example, in California, the state has prioritized energy efficiency and views it as an energy resource, similar to generation. Policymakers have established a "loading order" of preferred energy sources that emphasizes expanding customer energy efficiency and demand-side management programs before adding new generation.

Other policies that have helped us and the state achieve aggressive efficiency goals, include:

- *Aligning incentives.* Many rate designs create financial disincentives for utilities to promote energy efficiency. California's model of "decoupling" removes these disincentives: utility revenues and earnings are independent of actual energy sales volumes. Decoupling eliminates the financial incentives to sell ever-increasing amounts of energy (i.e., the financial incentives are "coupled" with growth in power sales). The state's utilities collect no more and no less than the revenues necessary to run their business and provide a fair return to shareholders. If sales rise above these levels, the extra revenues go back to customers, rather than to the bottom line of the company; if sales fall below intended levels, utilities are assured they can recover the shortfall going forward. Energy efficiency goals can be achieved even more effectively if decoupling is combined with incentives that help motivate utilities to promote and embrace energy efficiency and put it on par with similar investment opportunities, such as building new generating facilities. California pioneered such incentives in the 1990's and adopted a system whereby utilities' shareholders can benefit if the company delivers real energy savings to customers.

- *Establishing a consistent regulatory environment.* California's current cycle for energy efficiency program development and investment is three years. Program continuity is important to all of the industry players, including the utilities, large and small technology and services companies, non-profits, and governmental entities. Providing a three-year energy savings target and funding for this time period enables us to engage with customers on high-value efforts that have longer lead-times. Customers are assured that the incentives will be available, even though efficiency measures may take several years to complete. These multi-year program cycles also allow us to work with manufacturers and distributors of energy efficient products and equipment, because we can make multi-year commitments to support commercialization and deployment efforts.

- *Developing evaluation, monitoring and verification (EM&V) programs to track and account for these savings.* California is continuing to refine EM&V methodologies to be transparent, consistent and understandable, which will further acceptance of energy efficiency investments by customers and utility shareholders and allow programs to be even more effective and target the highest value savings.

- *Encouraging public-private partnerships.* California's success with energy efficiency is the result of cooperation at all levels. For example, PG&E has partnered with local governments to help them reduce energy usage, create jobs, save money, achieve environmental goals and provide other community benefits. Through our Innovator Pilots Program, we are helping communities test new ways to achieve deeper energy savings. The program provides funding to local, regional and sub-regional governments to support innovative approaches to energy efficiency.

- *Establishing building codes and appliance standards.* Approximately half of the energy savings achieved over the past three decades in California are the result of the state's aggressive building codes and energy efficiency standards for end-use equipment and appliances. Codes and standards provide the foundation for all other energy efficiency efforts and drive new technologies, programs and practices. PG&E has dedicated employees that support the efforts of the California Energy Commission (CEC), the U.S. Environmental Protection Agency's EnergyStar Program and others through our Codes and Standards Enhancement program. For example, PG&E actively supported an efficiency standard for battery charger systems that was adopted by the CEC in 2012. There are an estimated 170 million chargers in California households. Once fully implemented, California customers will save more than $300 million annually and eliminate one million metric tons of GHG emissions.

Legislative and Agency Actions

Congress has debated and passed multiple bills over the past several years that incorporate some of these policy recommendations. For example, at the end of last session, Congress extended many expiring energy efficiency tax credits until the end of 2013, including those related to home improvements and equipment upgrades. It also passed H.R. 6582, a bill focused on boosting energy efficiency in the federal government and other areas, such as the industrial sector and through appliance standards. We appreciate the instrumental role that many members of this Committee had in creating and passing these bills.

In addition to the bills that passed, last Congress Representatives McKinley and Welch introduced the "HOMES Act," which focused on home energy retrofits. And, earlier this month, in the 113th Congress, Representative Eshoo, along with Representative Mike Rogers, introduced the "Energy Efficient Government Technology Act," which seeks to make energy improvements to federal data centers. In each case, we believe these bipartisan bills provide the direction needed to continue to create incentives and establish new effective policies. As the Committee considers bills such as these or others that may be introduced, we ask that it recognize the important role that utilities and UESCs play in ensuring that efforts track with existing state energy efficiency programs and leverage the unique knowledge, expertise and capabilities that utilities have developed through many years of experience implementing successful initiatives.

I would also like to express my support and thanks to Congressmen Gardner and Welch for leading the creation of the bipartisan Energy Savings Performance Caucus. Clearly, Mr. Chairman, their efforts along with the bills referenced above, display the wide-ranging interest to advance thoughtful, bipartisan approaches to increasing our nation's energy productivity and leveraging energy efficiency as a resource.

We are also encouraged by the Administration's continued focus on this topic, through efforts like Better Buildings, Green Button, the continued work of EnergyStar and the proposed "Race for the Top" grants announced during President Obama's State of the Union address. PG&E is proud to serve as an "Utility Ally" of the Better Buildings program and has long worked collaboratively with EnergyStar and its offshoots. Programs such as these encourage innovation and collaboration, advance best practices and educate the public on the energy gains that could be made – helping average Americans save money and making businesses more competitive.

Finally, we appreciate the work and recommendations of the Alliance Commission on National Energy Efficiency Policy. The Commission's Energy 2030 Report findings underscore the energy productivity gains that could be made with existing technologies. The report, which resulted from a broad-based collaborative effort, also provides a number of recommendations for federal policies the Committee might consider pursuing. We also want to commend the Business Council for Sustainable Energy, of which PG&E is a member, and Bloomberg New Energy Finance for their work in creating the Sustainable Energy America 2013 Factbook. It is an excellent resource for straightforward and quantitative information on sustainable energy markets, trends and investments.

The Time Is Now

As PG&E and California have demonstrated, energy efficiency can help save money, spur innovation, provide consumers with more choices, make our economy more productive and benefit the environment. While there has been tremendous progress nationally over the last several decades, there are significant opportunities to do more. Making cost-effective energy improvements to existing federal and commercial buildings, while setting attainable energy standards for building codes, materials and appliances will reduce pollution, allow consumers to better manage energy costs, advance new technologies and make our country more globally competitive. As Congress moves forward on this issue, it is important to recognize the critical role that utilities have played and will continue to play in the successful design and implementation of these efforts.

On behalf of PG&E, thank you for the opportunity provided today. I appreciate the commitment of this Committee to advancing energy efficiency as a priority resource and recognizing its tremendous value to enhancing America's energy security and economic competitiveness.

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Mr. WHITFIELD. Thank you.

Mr. Elliott, you are recognized for 5 minutes.

STATEMENT OF R. NEAL ELLIOTT

Mr. ELLIOTT. Thank you, Chairman Whitfield, Ranking Member Rush, members of the committee. I appreciate the opportunity to speak today. My name is Neal Elliott. I am the Associate Director for Research at the American Council for an Energy Efficient Economy, frequently called ACEEE. We are a private, nonprofit, nonmember research institute based here in Washington, D.C.

As Ranking Member Rush said in his opening remarks, ACEEE has looked at the impact of energy efficiency on the U.S. economy and found it to be a significant contributor to economic growth over the last 40 years. In particular, I would note that as has been noted by many of the witnesses so far today, energy efficiency represents the least cost energy resource in the U.S. economy, and a recent analysis suggests that in 2010 it contributed about half as much as all of the conventional resources to the U.S. economy.

I mentioned in my written testimony five areas that we think the committee should consider for action in the coming Congress, and wanted to focus three of those in my oral remarks.

The first, which is has come up several times, is appliance standards, and I wanted to mention that since 1987, with the passage of the EPCA, Energy Policy Conservation Act, energy standards have saved 3.4 quads of energy and that the standards that are in place today are projected to save $1.1 trillion through 2035.

We have many other standards that are currently in development, and I wanted to bring to the attention of the committee that one of the important ways that these are being developed now is through a negotiated process in which the energy efficiency advocates, people—stakeholders such as PG&E and other utilities, and the manufacturers come together to develop consensus proposal. The Energy Policy Act of 2005 enabled DOE to accept those consensus standards directly into rule and we have begun to see that move forward in the process. There are a number of negotiations that are currently underway. In the past, these negotiations have been enacted as part of the federal energy legislation, and we hope the committee will consider several of the provisions that are currently under development, as they look at legislation. This is a very efficient and effective way to bring consensus between the manufacturers and stakeholders, and move the market forward together.

Second issue I wanted to raise to the committee is building codes. As has been noted, buildings consume approximately 40 percent of the energy in the U.S. economy, and codes represent the easiest and most cost effective way for consumers to benefit from energy efficiency. It is important that we continue to revise and look at best practices that exist in terms of building codes, but it is also equally important that we focus on the implementation of the building codes in the marketplace. A building code on the books means nothing if the builders out there in the market are actually not implementing it, and we would encourage DOE to work with State and local governments to build the capacity, both within the enforcement side of this, but also work with the contracting community and building community out there to implement the codes so that the energy efficiency benefits are available to all customers.

Finally, the last area I wanted to speak about is manufacturing. U.S. manufacturing sector is poised for a major expansion and reinvestment, and until recently, has not received a lot of attention at the federal level. In particular, we would recommend three things the Department should—the committee should consider.

First, we think it is important that the DOE's manufacturing program be reenergized. There has been a lack of leadership for over a decade there, and we think there is some opportunities for it to move forward. Specifically, we would recommend that the Department be directed to establish an industrial steering committee to ensure a strong working relationship exists between manufacturers, the Department, and other stakeholders, and that that partnership should work to leverage private sector funding. In the past, this program R&D area has been among the most successful R&D efforts in the entire Federal Government, and was able to leverage $3 in private sector funding for every $1 that was spent by the Federal Government.

Second, we think it is important to maintain a balance between your term R&D, long-term R&D, and deployment, and all of these need to be targeted in cooperation with the manufacturers so that we receive maximum efficiency.

Finally, I wanted to mention the idea of smart manufacturing. This is—as we look, we have already mentioned intelligence in the marketplace. We think manufacturing will benefit from that and encourage you to direct the Department to initiate a smart manufacturing program to explore those resources.

Thank you for the opportunity to present, and I look forward to questions. Thank you.

[The prepared statement of Mr. Elliott follows:]

ACEEE Testimony
American Council for an Energy-Efficient Economy

Submission of R. Neal Elliott, Ph.D., P.E.
Associate Director for Research
American Council for an Energy-Efficient Economy (ACEEE)

To the House Energy and Commerce Committee
Subcommittee on Energy and Power

Hearing on:
American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy-Efficient Technologies

February 26, 2013

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SUMMARY

Energy efficiency is the least-cost energy resource available in the United States today. Energy efficiency is also important to the U.S. economy, contributing over half as much benefit as conventional energy resources contribute, and an important source of new jobs.

Energy efficiency policies represent bipartisan opportunities to improve our energy and economic security. A number of energy efficiency policy opportunities exist within this Committee's jurisdiction that can contribute to these goals. Among these policies are:

- Appliance and equipment standards
- Building codes
- Building labeling and disclosure
- Training and assistance centers for buildings and industry
- Industrial energy efficiency

These policies can help ameliorate some of the market barriers that keep investments in energy efficiency below optimal levels. Smart policies can help address some of these market barriers, helping the private market to better capture these efficiency opportunities.

INTRODUCTION

My name is Neal Elliott and I am the Associate Director for Research with the American Council for an Energy-Efficient Economy (ACEEE), a nonprofit organization dedicated to increasing energy efficiency to promote both economic prosperity and environmental protection. ACEEE was formed in 1980 by energy researchers and will be celebrating our 33rd anniversary in 2013. Personally I have been involved in energy efficiency issues since the late-

1970s, primarily focusing on industry and agriculture, and have testified multiple times before various House and Senate committees on energy efficiency topics.

ACEEE is a nonpartisan organization, having testified before this committee as both a Republican and Democratic witness in the past. In our view, energy efficiency is a quintessentially nonpartisan issue.

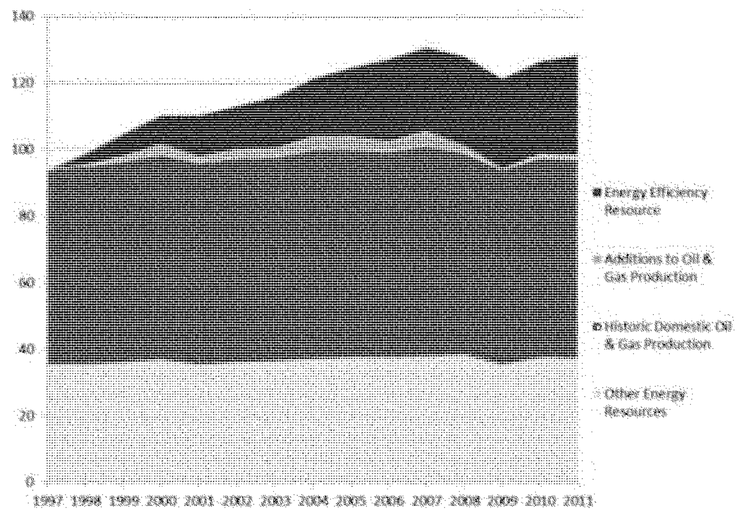
In my testimony I wish to make two primary points:

1. Energy efficiency is a key energy resource for the United States, with costs generally lower than other energy resources. Energy efficiency is important to the U.S. economy, contributing over half as much benefit as conventional energy resources contribute.
2. A number of energy efficiency policy opportunities exist today that can contribute to our energy and economic security. Among these policies that I will focus on in my testimony are:
    - Appliance and equipment standards
    - Building codes
    - Building labeling and disclosure
    - Training and assistance centers for buildings and industry
    - Industrial energy efficiency

ENERGY EFFICIENCY IS A KEY RESOURCE

Energy efficiency investments have been an important contributor to our nation's economic growth and increased standard of living over the past 40 years. Energy efficiency improvements since 1970 accounted for approximately 100 quadrillion Btu in 2010, which is *about as much energy as we consume each year and more than the energy we get annually from domestic coal, natural gas, and oil sources combined.*[1]

Figure 1. U.S. Energy Resources 1997–2011



Source: Data from EIA except for energy efficiency, which was derived by ACEEE from EIA data on energy use per dollar of GDP.

A recent analysis by ACEEE suggests that the incremental cost of all energy efficiency investments (e.g., upgrading from an average refrigerator to an ENERGY STAR® model) was $72–$101 billion in 2010.[2] This includes energy efficiency program expenditures, sales of ENERGY STAR products, investments in building efficiency improvements, repairs and new construction, trends in manufacturing energy use and investments, and sales of efficient

[1] See Figure 1 in Laitner et al. 2012. *The Long-Term Energy Efficiency Potential.* American Council for an Energy-Efficient Economy. http://www.aceee.org/research-report/e121.

[2] This estimate is based on our analysis of available data for 2010—the last year for which reasonably complete data is available on these types of investments.

vehicles. This estimate is consistent with studies by others and is significantly greater than our earlier estimate for investments made in 2004.[3]

Even though the United States is much more energy efficient today than it was 40 years ago, there is still enormous potential for additional cost-effective energy savings. A January 2012 study by ACEEE found that by 2050, energy efficiency measures and practices could reduce U.S. energy use by 42-59% relative to current projections, and in the process save consumers and businesses billions of dollars, raise gross domestic product in 2050 by $100-$200 billion, and support 1.3-1.9 million jobs in 2050.[4]

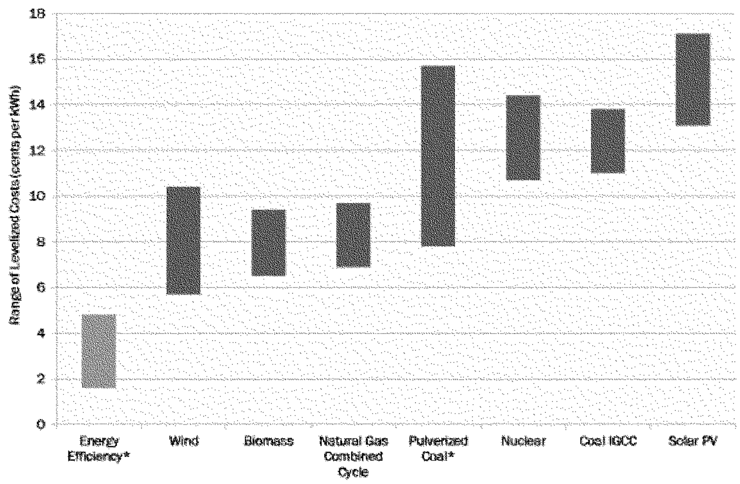
By contrast, $170 billion was spent on conventional energy supply in 2010, which is about twice the investment in energy efficiency. The productivity of our economy may be currently more directly tied to greater levels of energy efficiency than to energy supply.

Energy efficiency investments have a variety of important economic benefits. For example, energy efficiency tends to be less expensive than most energy supply resources. Figure 2 compares the cost to the utility of energy efficiency investments and new power supply investments.

[3] ACEEE. 2013. Fact Sheet, "The Importance of Energy Efficiency to the U.S. Economy," Washington D.C., http://aceee.org/fact-sheet/energy-efficiency-investment

[4] Laitner et al. 2012. *The Long-Term Energy Efficiency Potential.* Washington, D.C. American Council for an Energy-Efficient Economy. http://www.aceee.org/research-report/e121.

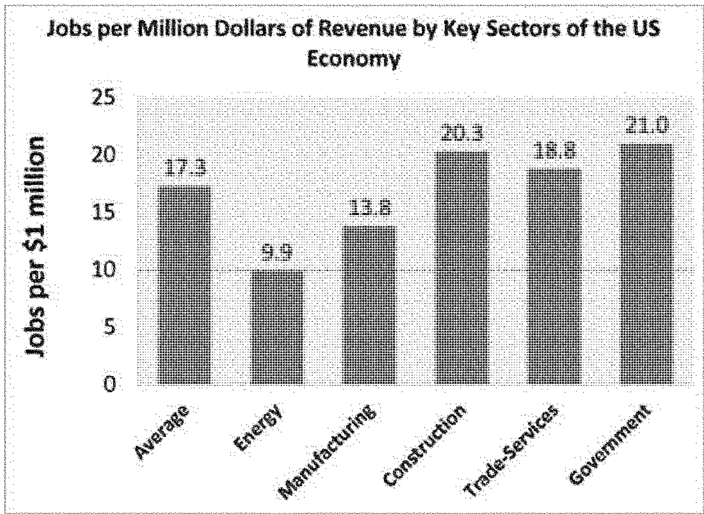
Figure 2. Levelized Cost per kWh for Different Electricity Resources



*Notes: Energy efficiency average program portfolio data from Molina 2013 (ACEEE)- forthcoming; All other data from Lazard 2012. High-end range of advanced pulverized coal includes 90% carbon capture and compression.

Likewise, energy efficiency tends to be very labor-intensive, helping to create jobs. First, jobs are created designing, manufacturing, and installing efficiency measures. Second, as consumers and businesses save on their energy bills, they respend the savings, generating additional jobs. Figure 3 shows how more jobs are generated per dollar invested in construction and services (where most of the energy efficiency jobs are) than in the energy sector (which is capital but not labor intensive).

Figure 3. Jobs per Million Dollars of Revenue by Key Sectors of the U.S. Economy



Source: ACEEE. *How Does Energy Efficiency Create Jobs*. http://www.aceee.org/fact-sheet/ee-job-creation.

Unfortunately, a variety of market barriers keep these savings from being realized. These barriers are many fold and include such factors as "split incentives" (landlords and builders often do not make efficiency investments because the benefits of lower energy bills are received by tenants and homebuyers); panic purchases (when a product such as a refrigerator needs replacement, there often is not time to research energy-saving options); lack of consumer information; lack of skilled work force; and bundling of energy-saving features with high-cost extra "bells and whistles."

Potential Energy Efficiency Strategies

As the Committee considers energy legislation for the 113th Congress, I urge you to consider energy efficiency provisions that represent bipartisan opportunities to improve our energy and economic security. The following represent ideas that fall within the Committee's jurisdiction, and for which partners in the business and advocacy communities stand ready to support.

Appliance and Equipment Standards

Appliance and equipment standards have been one of the greatest energy efficiency policy success stories of the last quarter century, resulting in cumulative energy savings since 1987 of 3.4 quads in 2010, with the net present value of consumer savings from standards already in place about $1.1 trillion through 2035[5]. In addition, these standards have also contributed to increased consumer choices in products such as light bulbs, refrigerators, and washing machines by spurring innovation among manufacturers.

Updates to existing standards and standards on new products have the potential to bring about large savings in energy consumption. ACEEE's analysis last year found that the potential energy savings from 34 new standards would result in annual electricity savings in 2035 of about 310 TWh, or about 7% of projected electricity consumption in that year, and natural gas savings of about 240 TBtu enough to energy heat 8% of all the natural-gas-heated U.S. homes.[6]

Increasingly these updates and new standards are resulting from collaboration between energy efficiency advocates and manufacturers. Several consensus agreements are emerging in standards proceedings that are currently underway at the Department of Energy (DOE), and a provision from the *Energy Policy Act of 2007* allows DOE to adopt these consensus agreements directly. In addition, other consensus agreements have been put into place in legislation of the

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[5] Amanda Lowenberger, Joanna Mauer, Andrew deLaski, Marianne DiMascio, Jennifer Amann, Steven Nadel, 2012, *The Efficiency Boom: Cashing In on the Savings from Appliance Standards*, http://aceee.org/research-report/a123.
[6] Ibid.

past decade. We encourage the Committee to consider including future agreements as they develop in energy legislation by the Committee. The energy efficiency community and our business partners stand ready to work with the Committee on implementing these agreements through legislation.

On a less encouraging note, unfortunately, the Administration has recently missed deadlines for completing eight new appliance, lighting and equipment energy efficiency standards, largely because of delays by the Office of Management and Budget in approving notice of proposed rules or final rules. These delays have cost consumers over $3.7 billion in savings as of this month. The Committee should encourage the Administration to expedite these reviews.[7]

Building Codes

Buildings consume roughly 40% of all energy in the United States.[8] Building energy codes are universally recognized as the easiest and most cost-effective way to help consumers save energy and money, making housing more affordable and reducing air pollution. National model building codes are developed by the International Code Council (ICC) and the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE).

DOE provides technical assistance to these bodies and also assists states which are considering adopting these codes. We recommend that DOE set energy saving goals for model codes and expand its work to encourage and assist states to adopt and successfully implement these codes.

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[7] Appliance Standards Awareness Project and ACEEE fact sheet "Cost of Overdue Energy Efficiency Standards," http://www.appliance-standards.org/sites/default/files/The_Cost_of_Overdue_Energy_Efficiency_Standard_Jan_2013_0.pdf.

[8] Office of Energy Efficiency and Renewable Energy. 2011. *Buildings Energy Data Book.* Washington, D.C.: U.S. Department of Energy. http://buildingsdatabook.eren.doe.gov/default.aspx.

Information on Energy Use in Buildings

An informed consumer can make sound choices, so providing information about energy use in buildings, whether it is a home or commercial space, would allow consumers to make economically sound choices about the cost of owning a building, and would encourage investments that improve the energy efficiency of existing and new buildings.

While the benefits exist in all buildings markets, ACEEE feels that an appropriate initial focus would be on large buildings, including multifamily housing. This market is in general more sophisticated and is more capable of acting on energy use information, and the cost of generating benchmark information for these buildings is small relative to the value of these buildings.

In particular, we suggest that:

- The Energy Information Administration expand data collected by the Commercial Buildings Energy Conservation Survey (CBECS), which has seen its survey curtailed due to budget constraints.
- DOE establish a competitive solicitation to states and localities, implementing innovative building labeling and disclosure policies to advance EE in large, existing buildings.
- DOE create and maintain an online database of building energy performance data and make the database available for voluntary uploads from states, localities, and the private sector. Building on EISA Section 433 and Executive Orders, federal agencies should benchmark all federal buildings and disclose through the database scores and Energy Usage Indexes (EUIs) for all buildings not subject to national security exemptions. This effort could build upon DOE's Building Performance Database.

- Recipients of section 179D tax deductions and states, localities, contractors, and other private sector entities that receive federal funding for energy efficiency in buildings should benchmark the energy use in the buildings annually for 3-10 years and disclose this information through the database (again with exemptions for national security and other appropriate considerations).

Building and Industrial Training and Assessment Centers

Presently DOE has a very successful program to help train new energy efficiency engineers by working with university professors and their students to conduct energy audits of small to medium-sized manufacturing facilities. The students gain practical work experience and the manufacturers get a low-cost energy audit. Given this training, the majority of participating students receive multiple job offers upon graduation. This program has been successfully operated since 1976. ACEEE has proposed expanding the IAC program in both size and scope to better meet the workforce and energy assessment needs of U.S. manufacturers. The expansion would be accomplished by establishing Centers of Excellence at current IAC locations, and then partnering with other universities, community colleges, and trade schools to create satellite centers to educate students in energy efficiency at all technical levels. [9]

We recommend that this program be expanded to include training of building engineers and not just industrial engineers. ACEEE has developed a proposal, which we detailed in a conference paper in 2010.[10] This provision was included in *Energy Savings and Industrial*

[9] Daniel Trombley and R. Neal Elliott. 2009. "Expanding the Industrial Assessment Center Program: Building an Industrial Efficiency Workforce," in the proceedings of the *2009 ACEEE Summer Study on Energy Efficiency in Industry*, http://aceee.org/proceedings-paper/ss09/panel05/paper08.
[10] Daniel Trombley, et al. 2010. "How Building Assessment Centers Can Leverage the Success of the Industrial Assessment Centers to Train the Next Generation of Efficiency Experts," in the proceedings of the *2010 ACEEE Summer Study on Energy Efficiency in Buildings*, http://aceee.org/proceedings-paper/ss10/panel10/paper25.

Competitiveness Act of 2011 (S. 1000) introduced in the 112th Congress, which also included the provision for an updated and expanded industrial center program.

Industrial Energy Efficiency Programs

Manufacturing continues to represent an important component of the U.S. economy, accounting for about 14% of gross domestic product. The manufacturing sector is responsible for almost a third of national energy consumption. Recently we have seen a dramatic return of manufacturing to the U.S., referred to as *reshoring* as affordable energy and high productivity have made the U.S. an attractive place for global manufacturing.

Until recently, energy use in the industrial sector has received little policy attention. This situation has changed with the signing of President Obama's executive order on industrial energy efficiency and combined heat and power last August, and the inclusion of manufacturing provisions in *American Energy Manufacturing Technical Corrections Act of 2012* (H.R. 6582) that was enacted last December. We recommend that the Committee explore three areas for action in the 113th Congress.

Future of Industry

The industrial program at DOE has been the leading federal program focused on manufacturing, and as has been among the most successful federal research and deployment programs.[11] This program, now renamed the Advanced Manufacturing Office (AMO) has unfortunately experienced a lack of leadership for over a decade.

[11] R. Neal Elliott. 2009. Testimony before the Senate Energy and Natural Resources Committee on *Restoring America's Manufacturing Leadership through Energy Efficiency Act of 2009*, March 24, 2009 http://aceee.org/testimony/testimony-r-neal-elliott-associate-director-research-us-sena.

To help get this important program back on track, we suggest that the Committee consider the following provisions:

1. Establish an Industrial Technologies Steering Committee that will create a strong working relationship between AMO and stakeholders, and facilitate the office's collaboration with industry and advocates;
2. Focus AMO efforts on an even mix of research and development and deployment programs that reflect the importance of both approaches for maximizing industrial efficiency;
3. Ensure that the program's research and development portfolio is responsive to the needs of the manufacturing sector; and
4. Ensure that AMO's deployment activities serve the needs of a wide array of market segments, including workforce training and combined heat and power technical assistance.

Smart Manufacturing

Opportunities in industrial energy efficiency will come increasingly from the application of "intelligence" in manufacturing systems, as we discussed in our 2012 report on long-term energy efficiency trends.[12] These developments are referred to as *Smart Manufacturing*.[13]

We suggest that a smart manufacturing program be established at DOE, and that the program focus on developing the infrastructure needed to enable smart manufacturing across the country. As part of this activity, DOE should undertake at-scale demonstrations of smart

[12] John "Skip" Laitner et al. 2012. Op sit.
[13] Time. "What is Smart Manufacturing," https://smart-process-manufacturing.ucla.edu/about/news/time-magazine-what-is-smart-manufactuing.pdf.

manufacturing in small, medium, and large enterprises in various industry segments, and work with states to make critical resources, such as access to simulation expertise and supercomputing capacity available to all firms.

Energy Efficiency in Supply Chains

Related to smart manufacturing, we encourage the Committee to establish a program that focuses on energy efficiency in manufacturing supply chains. There is a growing consensus in the manufacturing community that it is important to deal with supply chain issues. We propose the establishment of a Supply Star program at DOE, based upon the successful Energy Star program, to help companies make their supply chains more efficient. DOE can provide companies with financing, technical support, and training to help improve their supply chain efficiency. Companies that are successful in making their supply chain more efficient will be rewarded with the Supply Star label, thus helping consumers make more informed purchasing decisions.

We also suggest that the program work with integrating companies and their suppliers to develop standards for the exchange of information about energy to be targeted across supply chains to reduce energy use. These data exchange principles will contribute to realizing the substantial energy savings that can be realized by deploying smart manufacturing across supply chains.

Conclusion

Energy efficiency is a key part of an "all of the above" energy strategy. Energy efficiency has reduced U.S. energy use by about half since 1970 and much more is possible. Energy efficiency is typically less expensive per unit of energy than most energy resources, and energy efficiency is more labor intensive, helping to create more jobs. Unfortunately, a series of market barriers keep investments in energy efficiency below optimal levels. Smart policies can help address some of these market barriers, helping the private market to better capture these efficiency opportunities. ACEEE stands ready to assist the Committee in fleshing out these proposals.

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

Mr. WHITFIELD. Well thank you, Mr. Elliott, and Mr. Gayer of the Brookings Institution, you are recognized for 5 minutes.

STATEMENT OF TED GAYER

Mr. GAYER. Great, thank you. Chairman Whitfield, Ranking Member Rush, and members of the subcommittee, thank you very much for the opportunity to appear here today. My comments will cover the market incentives for energy efficiency innovation, the most cost effective means of reducing pollution stemming from energy use, and the limitations and problems associated with government energy efficiency mandates.

First on market incentives. I believe that market prices are good at conveying information about the strength of consumer demand for a good, and the scarcity of supply for that good, allowing for a balancing of buyers and seller's interest. In the market for appliances, prices reflect how consumers value features such as energy efficiency and convenience. If the price of energy increases, consumers are willing to pay more for more efficient appliances, providing a clear incentive to suppliers to respond. The importance of energy prices for the bottom line of consumers and businesses provides a strong incentive for producers to provide the innovative energy efficient products we see arriving on the market today, and these market incentives account for the preponderance of energy efficiency gains that have been mentioned in this hearing today.

In addition to providing incentives for energy efficiency, another important benefit of the market process is that consumers with different preferences can find products that best suit their needs. It is important to remember that there is no uniformly right amount of energy efficiency for any given product. However, market prices can provide misleading signals, to the extent that they do not account for the pollution costs stemming from energy use. In other words, the price that shows up on one's electric bill accounts for the private cost of energy, but it does not include any environmental—additional environmental damages that impact others due to one's energy use. Economists refer to these latter costs as "negative externalities." The best approach to addressing this problem is for the government to price these costs directly. Consumers and businesses would then face the full cost of energy use and markets would respond through some combination of new technologies, alternative fuels, and conservation.

There are a number of reasons why this market-oriented approach of setting a price on pollution is more cost-effective than regulations such as energy efficiency mandates. First, the one-size-fits-all energy efficiency mandates ignore the substantial diversity of preferences, financial resources, and personal situations that consumers and businesses must align in order to make their decisions. Second, energy efficiency mandates do not promote conservation. For example, an energy efficiency standard for air conditioners increases the incentive to run the air conditioners longer. Third, energy efficiency standards must squeeze energy reductions out of new products only, and can even create incentives for consumers and businesses to retain older, and thus less energy-efficient, products.

In recent work I did with Kip Viscusi of Vanderbilt University, we examined a number of recent government regulations that mandate energy efficiency standards for vehicles and appliances. Despite the fact that these regulations frequently are touted as pollution-reducing initiatives, by the agencies' own estimates, they confirm that the environmental benefits tend to be quite small and are often outweighed by the costs that they estimate.

In order to justify these regulations, the agencies assert that consumers and firms are making incorrect purchase choices and that they therefore benefit if product choices are restricted to those that meet the agencies' mandated standards. Dismissing consumer preferences outright in this way is a significant departure from the well-established principles for conducting cost-benefit analyses, both in the economics literature, and I would add, by the Administration's Office of Management and Budget.

By claiming regulatory benefits from the correction of so-called "consumer irrationality," agencies are shifting regulatory priorities from the important goal of reducing the harm individuals impose on others, through pollution, towards the nebulous and unsupported goal of reducing harm individuals cause to themselves by purchasing purportedly uneconomic products. This shift from environmental protection to consumer protection results in a host of costly regulations that are far less effective than a government policy that simply sets a price on pollution. It is important to emphasize that these costs are real and that they harm economic well-being. Raising the costs of consumer products and products used by businesses through government mandates does not lead to economic growth or job creation. It also establishes a dangerous precedent: If agencies can justify regulations on the unsubstantiated premise that consumers and businesses, but not the regulators, are irrational, then they can justify the expansive use of regulatory powers to control and constrain virtually all choices consumers and businesses make.

To summarize, I believe that markets generally work well to provide incentives for energy efficiency and to satisfy consumers' diverse tastes. To the extent that prices fail to incorporate the environmental cost of energy use, the most sensible government response is to price the pollution costs directly, and then allow consumers and businesses to respond to the higher prices. Regulations and mandates are inferior policies, but still may be better than doing nothing if the benefits exceed the costs. Unfortunately, by the agencies' own estimates, many of these mandates lead to minimal environmental benefits that are far less than the costs that they estimate themselves. In an effort to justify these regulations, the agencies have deviated from well-established economic principles by asserting that consumers and businesses benefit from government mandates that restrict choice. The evidence for this view, I believe, is weak, and assuming that citizens are not capable of making sensible decisions that affect their own pocketbooks is not the right way to advance the important goal of enhancing the quality of our environment.

Thank you very much.

[The prepared statement of Mr. Gayer follows:]

Testimony by Ted Gayer, Brookings Institution
Hearing on "American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies"
Subcommittee on Energy and Power
Committee on Energy and Commerce
February 26, 2013

Chairman Whitfield, Congressman Rush, and Members of the Subcommittee, I appreciate the opportunity to appear here today. My comments will cover the market incentives for energy efficiency innovation, the most cost-effective means of reducing pollution stemming from energy use, and the limitations and problems associated with government energy-efficiency mandates.

Many of the points I will make come from a Mercatus working paper I co-authored with W. Kip Viscusi of Vanderbilt University, which I have submitted along with my testimony. A revised version of the paper is forthcoming in the *Journal of Regulatory Economics*.

Market prices convey information about the strength of consumer demand for a good and the scarcity of supply for that good, allowing for a balancing of buyers' and sellers' interests. In the market for appliances, prices reflect how consumers value features such as energy efficiency and convenience. If the price of energy increases, consumers will be willing to pay more for more efficient appliances, providing a clear incentive to suppliers to respond. The response, in turn, depends on the constraints on production, such as the state of technology. Economists agree that this flow of information between producers and consumers is better achieved through the price mechanism than through government oversight. One important benefit of the market process is that consumers with different preferences can find appliances that best suit their needs. For example, a consumer who lives in a region where energy is inexpensive may prefer appliances that emphasize convenience over energy efficiency compared to a consumer who lives in a region with expensive energy. In short, there is no uniformly "right" amount of energy efficiency in an appliance any more than there is a "right" variety of apple.

However, market prices can provide misleading signals to the extent that they do not account for the pollution costs stemming from energy use. In other words, the price that shows up on one's electric bill accounts for the private cost of energy, but it does not include the additional environmental damages that impact others due to one's energy use. Economists refer to these latter costs as "negative externalities." The best approach to addressing this problem of negative externalities is for the government to price these pollution costs directly. Consumers and firms would then face the full cost of energy use, and markets would respond through some combination of new technologies, alternative fuels, and conservation.

There are a number of reasons why the market-oriented approach of setting a price on pollution is more cost-effective than regulations such as energy efficiency mandates. First, the one-size-fits-all energy efficiency mandates ignore the substantial diversity of preferences, financial resources, and personal situations that consumers and firms must align in order to make their decisions. Second, unlike a price set for pollution, energy efficiency mandates do not promote conservation. Indeed, they lower the cost of using an appliance, reversing some of the energy savings. For example, an energy efficiency standard for air conditioners increases the incentive to run the air conditioners longer. Third, energy efficiency standards apply only to new products, which can create incentives for consumers and firms to retain older (and thus less energy-efficient) products.

Kip Viscusi and I examined a number of recent government regulations that mandate energy efficiency standards for vehicles and appliances. Despite the fact that these regulations are frequently touted as pollution-reducing initiatives, the agencies' own estimates confirm that the environmental benefits are negligible and are often dwarfed by the societal costs they impose.

In order to justify these expensive regulations, the agencies assert that consumers and firms are making irrational purchase choices and that they therefore benefit if product choices are restricted to those that meet the agencies' mandated standards. Dismissing consumer preferences as irrational is a significant departure from well-established tenets for conducting cost-benefit analyses set forth in the economics literature and by the administration's Office of Management and Budget.

By claiming regulatory benefits from the correction of so-called "consumer irrationality," agencies are shifting regulatory priorities from the important goal of reducing the harm individuals impose on *others* (through pollution) towards the nebulous and unsupported goal of reducing harm individuals cause to *themselves* by purchasing purportedly uneconomic products. This shift from environmental protection to consumer protection results in a host of costly regulations that are far less effective than a government policy that simply sets a price for pollution. It also establishes a dangerous precedent: If agencies can justify regulations on the unsubstantiated premise that consumers and firms (but not regulators) are irrational, then they can justify the expansive use of regulatory powers to control and constrain virtually all choices consumers and firms make.

To summarize: I believe that markets generally work well to provide incentives for energy efficiency and to satisfy consumers' diverse tastes. To the extent that energy prices fail to incorporate the environmental cost of energy use, the most sensible government response is to price the pollution costs directly, and then allow consumers and businesses to respond to the higher prices. Regulations and mandates are inferior policies, but still may be better than doing nothing if the benefits exceed the costs. Unfortunately, by the agencies' own estimates, energy efficiency mandates frequently lead to minimal environmental benefits that are far less than the costs. In an effort to justify these uneconomic regulations, the agencies have deviated from well-established economic tenets by asserting that consumers and firms are "irrational" and that they therefore benefit from government mandates that restrict choice. The evidence for this view is weak, and assuming that citizens are not capable of making sensible decisions that affect their own pocketbooks is not the right way to advance the important goal of enhancing the quality of our environment.

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WORKING PAPER

OVERRIDING CONSUMER PREFERENCES WITH ENERGY REGULATIONS

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Overriding Consumer Preferences with Energy Regulations*

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Keywords: Energy regulations; Cost-benefit analysis; Behavioral economics; Consumer choice; Climate policy; Energy efficiency standards

JEL: Q4, Q48, Q5, Q54

Abstract

This paper examines the economic justification for recent U.S. energy regulations proposed or enacted by the U.S. Department of Energy, the U.S. Department of Transportation, and the U.S. Environmental Protection Agency. The case studies include mileage requirements for motor vehicles and energy-efficiency standards for clothes dryers, room air conditioners, and light bulbs. The main findings are that the standards have a negligible effect on greenhouse gases and the preponderance of the estimated benefits stems from private benefits to consumers, based on the regulators' presumption of consumer irrationality.

* The authors would like to thank Caroline Cecot, Kasey Higgins, Jinghui Lim, and Sam Miller for assistance in developing the case studies for this paper.

Overriding Consumer Preferences with Energy Regulations

Introduction

The efficiency rationale for any government regulation rests on the existence of some type of market failure. The ways markets may fail are quite diverse, ranging from characteristics of the market structure to various kinds of externalities; that is, adverse effects on parties other than the buyer and seller of a product. In the absence of some type of market failure there is no legitimate basis for regulation from the standpoint of enhancing economic efficiency.

This article examines a major class of recent government initiatives by the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Transportation (DOT) pertaining to energy efficiency (as distinct from economic efficiency). The regulations of interest all pertain to consumer products that are durable goods. There may be some kind of market failure with respect to the energy usage of these products, as energy use leads to environmental consequences. However, the existence of an imperfection alone cannot justify all regulations that take the form of government intrusion into the marketplace to override consumer choices. We examine the justification for these energy regulations and show that demonstrable market failures are largely incidental to an assessment of the merits of these regulations. Rather, the preponderance of the assessed benefits is derived from an assumption of irrational consumer choice. The impetus for the new wave of energy-efficiency regulations has little to do with externalities. Instead, the regulations are based on an assumption that government choices better reflect the preferences of consumers and firms than the choices consumers and firms would make themselves. In the absence of these claimed private benefits of the regulation, the costs to society dwarf the estimated benefits.

We begin with a discussion of how one might assess the desirability of energy-efficiency standards. What criteria should be applied to such policies? We advocate the mainstream-economics approach of evaluating the merits of regulations based on their benefits and costs and whether, on balance, the regulations promote social welfare.[1] But framing the issue in these terms is only the starting point; it leaves open the determination of what constitutes a cost or a benefit. As our discussion in this paper indicates, government agencies do not properly assess the benefits from energy-efficiency standards. They assume consumers and, in some cases, firms are incapable of making rational decisions and that regulatory policy should be governed by the myopic objective of energy efficiency to the exclusion of other product attributes. Energy-efficiency standards provide a valuable case study of how agencies can be blinded by parochial interests to assume not only that their mandate trumps all other concerns but also that economic actors outside of the agency are completely incapable of making sound decisions. The assumption that the world outside the agency is irrational is a direct consequence of the agencies' view that energy efficiency is always the paramount product attribute and that choices made on any other basis must be fundamentally flawed.

The most prominent economic justification for environmental policies is to remedy a market failure due to externalities, which do represent actual potential benefits of energy-efficiency standards. The classic example of an externality is the release of air pollution as a byproduct of production of a marketable good. The air pollution harms human health, but abatement raises the firm's production cost. If the government clearly establishes a property right for the clean air, then depending on who owns the property right, either polluters would need to purchase the use of the air or the victims of pollution would need to pay polluters to reduce

[1] This approach is consistent with the approach federal regulatory agencies have been required to follow since President Bill Clinton signed Executive Order no. 12866, *Federal Register* 58, no. 190 (October 4, 1993): 51,735–44.

pollution. Either way, as Ronald Coase demonstrated, the social costs of air pollution are internalized into the market decision, resulting in an economically efficient outcome.[2] However, high transaction costs frequently prevent the affected parties from reaching an efficient solution, especially in the case of air pollution in which large populations are exposed to pollution. As a result, abatement is not undertaken since the production decision is made without considering the external harm to human health. In these cases, more direct government intervention (whether through market-based instruments such as a pollution tax or through command-and-control regulations) can achieve the level of air-pollution reduction that increases net benefits to society.

Environmental policies can be most successful at maximizing net benefits—or at least improving net benefits relative to the nonintervention case—if they are designed after careful consideration of unbiased estimates of the costs and benefits of environmental quality. Benefit-cost analysis (BCA) provides the methodology for such an assessment and is the key component of effective regulatory policy. BCA has played a central role in the evaluation of government regulations for several decades. The BCA approach measures changes in human welfare either as the amount individuals are willing to pay for a gain (or to avoid a loss) or the amount they are willing to accept as compensation for a loss (or to go without a gain). The criterion for choosing among the regulatory options is to determine which option maximizes the difference between these benefits and costs. This is known as the Kaldor-Hicks criterion, which focuses on whether the gainers can potentially compensate the losers.

The conceptual argument for using BCA within the regulatory process is based on long-established economic theories and has been a requirement for all major government regulations for over three decades. Nevertheless, the analyses for recent energy regulations make an increasingly important methodological challenge to BCA concerning the treatment of private

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[2] Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (1960): 1–44.

benefits to individuals from government regulations. In order to make inferences in an infinitely complex world, neoclassical economics relies on the simplifying assumption that the choices revealed through market transactions express the preferences of rational consumers and producers. Therefore, the traditional approach to BCA assumes that informed citizens are rational, implying that while they do not consider the costs their actions impose on others, they are best able to choose the option that achieves the highest net benefits to themselves subject to their budget constraints. Assuming no market barriers interfere with this optimal behavior, traditional BCA methodology does not find private benefits from regulations that restrict the set of market goods available to consumers.

A fundamental tenet of BCA is that the value of benefits is society's willingness to pay for the benefits based on individual preferences. Any BCA that purports to show that private benefits of interfering with these choices exceed the costs violates this premise. Overriding market decisions to advance the preferences of government agencies will always make consumers and firms worse off unless one demonstrates that there are fundamental flaws which, if recognized, would lead people to make decisions in line with the regulations.

The growing field of behavioral economics sometimes calls into question the assumption of consumer rationality. For example, some studies find that people base decisions on psychological heuristics, which are essentially shortcuts used to process information-rich or uncertain options.[3] These shortcuts can lead to irrational results, such as a tendency to confirm previously held beliefs even if they are inaccurate. Other studies find that, contrary to a rational self-interested model of consumer behavior, people tend to pursue goals such as fairness,

[3] Gerd Gigerenzer, Peter M. Todd, and the ABC Group, *Simple Heuristics That Make Us Smart* (Oxford: Oxford University Press, 1999); and Daniel Kahneman, "Maps of Bounded Rationality: Psychology for Behavioral Economics," *American Economic Review* 93, no. 5 (December 2003): 1449–75.

altruism, and revenge.[4] Such phenomena suggest that people's preferences are more complicated than portrayed in elementary economics textbooks. Other studies find that people at times lack self control and engage in such things as procrastination or making rash decisions.

Although most of the evidence for these behavioral anomalies has been based on small-scale experiments on students rather than actual market behavior, it is well accepted that there are some systematic behavioral anomalies that do not accord with fully rational behavior. However, the existence of such phenomena does not imply that they are ubiquitous and consequential in all economic situations. Just as one would want to assess whether a pollution externality is trivial or important, it is also essential to document both the existence and magnitude of behavioral anomalies if they are to be used as a justification for government intervention.

The existence of behavioral anomalies does not imply that economic outcomes are completely random or that the usual economic tools lack insight. One should be wary about overstating the conflict between the traditional neoclassical approach to economics and the behavioral-economics approach. Demand curves slope downward, and basic economic predictions have enormous empirical support. There is little impetus or rationale for taking away consumers' ability to make their own decisions in a wide range of contexts.

Indeed, even adherents to the behavioral-economics approach use much of the standard economic framework. From a methodological standpoint, all economists rely on logical analyses and empirical tools to make inferences about the economy and economic policies. Likewise, all acknowledge the impossibility of modeling the many facets of human behavior and the necessity of relying on simplifying assumptions. Behavioral economics, for the most part, is concerned with finding the systematic deviations from conventional views of rational behavior and

[4] Matthew Rabin, "Psychology and Economics," *Journal of Economic Literature* 36 (March 1998): 11–46.

integrating them into economic models. Nonetheless, the evidence of systematically irrational behavior can create a conflict between two core BCA principles. If consumers are believed to be acting irrationally (that is, against their self interest), then a BCA must choose between incorporating the benefits of a policy that addresses the harm done by an individual and respecting consumer sovereignty and thus ignoring such benefits, leading to a violation of the Kaldor-Hicks criterion that underlies BCA. A BCA that mistakenly fails to account for a systematic deviation from rationality by consumers will result in a policy prescription that is suboptimal, as it will not address the benefits to consumers of correcting the harm they cause themselves in making market decisions.

The social-welfare implications are also clear if a BCA mistakenly assumes consumers are systematically deviating from making rational decisions that maximize their personal utility subject to their budget constraints. The resulting policy prescription will sacrifice welfare gains, as it will harm consumers by restricting their choices and ignoring their revealed preferences for certain goods. This social-welfare loss suggests that regulators should proceed with extreme caution before justifying costly rules based on the assumption of consumer irrationality. Abandoning the principle of consumer sovereignty shifts regulatory policy from an emphasis on mitigating harm individuals impose on others toward a paternalistic emphasis on mitigating harm individuals impose on themselves.

The principle of consumer sovereignty that underpins traditional BCA and the core of most economic theory is rooted in the neoclassical assumption of rationality. Economists all understand that individual rationality is a simplifying assumption, not an absolute truth asserting consumer infallibility. The basis of the assumption—supported by much empirical evidence—is that in most contexts consumers are better equipped than analysts or policymakers to make market decisions that affect themselves. Consumers typically are better able to make decisions about which products they value and which goods they should purchase given the substantial heterogeneity in preferences, financial resources, and personal situations.

The principal impetus for respecting consumer decisions can be traced to the fundamental role of heterogeneity in undermining the desirability of mandating uniformity. Differences in preferences and income generate different consumer demand for products. Even for products all consumers might find attractive, there will be differences in preferences; some consumers are willing to pay more for the product than others, giving rise to the usual downward-sloping demand for the product. There will also be more extreme situations in which some consumers may not want a product at any price even though others may value it, as in the case of vegetarians who do not wish to consume meat. In recognition of these differences, the market often generates highly differentiated products, such as very basic automobiles, which serve as a functional form of transportation, to luxury cars. Homogenizing these choices through command-and-control regulations has the effect of imposing costs on those at the low-quality end of the spectrum and depriving those at the high end of product attributes that they value. As a consequence, BCA assessments of consumer product regulations should recognize the important role of heterogeneity throughout the market rather than assuming everyone can be characterized by some average composite consumer.

If BCA abandoned the presumption of consumer sovereignty and replaced it with another assumption about the systematic behavior of consumers, it would lead to the normative implication that the analyst or policymaker decides what is best for each consumer. Given the informational and analytical challenges of finding behavioral failings among heterogeneous individuals, this is a tall order for any analyst or policymaker, especially given that they are also prone to information and behavioral failings. A principal theme of Viscusi's book, *Rational Risk Policy*, is that government regulators often institutionalize individual irrationality because policymakers are human and because the pressures exerted by their constituencies push policies in directions away from rational norms.[5]

Exaggerated responses to highly publicized risks are as much a problem for government policy as for citizens at large. Similarly, the U.S. Government Accountability Office (GAO) has documented examples of flawed government decision making with respect to energy policies involving a program run by EPA and DOE to promote energy-efficient appliances.[6] The GAO found the program vulnerable to fraud, including the granting of energy-efficient status to many bogus products. As Glaeser notes, "If humans make mistakes in market transactions, then they will make at least as many in electing representatives, and those representatives will likely make mistakes when policymaking."[7]

A shift away from the principle of consumer sovereignty will also lead to regulations focused more on correcting self harm than on internalizing environmental harm. For example, it would place greater weight on regulations that ban energy-inefficient products than on regulations that raise the price of pollution. Policies designed to focus on addressing the purported irrationality of the consumer rather than on the traditional goal of internalizing external costs of pollution will sacrifice some pollution reduction for more protection of the consumer from self harm.[8] Therefore, the burden of proof for any BCA conducted as part of a review of regulatory proposals should be placed heavily on justifying any presumption of a

[5] W. Kip Viscusi, *Rational Risk Policy* (Oxford: Oxford University Press, 1998).
[6] U.S. Government Accountability Office, *Energy Star Program: Covert Testing Shows the Energy Star Program Certification Process Is Vulnerable to Fraud and Abuse* (Washington, DC: U.S. Government Printing Office, 2010).
[7] Edward L. Glaeser, "Paternalism and Psychology," *Regulation* 29 (2006): 32–38.
[8] Ted Gayer, "A Better Approach to Environmental Regulation: Getting the Costs and Benefits Right" (Hamilton Project Discussion Paper 2011-06, May 2011).

deviation from consumer sovereignty. The agency preparing the BCA needs to demonstrate a systematic deviation from consumer rationality rather than just presuming that the regulator is better equipped to make decisions that protect individuals from themselves.

The Energy-Efficiency Gap

The clearest regulatory example questioning consumer rationality is with respect to energy-efficient consumer goods, for which consumers frequently face a tradeoff of a higher up-front capital cost versus lower future operating costs over the life of the product. A rational consumer will consider things such as the expected future cost of energy, the expected lifetime of the product, the frequency of use of the product, and the discount rate to convert future savings to present value compared to the up-front capital cost. Under traditional BCA methodology, a consumer who, all other things equal, opts for the less energy efficient product is revealing a rational preference to sacrifice future savings for a low up-front cost. However, if there are systematic behavioral impediments to rational behavior, as has been demonstrated in other contexts in recent research, then this consumer preference could be a misguided decision leading to a suboptimal purchase.

A long-standing empirical finding, known as the energy-efficiency gap, shows that consumer choices for energy-efficiency purchases imply a discount rate much higher than market discount rates, suggesting that consumers underweight the future cost savings stemming from an energy-efficient product compared to the weight they put on the future in other market settings. In an early example, Hausman found implicit discount rates of about 20 percent for a sample of consumers in choosing air conditioners.[9] This discount rate is high, but it is unclear whether it is an empirical anomaly. Interest rates that prevailed in the 1970s were considerably higher than

[9] Jerry A. Hausman, "Individual Discount Rates and the Purchase and Utilization of Energy-Using Durables," *Bell Journal of Economics* 10 (1979): 33–54.

they are today, and consumers routinely pay higher interest rates on credit-card debt. More importantly, consumers more than three decades after the data used in that study are operating in a quite different informational environment. Today, energy labeling policies and private ratings agencies such as Consumers Union provide better information on the energy costs of major appliances.

Empirical evidence suggests that consumers' valuation of the long-term differences in fuel efficiency for different models of cars may be quite reasonable. In an econometric study of prices of used cars, Dreyfus and Viscusi estimated the rate of interest implicit in a consumer's valuation of the discounted value of vehicle operating costs.[10] They offered the following observation on the 11–17 percent interest rate range that they estimated: "This range includes the prevailing rate of interest for car loans in 1988 and is consequently consistent with market rates."[11] Unlike some engineering studies that purport to show that consumers neglect energy efficiency, this study considered a wide range of car attributes other than energy efficiency that are valued by consumers.

The findings of an energy-efficiency gap could suggest irrational consumer behavior. Indeed, the behavioral-economics literature provides evidence—especially in experimental rather than market settings[12]—that people frequently deviate from rationality in making economic decisions. But the evidence is limited and mixed on the narrower question of whether there are

[10] Mark Dreyfus and W. Kip Viscusi, "Rates of Time Preference and Consumer Valuations of Automobile Safety and Fuel Efficiency," *Journal of Law and Economics* 38 (April 1995): 79-105.
[11] Ibid., 79.
[12] A finding that people deviate from rational behavior in a laboratory or field experiment does not necessarily imply that it will occur in a market setting. Indeed, Becker portrays skepticism about behavioral economics for this reason, noting that "there is a heck of a difference between demonstrating something in a laboratory, in experiments, even highly sophisticated experiments, and showing that they are important in the marketplace" and that "some defects in behavior claimed by behaviorists tend . . . to be eliminated in an exchange economy." See Gary Becker, "Interview," *The Region*, Federal Reserve Bank of Minneapolis (2002).

deviations from rationality that systematically lead to suboptimal energy-efficiency choices.[13] Some studies find evidence that people base decisions of which appliances to purchase on current energy prices rather than expected future prices, leading to a tendency to forgo purchasing energy-efficient products.[14] Being able to successfully predict future energy price trends is a daunting task that imposes challenges even for experts in the field. Other studies find that the psychological "salience" of the more expensive, efficient appliance leads to an underinvestment in energy efficiency.[15] Even if such behavioral biases are leading to inefficient energy decisions by consumers, providing accurate information to consumers would be preferable to regulatory mandates. Indeed, Executive Order 12866 (signed by President Clinton and re-affirmed by President Obama in his Executive Order 13563[16]) requires each agency to "identify and assess available alternatives to direct regulation, . . . such as . . . providing information upon which choices can be made by the public."[17] Informational efforts can and do provide energy-cost information over the lifetime of the appliance. Policies that subsidize or mandate energy-efficient products should only be attempted if and when information provision is demonstrated to be ineffective as a means of addressing the behavioral biases and if more improved informational interventions would not be more effective.

There are a number of alternative reasons that can explain the energy-efficiency gap. Many of these explanations are consistent with individual rationality and do not create any

[13] For overviews of the literature, see, for example, Jason F. Shogren and Laura O. Taylor, "On Behavioral-Environmental Economics," *Review of Environmental Economics and Policy* 2, no. 1 (2008): 26–44; and Kenneth Gillingham, Richard G. Newell, and Karen Palmer, "Energy Efficiency Economics and Policy" (discussion paper 09-13, Resources for the Future, Washington, DC, 2009).
[14] Willett Kempton and Laura Montgomery, "Fold Quantification of Energy," *Energy* 7 (1982): 817–27.
[15] Charlie Wilson and Hadi Dowlatabadi, "Models of Decision Making and Residential Energy Use," *Annual Review of Environment and Resources* 32 (2007): 169-203.
[16] Executive Order no. 13563, *Federal Register* 76, no. 14 (January 21, 2011): 3,821–23
[17] Executive Order no.12866, §1(b)(3), 51,735–36, reprinted as amended in 5 U.S.C. § 601 (2006), "Each agency shall identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public."

conflicts with traditional BCA practices. The observed consumer choice may simply reflect actual consumer preferences.[18] For example, Hassett and Metcalf argue that high discount rates are rational in the presence of high sunk costs and uncertainty over future conservation savings.[19] If you are planning to move or have a current liquidity problem, buying the more energy efficient but more expensive appliance may not make sense from an economic standpoint. Many of the studies purporting to show that consumers forgo profitable energy decisions are based on engineering studies that calculate the net present value of a set of possible energy-efficiency consumption choices, which requires assumptions for such things as capital costs, current and future energy prices, duration and frequency of appliance use, and discount rates.[20] These studies omit other relevant costs or benefits of the product to consumers that can drive the purchase decision. For example, Anderson and Newell find that manufacturing plants reject about half of the energy-efficiency projects recommended by engineering analyses because of unaccounted physical costs, risks, opportunity costs, lack of staff for analysis or implementation, risk of inconvenience to personnel, or suspected risk of problems with equipment.[21] By ignoring these relevant characteristics of the product, and the specifics of the customer's economic circumstances, the engineering studies can arrive at incorrect findings of personal savings from the products that have higher up-front costs but yield lower operating costs. Since the engineering studies focus only on capital costs and operating costs, they do not allow for any heterogeneity of preferences and use of products across consumers.

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[18] Jerry A. Hausman and Paul L. Joskow, "Evaluating the Costs and Benefits of Appliance Efficiency Standards," *American Economic Review* 72 (1982): 220–25.
[19] Kevin A. Hassett and Gilbert E. Metcalf, "Energy Conservation Investment: Do Consumers Discount the Future Correctly?" *Energy Policy* 21 (1993): 710–16.
[20] McKinsey & Co, "Electric Power and Natural Gas: Unlocking Energy Efficiency in the U.S. Economy," July 2009, http://www.mckinsey.com/clientservice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf.
[21] Soren T. Anderson and Richard G. Newell, "Information Programs for Technology Adoption: The Case of Energy-Efficiency Audits," *Resource and Energy Economics* 26, no. 1 (2004): 27–50.

Another possible explanation for the findings of apparently high consumer discount rates in engineering studies is that consumers do not expect to receive as high a return in energy savings as the analyst assumes. This might be the case if, for example, engineering estimates of potential energy savings misrepresent energy savings because they are based on highly controlled studies that do not directly apply to actual realized savings in a representative house. There is some evidence that engineering estimates of energy saved are indeed faulty.[22] Metcalf and Hassett find that the realized return to attic insulation falls short of the returns promised by engineers and product manufacturers. Accounting for this eliminates the paradox of the energy-efficiency gap in this situation.[23]

Another approach to measuring the energy-efficiency gap is to use empirical studies of energy-use data to estimate the average returns for the set of consumers that adopt an energy-efficient technology, for example, by comparing natural-gas billing data in the first year after weatherization work is done to the previous year. In addition to the problem associated with the short time horizon of such studies, these studies also suffer from the common pitfalls associated with omitted variable bias in which other key factors affecting the decision are ignored. As Allcott and Greenstone explain, such studies can omit many relevant costs and benefits.[24] For example, weatherization of a home can be a time-consuming and unpleasant task for the homeowner. Weatherization can also yield benefits not measured by billing data, such as greater home comfort. Failing to account for these factors that contribute to the consumption decision can lead to spurious findings of a purported energy-efficiency gap.

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[22] Steven Nadel and Kenneth Keating, "Engineering Estimates vs. Impact Evaluation Results: How Do They Compare and Why?" (Research Report U915, American Council for an Energy-Efficient Economy, Washington, DC, January 1, 1991), http://www.aceee.org/research-report/u915.
[23] Gilbert Metcalf and Kevin A. Hassett, "Measuring the Energy Savings from Home Improvement Investments: Evidence from Monthly Billing Data," *Review of Economics and Statistics* 81, no. 3 (1999): 516–28.
[24] Hunt Allcott and Michael Greenstone, "Is There an Energy Efficiency Gap?" (working paper 12-03, Massachusetts Institute of Technology, Cambridge, MA, January 17, 2012).

Finally, the findings of an energy-efficiency gap could be due to market failures entirely consistent with a presumption of consumer rationality. For example, if renters have incomplete information about the energy efficiency of their apartment building, then a landlord might under invest in energy efficiency because he is unable to recoup the costs in the rental rates.[25] There may be other market failures that can contribute to suboptimal consumer choices, such as a lack of information about future costs of more- versus less-efficient products, or inefficiencies stemming from average-cost pricing for electricity due to natural monopoly. Such market failures present economic justifications for possible government regulation, but they do not violate the presumption of consumer sovereignty and will frequently lead to different policy choices than those based on a presumption of consumer irrationality.

Taken as a whole, the engineering and empirical literature on the energy-efficiency gap does not provide strong, credible evidence of persistent consumer irrationality, and the literature on behavioral economics with respect to energy efficiency is still limited and unable to consistently demonstrate the magnitude of the contribution of behavioral deviations from rationality. BCAs should therefore operate under a presumption that consumers and producers accrue net gains from any private market transaction in which they voluntary engage. This presumption of the validity of revealed preference is explicitly recommended in the Office of Management and Budget's (OMB) guidelines for conducting regulatory analyses, known as Circular A-4. In considering the example in which emission standards lead to fuel savings, the OMB states, "These fuel savings will normally accrue to the engine purchasers, who also bear the costs of the technologies. There is no apparent market failure with regard to the market value

[25] Levinson and Niemann find that tenants whose electric bills are included in their rent consume much more electricity than those who pay their own bills. See Arik Levinson and Scott Niemann, "Energy Use by Apartment Tenants When Landlords Pay for Utilities," *Resource and Energy Economics* 26, no. 1 (2004): 51–75.

of fuel saved because one would expect that consumers would be willing to pay for increased fuel economy that exceeded the cost of providing it."[26]

Despite the weak evidence to support deviating from the presumption of consumer sovereignty and despite OMB guidelines to the contrary, the regulatory agencies frequently rely on engineering studies that presume consumers can accrue benefits by regulatory standards that restrict consumption choices. This reliance on engineering studies that presume consumer irrationality rather than model error is not new. Two examples of rules that relied on such engineering studies are an appliance efficiency standard proposed by DOE in 2000 and a light truck fuel economy standard proposed by National Highway Traffic Safety Administration (NHTSA).[27] What follows are case studies of recent analyses used to support energy- efficiency regulations promulgated by DOE, EPA, and DOT.

CAFE Standards for Passenger Cars and Light Trucks

The NHTSA within the DOT regulates corporate average fuel economy (CAFE) standards pursuant to the Energy Policy and Conservation Act of 1975 (EPCA), as revised by the Energy Independence and Security Act of 2007 (EISA).[28] The 2007 Supreme Court decision in *Massachusetts v. EPA* found that the EPA had authority to regulate greenhouse gases under the Clean Air Act, which meant the EPA could regulate vehicle fuel-economy standards as a means

[26] OMB, "Circular A-4: Regulatory Analysis," September 17, 2003, E3, http://www.whitehouse.gov/omb/circulars_a004_a-4.

[27] See Susan E. Dudley and Brian F. Mannix, *Public Interest Comment on the Office of Management and Budget's Draft Guidelines for the Conduct of Regulatory Analysis and the Format of Accounting Statements*, Regulatory Studies Program (Arlington, VA: Mercatus Center at George Mason University, 2003), http://mercatus.org/sites/default/files/publication/RIA_Guidelines.pdf; and Ronald J. Sutherland, *Public Interest Comment on Light Truck Average Fuel Economy Standards Model Years 2005–07*, Regulatory Studies Program (Arlington, VA: Mercatus Center at George Mason University, 2003), http://mercatus.org/sites/default/files/publication/Light_Truck_Average_Fuel_Economy_Standards.pdf.

[28] *EPCA*, Public Law 94-163, *U.S. Statutes at Large* 89-871 (1975), codified at *U.S. Code* 49 § 32902, as amended by *EISA*, Public Law 110-140, *U.S. Statutes at Large* 121-1492 (2007): 1577. The EISA amended EPCA to require, among other things, the creation of CAFE standards for medium- and heavy-duty vehicles for the first time.

of reducing greenhouse gases.[29] Thus, the CAFE rulemaking is done jointly by EPA and NHTSA (on behalf of DOT), subject to DOE review.[30]

On December 1, 2011, NHTSA and EPA jointly proposed similar new fuel-economy standards for passenger cars and light trucks for model years 2017 through 2025.[31] NHTSA proposed standards that would require an average industry fleet-wide standard of 40.9 miles per gallon (mpg) by 2021 and 49.6 mpg by 2025.[32] EPA's requirements are framed not in terms of fuel economy but as greenhouse gas emissions standards.[33] This may be effective political salesmanship, but we believe it is a bit of a misnomer given the very minor role greenhouse-gas benefits play in justifying the economic desirability of the regulation.[34] Unlike the NHTSA approach, EPA's greenhouse-gas emission standards impose requirements pertaining to carbon dioxide emissions rather than fuel mileage. The EPA standard of 163 grams of carbon dioxide per mile translates into a 54.5 mpg standard if manufacturers rely solely on fuel efficiency to reduce the emissions.[35] However, there are other mechanisms by which greenhouse-gas emissions can be reduced, such as improved air-conditioning systems,[36] so fuel-economy standards for the two agencies' proposed regulations are not necessarily incompatible.

[29] *Massachusetts v. EPA*, 549 U.S. 497, 533 (2007) (holding that if the agency finds that greenhouse-gas emissions threaten public health or welfare, then the Clean Air Act "requires the agency to regulate emissions of the deleterious pollutant from new motor vehicles"). See also *Clean Air Act*, Public Law 88-206, *U.S. Statutes at Large* 77-392 (1963), § 202(a)(1), codified at *U.S. Code* 42(2006), § 7521(a)(1) (allowing the EPA to regulate air pollutants from motor vehicles if such pollutants "may reasonably be anticipated to endanger public health or welfare").

[30] NHTSA consults with DOE on CAFE standards pursuant to EPCA, as revised by EISA. See *U.S. Code* 49, §§ 32902(b)(1), 32902(i), 32902(j).

[31] "2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards," *Federal Register* 76 (December 1, 2011): 74,854 [hereinafter "Joint Proposed Rule"].

[32] Ibid., 74,859. See also NHTSA, "Preliminary Regulatory Impact Analysis, Corporate Average Fuel Economy for MY 2017–MY 2025 Passenger Cars and Light Trucks 2–3" (November 2011) [hereinafter "NHTSA, PRIA"].

[33] Joint Proposed Rule, 74,854. See also EPA, "Draft Regulatory Impact Analysis, Proposed Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards v" (November 2011) [hereinafter "EPA, DRIA"].

[34] See table 2 and discussion supra notes 21–24.

[35] Joint Proposed Rule, 74,859.

[36] Ibid., 74,869.

The use of engineering models to compute the net present value (that is, the value today of a stream of future benefits, less costs) of a more versus less fuel-efficient product includes a number of input values that demonstrate the computational complexity that exists for the regulator's analysis. For the analysis of CAFE standards for passenger cars and light trucks (for 2017 and later model years), the EPA and NHTSA needed to derive input values for such things as vehicle miles driven per year, the responsiveness of annual vehicle miles driven to changes in fuel cost, the magnitude of the rebound effect (which is the increase in driving that would occur with more fuel-efficient vehicles), projections of future fuel costs, the number of years the vehicle would be in service, the relationship between the measured fuel efficiency and the actual on-road efficiency, and the discount rate.[37] The analysis presumes the regulator is better than the consumer at computing the various inputs to the net present value computation and the consideration of different vehicle classes controls for other features of the vehicles that might appeal to the consumer. This assumption effectively rules out consideration of motor-vehicle attributes other than fuel efficiency that will be affected by the regulation.

The dimensions of consequence in the EPA and NHTSA analyses essentially convert all motor vehicles into three-attribute products. Cars serve as a means of transportation whose only other dimensions of interest are mpg and cost. One does not have to be a reader of automobile reviews in Edmunds.com, *Car and Driver*, or *Road and Track* to realize that fuel efficiency is but one of many factors people use to assess the quality of an automobile. Acceleration, handling, braking ability, legroom, riding comfort, safety, reliability, styling, and trunk storage are among the many other dimensions of concern to automobile purchasers. Indeed, most

[37] See EPA, DRIA, 7-2 (summarizing benefit values in Table 7.1-6.4-1). See generally EPA and NHTSA, "Joint Technical Support Document, Proposed Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards 4-2 to 4-69" (November 2011) [hereinafter "Joint TSD"].

automobile reviews note the tested vehicle price and the mpg but then focus on other vehicle characteristics of consequence to consumers but not as readily apparent.

Econometric studies of the determinants of automobile prices likewise recognize the importance of product attributes in addition to fuel efficiency. For example, the variables included in the used-car price regression equation in Dreyfus and Viscusi included the following: passenger mortality rate for that model, fuel-expenditure operating cost, vehicle acceleration (that is, horsepower-to-weight ratio), cargo capacity, maintenance rating, luxury or sport vehicle, automatic or manual transmission, two-seat model, convertible, wagon, diesel, vehicle size category, and vehicle manufacturer.[38] Several dimensions other than fuel-expenditure operating cost will be affected by design changes in response to CAFE standards.

The analyses by EPA and NHTSA ignore the loss in consumer welfare that would result if achieving higher fuel-economy standards means manufacturers have to sacrifice any of these other vehicle characteristics. The EPA and NHTSA analyses abstract from all these concerns and focus on several cost-related aspects. In addition to the calculation of lifetime fuel savings to the consumer, the regulators also compute the private consumer surplus from additional driving (that is, the private benefit to consumers net of driving costs that occurs because the amount of driving increases as fuel efficiency increases) and the private benefit of reduced fueling time (because consumers would have to refuel less often).[39] The sum of these private net benefits to the consumer represents the bulk of the benefits of the fuel-efficiency mandate for both the NHTSA and EPA analyses. As shown in table 1, NHTSA estimates a total cost of $177 billion and a total benefit of $521 billion.[40] Of the $521 billion in the NHTSA estimate of total benefits (assuming

[38] Dreyfus and Viscusi (1995)
[39] Joint TSD, 4-27 and 4-54.
[40] See also NHTSA, PRIA, 45–46 (table 13). Costs include technology, congestion, accident, and noise costs; benefits are everything else.

a discount rate of 3 percent and constant 2009 dollars) resulting from the proposed CAFE standards for passenger cars and light trucks, fully $440 billion (or 85 percent) stem from private savings to consumers.[41] This $440 billion consists of $416 billion in lifetime fuel savings, $9 billion in consumer surplus from additional driving, and $15 billion in refueling time value.[42]

The EPA analysis for a slightly different standard is similar. As shown in table 2, EPA estimates $192 billion in total costs and $613 billion in total benefits.[43] Most of these benefits (87 percent) are private benefits to consumers: $444 billion in lifetime fuel savings, $71 billion in consumer surplus from additional driving, and $20 billion in refueling time value.[44]

The environmental benefits play a largely incidental role in both analyses. In the NHTSA analysis, the estimated benefits from reducing the greenhouse-gas carbon dioxide accounts for only $46 billion, or 9 percent of total benefits.[45] The greenhouse-gas carbon dioxide benefits in the EPA analysis are also $46 billion, or 8 percent of the benefits EPA estimates.[46]

Even these comparatively modest benefits overstate the benefits to the U.S. citizenry, since they also include the climate-change related benefits to other countries of reduced emissions within the United States.[47] To the best of our knowledge, this is the first situation in which benefits to countries other than the United States have been included in a regulatory impact analysis.

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[41] Ibid.
[42] Ibid.
[43] Joint Proposed Rule, 75,145–47 (table III-82). See also EPA, DRIA, vi (table 1).
[44] Joint Proposed Rule, 75,145–47.
[45] NHTSA, PRIA, 45–46.
[46] Joint Proposed Rule, 75,145–47.
[47] Ibid., 75,127 ("Applying the *global* SCC estimates . . . to the estimated reductions in CO_2 emissions under the proposed standards, we estimate the dollar value of the GHG [greenhouse-gas] related benefits for each analysis year" [emphasis added]). The EPA used social cost of carbon (SCC) estimates developed through an interagency process. EPA, DRIA, 7-3. See also Interagency Working Group on Social Cost of Carbon, "Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866," February 2010, 1, http://www.epa.gov/otaq/climate/regulations/scc-tsd.pdf [hereinafter SCC TSD]. The domestic benefits of reduced emissions are a subset of the larger global benefits. See SCC TSD, 3 (describing a 2011 CAFE rule in which NHTSA used both global and domestic SCC estimates—where the global SCC [$33 per ton of carbon dioxide] was more than 16 times the magnitude of the domestic SCC [$2 per ton of carbon dioxide]).

If one counted only the domestic benefits, the social cost of carbon dioxide benefits would be just 7 to 23 percent of the estimated carbon dioxide benefits.[48] Counting only domestic benefits would reduce the CAFE rule's greenhouse benefits from $46.4 billion to a range of $3.2 billion to $10.7 billion. The domestic benefits of reducing greenhouse gas emissions therefore only account for 0.6 to 2.1 percent of total estimated benefits. The estimated costs of the regulation are 18 to 60 times greater than the domestic greenhouse-gas benefits. If the purpose of the standards is to reduce greenhouse-gas emissions, these regulations are very inefficient.

In our view, this procedure of including benefits to other countries overstates the estimated benefits and lacks economic justification. The benefit of any U.S. government policy is the willingness of the U.S. citizens to pay for that policy. In general, the purpose of regulations is not to impose costs on U.S. citizens to provide benefits to other countries. Unless we value a dollar of benefits to other countries as equal to a dollar of benefits to U.S. residents, the climate-change benefit calculations overstate the actual estimated benefit amount. While there may in fact be some altruistic concern for the well being of other nations, such concerns are unlikely to place these values on the same footing as benefits internal to the United States. Moreover, if all policies were judged based on benefits to the world, the entire U.S. policy landscape would be transformed into an aid mission to less-developed countries.

Indeed, in the CAFE notice of proposed rulemaking, the EPA went one step further than considering the climate-change related benefits from emission reductions in the United States; it also included the economic losses that would result from lower global oil prices to "other countries that produce and sell oil or petroleum products to the U.S."[49] Adopting the world as the reference point for assessing U.S. policies establishes an untenable precedent for other policy

[48] SCC TSD, 11. "On the basis of this evidence, the interagency workgroup determined that a range of values from 7 to 23 percent should be used to adjust the global SCC to calculate domestic effects."
[49] Joint Proposed Rule, 74,932.

contexts and is inconsistent with the underlying tenets of whose welfare effects are being assessed in a BCA.

The role of CAFE standards in reducing other pollutants is not a driver in terms of generating substantial policy benefits. The benefits from reducing other pollutants account for $13 billion in the NHTSA analysis and $8 billion in the EPA analysis.[50] The reduction in petroleum-market externalities associated with energy security accounts for another $22 billion in the NHTSA analysis and $24 billion in the EPA analysis.[51] With estimated costs of the regulation of $177 billion by NHTSA and $192 billion by EPA,[52] this regulation clearly fails a BCA without the presumption of consumer irrationality and the resulting substantial private benefits associated with mandating more-fuel-efficient vehicles.

NHTSA does attempt to address "the question of why current vehicle purchasing patterns do not result in average fuel economy levels approaching those that this rule would require . . . [and] why manufacturers do not elect to provide higher fuel economy even in the absence of increases in CAFE standards."[53] The main explanations NHTSA offers, without any empirical support, are that consumers might have inadequate information about the value of higher fuel economy, they may not give enough attention to long-term horizons, they may be driven by loss aversion in which they place more weight on short-term losses versus long-term gains, and there may be a lack of salience of fuel savings.[54] NHTSA also postulates that the irrationality might lie with the manufacturers, who may be forgoing profitable activities because of mistaken assumptions about the premiums prospective buyers would pay for increased fuel economy.[55]

[50] See tables 1 and 2. See also NHTSA, PRIA, 45–46; and Joint Proposed Rule, 75,145–47.
[51] Ibid. (all sources).
[52] Ibid.
[53] NHTSA, PRIA, 699.
[54] Ibid. 699–711.
[55] Ibid., 703.

NHTSA does acknowledge that perhaps "the agency's underlying assumptions about some of the factors that affect the value of fuel savings differ from those made by potential buyers, because NHTSA has used different estimates for some components of the benefits from saving fuel from those of buyers, or simply because the agency has failed to account for some potential costs of achieving higher fuel economy."[56] Similarly, NHTSA acknowledges the existence of heterogeneous preferences across a range of characteristics by mentioning the possibility "that achieving the fuel economy improvements required by stricter fuel economy standards might lead manufacturers to forego [*sic*] planned future improvements in performance, carrying capacity, safety, or other features of their vehicle models that represent important sources of utility to vehicle owners."[57] This would suggest that "compromises in these or other highly-valued attributes would be viewed by potential buyers as an additional cost of improving fuel economy that the agency has failed to acknowledge or include in its estimates of the costs of complying with stricter CAFE standards."[58] Ultimately, NHTSA reports that it "has been unable to reach a conclusive answer to the question of why the apparently large differences between its estimates of benefits from requiring higher fuel economy and the costs of supplying it do not result in higher average fuel economy for new cars and light trucks."[59] Despite NHTSA's admission that it is uncertain whether the lack of market demand for higher fuel economy is due to consumer irrationality or consumer preferences, it proceeds to promulgate a regulation that assumes the former.

[56] Ibid.
[57] Ibid., 708.
[58] Ibid.
[59] Ibid., 711.

EPA also acknowledges that "it is a conundrum from an economic perspective that these large fuel savings have not been provided by automakers and purchased by consumers."[60] Rather than explore possible determinants of consumer choice other than fuel economy, EPA then proceeds to conjecture possible justifications. The first justification offered amounts to an assertion of consumer irrationality, in that "consumers put little weight on benefits from fuel economy in the future and show high discount rates."[61] Another justification hints at a systematic behavioral bias without offering specifics: "Fuel savings in the future are uncertain, while at the time of purchase the increased costs of fuel-saving technologies are certain and immediate."[62] Another justification seems grounded in neither neoclassical economics nor behavioral economics: "Consumers may not be able to find the vehicles they want with improved fuel economy."[63] The other justifications largely amount to problems of inadequate information, such as the reasoning that fuel-economy benefits are not salient enough to consumers, that consumers have difficulty calculating expected fuel savings, or that consumers might associate higher fuel economy with inexpensive, less well-designed vehicles.[64] Among the list of justifications for the "paradox" are acknowledgements that it could be a consequence of EPA's miscalculation or omitted variables, in that "factors such as transaction costs and differences in quality may not be adequately measured" and "there is likely to be variation among consumers in the benefits they get from improved fuel economy."[65] The behavioral justifications offered by NHTSA and EPA offer very little evidence that consumers are causing self harm in their vehicle-purchasing decisions and would thus accrue private benefits by having their options restricted.

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[60] EPA, DRIA, 5-12.
[61] Ibid., 8-10.
[62] Ibid.
[63] Ibid.
[64] Ibid.
[65] Ibid.

The review also raises the question of why a rigid mandate is warranted rather than an informational regulation that would provide consumers with the guidance to make sounder choices. Indeed, in 2011 EPA did just that by issuing its Motor Vehicle Fuel Economy Label Final Rule.[66] The mandated label for all new cars is quite extensive, including an overall mpg rating, a city mpg rating, a highway mpg rating, gallons/100 miles, driving range on a tank of gas, fuel costs in five years versus the average new vehicle, annual fuel costs, fuel economy and greenhouse-gas rating, and smog rating.[67] These components of the label address the purported behavioral failures in that they (i) indicate the longer-term fuel costs, thus diminishing the effect of high discount rates, (ii) make the benefits of fuel economy salient and a less "shrouded" attribute, (iii) provide easy calculations of fuel economy, (iv) enable consumers to know the actual fuel-economy benefits rather than relying on rough rules of thumb, (v) make it clear that fuel economy is a valued vehicle attribute not a proxy for a less-expensive vehicle, (vi) make it easier for consumers to identify which vehicles provide fuel economy, (vii) provide diverse measures of fuel economy that consumers can relate to their driving style, and (viii) make the fuel costs more apparent as an upfront cost similar to that of the sticker price. Indeed, the EPA label rule is directed at remedying all but a couple of the types of consumer choice failures that EPA claims account for the private benefits of fuel-economy standards.

What is striking about the EPA analysis of the CAFE standard is that the EPA regulatory impact analysis does not even mention the existence of the agency's own new label rule. This oversight goes to the heart of the CAFE standard analysis, as most of the benefits needed to

[66] "Revisions and Additions to Motor Vehicle Fuel Economy Label Final Rule," *Federal Register* 76 (July 6, 2011): 39,478 [hereinafter EPA Label Rule].
[67] Ibid, 39,480.

justify the regulation relate to consumer choice failures targeted by the new labeling rule.[68] If the label rule does not have zero economic benefits, then the EPA analysis of the fuel-economy standard necessarily overstates the benefits associated with the proposed CAFE standards. If the label rule is completely worthless and generates no benefits for consumer choice, then EPA was remiss in issuing the regulation and the OMB, the watchdog over all major new federal regulations, was remiss in permitting the agency to move forward with a rule other EPA assessments implicitly treat as worthless.

We take an intermediate view with respect to the labeling regulation. Informational strategies have a productive role to play and should be the primary policy instrument used if the alleged market failure stems from a lack of information. Before EPA should consider other, more intrusive forms of intervention, it should demonstrate that private decisions are flawed and that informational remedies will not suffice. In general, agencies should examine less-restrictive regulatory alternatives before adopting highly intrusive technology-forcing standards. The proposed EPA fuel-economy label rule is not ideal, as Cohen and Viscusi discuss, but it is far superior to restricting the choices available to consumers.[69] That a particular labeling approach may fall short should serve as an impetus for developing more effective informational policies rather than abandoning all labeling regulations because the particular policies implemented were not designed as well as they could have been. Informational regulations remain highly attractive, as they use a form of intervention that does not attempt to homogenize consumer choice or override the preferences of those who value a more diverse set of automobile attributes than mpg and cost.

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[68] The labeling policy even seeks to call consumers' attention to greenhouse-gas emissions and environmental externalities generally. However, it is unlikely voluntary restraints will be sufficient to generate efficient control of the external damages from energy use.

[69] Mark Cohen and W. Kip Viscusi, "The Role of Information Disclosure in Climate Mitigation Policy" (paper presented at Stanford-RFF Climate Policy Conference, Washington, DC, October 2011).

Even if EPA and NHTSA could demonstrate some form of consumer choice failure, these choices would need to be completely flawed to warrant counting the entirety of the private savings as net economic benefits. In the absence of the regulation, EPA and NHTSA are assuming there could be no rational basis for choosing a vehicle that does not meet the proposed standards even though the majority of the vehicles people currently drive do not meet the fuel-efficiency target. Choosing a car other than a Toyota Prius, a Nissan Leaf, or a Chevrolet Volt is not an inexplicable quirk of individual behavior but generally stems from valuation of car attributes these models do not offer. Indeed, applying the behavioral economists' critique of conspicuous consumption and status goods to cars may suggest that the purchase of highly fuel-efficient cars may be driven by forces behavioral economists view as irrational. The issue of rationality based on behavioral economists' scorecards may cut in the opposite direction to the extent that people purchase visibly fuel-efficient vehicles such as the Prius not for their own benefit but as a badge of political correctness to signal their environmental credentials to their neighbors. Such conspicuous consumption poses no problems if private choices are respected, irrespective of the source of the preferences.

CAFE Standards for Heavy-Duty Vehicles

On September 15, 2011, NHTSA and EPA jointly proposed fuel-economy standards for on-road heavy-duty vehicles, categorized as combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. The agencies relied on the same analytical framework they used for the CAFE standards for passenger cars and light trucks, meaning computing private fuel savings through an engineering analysis of the net present value of higher fuel economy and reduced fueling time, as well as computing effects on emissions of carbon dioxide and other pollutants, congestion, traffic fatalities, noise, and energy security.

As with the CAFE standards for passenger cars and light trucks, the bulk of the benefits of the heavy-duty vehicles standards are private benefits to the purchasers rather than benefits from reducing externalities. As shown in table 3, using a 3 percent discount rate and 2009 dollars, the agencies estimate a total cost of $9.6 billion and a total benefit of $58.9 billion for model-year trucks 2014 through 2018.[70] Of the $58.9 billion in estimated total benefits, fully $50.5 billion (86 percent) stem from private savings to consumers. This $50.5 billion consists of $50.1 billion in fuel savings and $400 million in the value of reduced fueling time.

The estimated benefits from reducing greenhouse-gas carbon dioxide account only for $5.7 billion, or less than 10 percent of total benefits. This number overstates the benefits to U.S. citizens, as it includes the climate-change related benefits to other countries of reduced emissions within the United States. In the final rule, EPA and NHTSA acknowledge that "the reductions in external costs are less than the costs of new fuel saving technologies needed to meet the standards."[71] Rather than see this as violating the market-failure rationale for the regulation, the agencies justify their rule by stating that the private "savings in fuel costs are *by themselves* sufficient to pay for the technologies" and thus the "*entire* value of the reductions in external costs represents additional net benefits of the program, beyond those resulting from the fact that the value of fuel savings exceeds the costs of technologies necessary to achieve them."[72]

The agencies' attempts to explain the seeming irrationality of buyers of heavy-duty trucks is more strained than in the case of passenger cars, because in this case the vast majority of the

[70] "Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles," *Federal Register* 76 (September 15, 2011): 57,106, 57,347 (to be codified at 49 C.F.R. pt. 523). These numbers are found in table VIII-33 of the final rule.
[71] Ibid., 37,315.
[72] Ibid. 57,316 (emphasis in the original).

vehicles are purchased and operated by businesses, which the agencies acknowledge have "narrow profit margins, and for which fuel costs represent a substantial operating expense."[73] The agencies are arguing that these firms, operating in a highly competitive environment, are forgoing substantial cost-minimizing purchases and thus incurring losses to owners and shareholders.

The agencies' first hypothesis for why the trucking industry fails to adopt cost savings technologies is that "there is inadequate or unreliable information available about the effectiveness of many fuel-saving technologies for new vehicles."[74] The agencies reason that the lack of information might be because "information on technologies is costly" and "information has aspects of a public good." There is no evidence given to support these claims with respect to heavy trucks. Fuel-efficiency information can be conveyed at low cost, and with billions of dollars at stake there are ample private-market incentives to provide such information. And if the problem is purely informational, labeling policies will suffice. The agencies' second hypothesis is that the resale market "may not adequately reward the addition of fuel-saving technology to vehicles."[75] Again, given the low cost of conveying information and the substantial amount of savings at stake, this hypothesis lacks credibility. Moreover, the assertion about markets is contradicted by empirical evidence. Since energy-efficient used cars command a price premium from consumer purchasers, as Dreyfus and Viscusi show, what reason is there to believe that profit-maximizing firms will not do likewise?[76]

The agencies' third hypothesis is that there are split incentives between owners and operators of heavy-duty trucks. Since the operators, not the owners, must purchase the fuel,

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[73] Ibid.
[74] Ibid., 57,317.
[75] Ibid.
[76] Dreyfus and Viscusi (1995)

"capital investments by truck owners may be channeled into equipment that improves" other features of the trucks rather than into fuel-saving technology.[77] The agencies acknowledge that "if operators can choose freely among the trucks they drive, competition among truck owners to employ operators would encourage owners to invest in fuel-saving technology."[78] They offer no evidence of a lack of competition in the industry that would support the split-incentives hypothesis.

The agencies also offer the hypothesis that "transaction costs of changing to new technologies . . . may slow or prevent their adoption."[79] As noted earlier, given high sunk costs and uncertainty over future savings, a high discount rate is entirely rational. A regulatory mandate that prevents firms from transitioning to a new technology at their desired rate would thus harm, not help, expected firm profits. The agencies acknowledge the possibility that uncertainty about future cost savings may be the reason firms are not purchasing the more fuel-efficient vehicles. Yet they later justify the mandate in part due to this rational response to uncertainty. They acknowledge that "the engineering estimates of fuel savings and costs . . . might overstate their benefits or understate their costs in real-world applications."[80] The agencies present little or no evidence to support their hypotheses of why firms are foregoing cost-reducing truck technologies, yet the agencies are undeterred in promulgating an expensive rule that relies on these hypotheses to justify approximately 85 percent of the rule's estimated benefits.

[77] "Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles."
[78] Ibid., 57,317.
[79] Ibid.,57,318.
[80] Ibid., 57316.

Clothes Dryers and Room Air Conditioners

The EPCA[81] prescribes energy-conservation standards for various consumer products, including residential clothes dryers and room air conditioners.[82] EPCA requires that DOE determine whether amended standards are technologically feasible and economically justified and would save a significant amount of energy.[83] At the end of 2011, DOE adopted new energy-efficiency standards for clothes dryers and room air conditioners.[84]

DOE relied on a net present value analysis to demonstrate the economic justification for the new standards.[85] This analysis computed the total consumer expense over the life of the appliance, including the purchase expense and operation costs (including energy expenditures), with the future operating costs discounted to the time of purchase and then summed over the lifetime of the product.[86] Similar to the analysis of the CAFE standards, the computational complexity of this assessment required DOE to assign values for each of six product classes on such things as the purchase price (stemming from manufacturer cost, manufacturer markup, and retailer markup), installation cost, repair and maintenance cost, annual energy consumption per unit, projected energy prices, the lifetime of the appliance, and the discount rate.[87]

Of the four product classes of clothes dryers that saw a tightening of the standard, assuming a 3 percent discount rate, DOE estimated $2.779 billion in consumer savings stemming from the vented electrical standard dryer regulation, $5 million in consumer savings stemming from the vented electric compact 120-volt dryer regulation, $14 million in consumer savings

[81] *Energy Policy and Conservation Act of 1975.*
[82] *U.S. Code* 42 § 6295(c) and (g) (West, Westlaw through Public Law 112-71 [excluding Public Law 112-55 and 112-56] approved December 19, 2011).
[83] Ibid., § 6295(o).
[84] "Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners," *Federal Register* 76 (April 21, 2011): 22,454.
[85] Ibid., 22,457.
[86] Ibid., 22,511.
[87] Ibid.

stemming from the vented electric compact 240-volt dryer regulation, and $215 million in consumer savings stemming from the vented gas dryer regulation.[88]

Of the four product classes of clothes dryers that saw a tightening of the standard, assuming a 7 percent discount rate, DOE estimated $1.017 billion in consumer savings stemming from the vented electrical standard dryer regulation, $2 million in consumer savings stemming from the vented electric compact 120-volt dryer regulation, $6 million in consumer savings stemming from the vented electric compact 240-volt dryer regulation, and $51 million in consumer savings stemming from the vented gas dryer regulation.[89]

As shown in table 4, the estimated increase in consumer savings stemming from a regulatory increase in the energy-efficiency standards for clothes dryers is $3.01 billion (3 percent discount rate) or $1.08 billion (7 percent discount rate). These values make up a significant share of the total estimated benefits of the regulations. For the external benefits, DOE estimates benefits of $93 million to $1.49 billion from reducing carbon dioxide emissions as a result of the regulation. As in the case of the analysis of fuel-economy standards for motor vehicles, this benefit estimate for greenhouse-gas emissions includes all global benefits from reducing domestic emissions. DOE estimates the benefits as between $4.77 million and $49 million (3 percent discount rate) and between $2.06 million and $21.2 million (7 percent discount rate) from reducing other pollutants. The clothes dryer regulations would not pass a BCA if it focused on external environmental benefits, given DOE's estimate of compliance costs of $64.5–$80.6 million.

An earlier proposed regulation of clothes washers was purported to have great energy savings for consumers, but a Rasmussen Research poll found tremendous consumer opposition

[88] Ibid., 22,541, tableV-26.
[89] Ibid., 22,542, tableV-26.

to the standard.[90] By a margin of 6 to 1 the public opposed regulations that would effectively eliminate top-loading washing machines. Even after being informed of the lower operating costs and greater energy efficiency of the new models, consumers opposed the regulation by a margin of 2.6 to 1. Much of the opposition arose because most consumers wash fewer loads per week than the DOE analysis assumed; for this group the present value of the cost savings is far less than the estimated savings. Engineering studies divorced from consumer usage and preferences can produce policies that produce far fewer benefits than predicted.

DOE's net present value analysis of the energy-efficiency standards of room air conditioners computed the total consumer expense over the life of the appliance, including the purchase expense and operation costs (including energy expenditures), with the future operating costs discounted to the time of purchase and summed over the lifetime of the product. DOE assigned input values for each of the six product classes on such things as the purchase price (stemming from manufacturer cost, manufacturer markup, and retailer markup), installation cost, repair and maintenance cost, annual energy consumption per unit, projected energy prices, the lifetime of the appliance, and the discount rate.[91]

Of the six product classes of room air conditioners that saw a tightening of the standard, assuming a 3 percent discount rate, DOE estimated $245 million in consumer savings stemming from the regulation of air conditioners with less than 6,000 Btu/h with Louvers, $1.162 billion in consumer savings stemming from the regulation of air conditioners with 8,000–13,999 Btu/h with Louvers, $3 million *loss* in consumer savings stemming from the regulation of air conditioners with 20,000–24,999 Btu/h with Louvers, $2 million *loss* in consumer savings

[90] Susan Dudley, *Addendum to Public Interest Comment on the Dept. of Energy's Proposed Clothes Washer Efficiency Standards, Docket No. EE-RM-94-403*, Regulatory Studies Program (Arlington, VA: Mercatus Center at George Mason University, December 4, 2000), http://mercatus.org/publication/doe-clothes-washer-addendum-poll-results.
[91] "Energy Conservation Program," 22,511–12.

stemming from the regulation of air conditioners with greater than 25,000 Btu/h with Louvers, $49 million in consumer savings stemming from the regulation of air conditioners with 8,000-10,999 Btu/h without Louvers, and $24 million in consumer savings stemming from the regulation of air conditioners with greater than 11,000 Btu/h without Louvers.[92]

Of the six product classes of room air conditioners that saw a tightening of the standard, assuming a 7 percent discount rate, DOE estimated $20 million *loss* in consumer savings stemming from the regulation of air conditioners with less than 6,000 Btu/h with Louvers, $558 million in consumer savings stemming from the regulation of air conditioners with 8,000–13,999 Btu/h with Louvers, $3 million *loss* in consumer savings stemming from the regulation of air conditioners with 20,000–24,999 Btu/h with Louvers, $2 million *loss* in consumer savings stemming from the regulation of air conditioners with greater than 25,000 Btu/h with Louvers, $25 million in consumer savings stemming from the regulation of air conditioners with 8,000–10,999 Btu/h without Louvers, and $12 million in consumer savings stemming from the regulation of air conditioners with greater than 11,000 Btu/h without Louvers.[93]

As shown in table 5, the estimated increase to consumer savings stemming from a regulatory increase in the energy-efficiency standards for room air conditioners is $1.47 billion (3 percent discount rate) or $570 million (7 percent discount rate). These values make up a significant share of the total estimated benefits of the regulations. For the external benefits, DOE estimates benefits of $77 million to $1.164 billion from reducing carbon dioxide emissions as a result of the regulations. This estimate includes all global benefits from reducing domestic emissions. DOE estimates between $4.16 million and $42.7 million (3 percent discount rate) and between $2.2 million and $22.6 million (7 percent discount rate) from reducing other pollutants.

[92] Ibid., 22,542 (tableV-28).
[93] Ibid., 22,542 (tableV-29).

The room air-conditioner regulations would not pass a BCA if it focused strictly on external environmental benefits, given DOE's estimate of industry costs of $111.3–$177.6 million.

Acting under authority from EPCA, DOE has promulgated energy-efficiency regulations for other appliances as well. For example, DOE issued standards for residential refrigerators in 2011, and for industrial products, such as high-intensity light fixtures (known as metal halide lamp fixtures) and walk-in coolers and freezers in 2012. As in the case of the fuel-economy standards, for each of these appliance standards, the preponderance of the estimated benefits consists of private benefits to the purchasers of the products. These are only benefits if consumers are not currently making the utility-maximizing choice, or in the case of the metal halide lamp fixtures and walk-in coolers and freezers, if profit-maximizing firms operating in a competitive environment are all failing to minimize their business costs. Put somewhat differently, there must be some form of individual irrationality or behavioral shortcoming of individual choices to give rise to these benefits. DOE provides little, if any, analysis and documentation of this assumed irrationality in its rules. In the clothes dryers and room air conditioners rule, it consists of a single paragraph devoid of any empirical evidence and specific citations to the literature:

> DOE also notes that the economics literature provides a wide-ranging discussion of how consumers trade off upfront costs and energy savings in the absence of government intervention. Much of this literature attempts to explain why consumers appear to undervalue energy efficiency improvements. This undervaluation suggests that regulation that promotes energy efficiency can produce significant net private gains (as well as producing social gains by, for example, reducing pollution). There is evidence that consumers undervalue future energy savings as a result of (1) a lack of information; (2) a lack of sufficient salience of the long-term or aggregate benefits; (3) a lack of sufficient savings to warrant delaying or altering purchases (for example, an inefficient ventilation fan in a new building or the delayed replacement of a water pump); (4) excessive focus on the short term, in the form of inconsistent weighting of future energy cost savings relative to available returns on other investments; (5) computational

> or other difficulties associated with the evaluation of relevant tradeoffs; and (6) a divergence in incentives (that is, renter versus owner; builder vs. purchaser). Other literature indicates that with less than perfect foresight and a high degree of uncertainty about the future, consumers may trade off these types of investments at a higher than expected rate between current consumption and uncertain future energy cost savings.[94]

General Service Incandescent Lamps

EISA established specific energy-efficiency standards for general service incandescent lamps (GSILs),[95] which are standard incandescent or halogen-type light bulbs.[96] The standards were set to be phased in over a two-year period from 2012 to 2014.[97] The light bulb regulation has served as the focal point for much recent controversy over the role of government policies in dictating consumer choices.

Executive Order 12866 requires agencies to assess both the costs and the benefits of intended regulations, even cases (such as the GSIL standards) in which the regulatory standard is specifically prescribed by statute and leaves the agency with no discretion.[98] DOE did not conduct a dedicated BCA for the GSIL standard; instead it included it within a technical-support document that assessed the overall national impacts of EISA.[99]

DOE presents relatively little documentation on how it calculated the costs and benefits of the standard. The DOE analysis calculated cumulative national energy savings as the sum of annual national energy savings, which in turn was estimated as the difference in annual national

[94] Ibid., 22,550.
[95] Public Law 110-140, § 321(a)(3)(A)(ii)(I)(cc), 121 Stat. 1492, 1577 (2007).
[96] Ibid., § 321(a)(1)(A).
[97] Ibid., § 321(a)(3)(A)(ii)(I)(cc).
[98] Executive Order no. 12866, § 1(b)(6).
[99] DOE, "Technical Support Document: Impacts on the Nation of the Energy Independence and Security Act of 2007," 2009.

energy consumption between the base case and the case with the new GSIL standards.[100] DOE estimates 14.14 quads in cumulative national energy savings.

The net present value to consumers is computed as the present value of operating-cost savings minus the present value of increased total installed costs.[101] (Present values were computed for both 3 percent and 7 percent discount rates.) DOE computed the operating-cost savings for a given year by multiplying the surviving stock of GSILs of a given vintage in that year by the per-unit operating-cost savings for that vintage (obtained by multiplying the vintage's expected energy savings by forecasted energy prices), then summing over vintages.[102] DOE computed increased total installed costs for a given year by researching product catalogs, online distributors, and manufacturing interviews to estimate "the increase in unit prices for products that comply with EISA 2007."[103] It then multiplied the surviving stock of GSILs of a given vintage in that year by this annual per-unit total-installed cost increase, then summed over vintages.[104] No consideration was made for consumer preferences for different types of light bulbs or for such things as the rebound effect. Thus, the quality of light, whether the bulb is dimmable, and other aspects of light bulbs are irrelevant to the DOE assessment.

DOE's net present value estimate is for $27.5 billion (7 percent discount rate) or $64.2 billion (3 percent discount rate) in cumulative savings to consumers from 2008 through 2038 stemming from the efficiency standards for light bulbs.[105] These estimates of private benefits far outweigh DOE's estimate of between zero and $16.34 billion in benefits from reducing carbon

[100] Ibid., 17.
[101] Ibid., 26.
[102] Ibid., 26–28.
[103] Ibid., 27–28.
[104] Ibid., 26.
[105] Ibid., 31.

dioxide emissions.[106] Once again, private benefits to consumers drive the economic justification for the analysis.

Conclusion

The economic puzzle raised by all these energy regulations is why consumers are this remiss. How can it be that consumers are leaving billions of potential economic gains on the table by not buying the most energy-efficient cars, clothes dryers, air conditioners, and light bulbs? Moreover, how can it also be the case that firms seeking to earn profits are likewise ignoring highly attractive opportunities to save money? If the savings are this great, why is it that a very basic labeling approach cannot remedy this seemingly stunning example of completely irrational behavior? It should be quite simple to rectify decisions that are this flawed.

It should be a red flag that something is amiss with an analysis that assumes such perplexing consumer and firm behavior that runs counter to the most rudimentary economic theory and our general sense that we do not live in a world in which people never make sound choices. It might be that there is something that is incorrect or perhaps even irrational in the assumptions being made in the regulatory impact analyses. Indeed, upon closer inspection it is apparent that there is no empirical evidence provided for the types of consumer failures alleged. Even if some consumers do sometimes fall short on certain dimensions of choice, the magnitude and prevalence of such a shortfall is important and is never addressed in the regulatory assessments. Nor is there adequate consideration of the actual and potential role of informational remedies that have already been adopted.

Perhaps the main failure of rationality is that of the regulators themselves. Agency officials who have been given a specific substantive mission have a tendency to focus on these concerns to the exclusion of all others. Thus, fuel efficiency and energy efficiency matter, but

[106] Ibid., 35.

nothing else does. If other attributes matter, it is assumed they either are irrelevant or will be included at no additional cost in the post-regulation products. In effect, government officials act as if they are guided by a single mission myopia that leads to the exclusion of all concerns other than their agency's mandate.

Institutional biases of this type are common and are fundamental characteristics of organizational behavior. Indeed, the existence of parochial visions by agencies is a major reason the Executive Office of the President has institutionalized a formal regulatory oversight process beginning with the Ford administration and including a BCA test since the Reagan administration. One question raised by these analyses is whether the legislation mandating these standards permits OMB to provide credible evidence of the market failures pivotal to justifying the regulations. Even if the regulations must by law be issued, there could be changes to the analysis to show the true economic burdens of the regulations. Indeed, OMB guidelines require that the agencies estimate the costs of not pursuing the optimal regulatory response due to legal constraints.[107] Moreover, OMB should also require agencies to prepare analyses in which the domestic greenhouse-gas benefits are included as benefits instead of the greenhouse-gas benefits to the world. And regulatory analyses for energy-efficiency regulations should have much firmer economic grounding than the current engineering approach.

Adopting a more accurate economic analysis does not imply that government agencies do not have any policy tools that can be used to foster greater energy efficiency. Informational policies and more limited forms of policy intervention may be warranted on a benefit-cost basis. Recent regulatory analyses demonstrate that the current energy-efficiency initiatives do very little to address climate change. Rather than squander societal resources on more ineffective

[107] See OMB, "Circular A-4.", which states: "If legal constraints prevent the selection of a regulatory action that best satisfies the philosophy and principles of Executive Order 12866, you should identify these constraints and estimate their opportunity cost."

policy efforts, a more productive approach would be to search for policy options that offer greater potential for making a serious dent in greenhouse-gas emissions.

Table 1. NHTSA's Estimated Costs, Benefits, and Net Benefits of the CAFE Rule

Input	Value (2009$, billions)
Costs	
Technology costs	132.137
Congestion costs	30.040
Accident costs	14.250
Noise costs	0.568
Total Costs	**176.995**
Benefits	
Lifetime fuel savings	416.456
Consumer surplus from additional driving	9.105
Refueling time value	15.292
Petroleum market externalities	21.547
Fatality costs	0.010
CO_2	45.614
CO	0.000
VOC	0.601
NOx	0.594
Particulate matter	6.705
Sox	5.401
Total Benefits	**521.325**
Net Total Benefits	**344.330**

Source: NHTSA, "Preliminary Regulatory Impact Analysis: Corporate Average Fuel Economy for MY 2017–MY 2025," November 2011, table 13.

Note: Estimates are for combined passenger cars and light trucks, 3 percent discount rate, billions of 2009$.

Table 2. EPA's Costs, Benefits, and Net Benefits of the CAFE Rule

Input	Value (2009$, billions)
Costs	
Technology costs	140.0
Accidents, congestion, and noise costs*	52.0
Total Costs	**192.0**
Benefits	
Lifetime fuel savings	444.0
Consumer surplus from additional driving	70.9
Refueling time value	19.5
Energy security benefits	24.2
CO_2	46.4
Non-CO_2 greenhouse-gas impacts	n/a
$PM_{2.5}$-related impacts	8.0
Total Benefits	**613.0**
Net Total Benefits	**421.0**

Source: EPA and NHTSA, "2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards," Federal Register 76 (December 1, 2011): 74854, table III-82; and EPA, "Draft Regulatory Impact Analyses: Proposed Rulemaking for 2017–2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," November 2011, table 1.
Note: An * indicates that these were included as disbenefits in EPA's tables. Estimates are for combined passenger cars and light trucks, 3 percent discount rate, billions of 2009$.

Table 3. NHTSA's Estimated Costs, Benefits, and Net Benefits of the CAFE Rule

Input	Value (2009$, billions)
Costs	
Technology costs	8.100
Accident, Congestion, Noise costs	1.500
Total Costs	**9.600**
Benefits	
Lifetime fuel savings	50.100
Refueling time value	0.400
Energy security impacts	2.700
CO_2	5.700
Total Benefits	**58.900**
Net Total Benefits	**49.300**

Source: EPA and NHTSA, Final Rule (2011), table VIII-33.

Note: Estimates are for combined heavy-duty vehicles, 3 percent discount rate, billions of 2009$.

Table 4. National Impacts of Clothes Dryer Rule (2009$ billion)

	3% Discount	7% Discount
NPV of consumer benefit	$3.01	$1.08
Value of CO_2 reduction	$0.093to $1.49	
Value of NO_x reduction	$0.005 to $0.049	$0.002 to $0.021
Change in Industry NPV	–$0.081 to –$0.065	

Source: "Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners," *Federal Register* 76 (April 21, 2011): 22,550–51 (tables V-47 and V-51).

Table 5. National Impacts of Clothes Dryer Rule (2009$ billion)

	3% discount	7% discount
NPV of consumer benefit	$1.47	$0.57
Value of CO_2 reduction	$0.077 to $1.16	
Value of NO_x reduction	$0.004 to $0.043	$0.002 to $0.023
Change in Industry NPV	-$0.18 to -$0.11	

Source: "Energy Conservation Program: Energy Conservation Standards for Residential Clothes Dryers and Room Air Conditioners," *Federal Register* 76 (April 21, 2011): 22,553–54 (tables V-51 and V-52).

Mr. WHITFIELD. Thank you, Mr. Gayer, and thank all of your for your testimony, and once again for being here with us today.

Ms. Burt, I want to ask you a question to start off with. I notice in your testimony you were talking about the per capita use of energy in California has been flat since 1970, so we are talking about 30 or 40 years. You are talking about the new technologies that have been launched. You talked about the new policies of the government and working with the utilities. You talked about $20 billion in savings. You talked about the lack of necessity to build 25 new generating plants. With all of those efficiencies and everything else, why is it that the California electricity rates are among the highest in the country, with the exclusion of Alaska or Hawaii? You all have been so productive in so many ways. Why is it that electricity rates are so high out there?

Ms. BURT. Well thank you, Mr. Chairman, for the question and for the opportunity.

California electric rates are high, and matter of fact, they are within the top 25 across the country of major utilities. The bills of Californians, however, are among the lowest, and so I think you have to look at both of those in collaboration.

Mr. WHITFIELD. How is that possible? How does that work?

Ms. BURT. Well, energy rates in California are higher the more you use. It is an inclining tier structure and it is designed that way to encourage energy efficiency. The lower rates, though, however, are very comparable to other parts of the United States. And so when we talk about rates, that is one slice of it, but we actually work with our customers to lower their bills, and that is really what they are about. You know, again, we serve about 15 million Californians across northern and central California, and we have a wide variety of customer groups.

Mr. WHITFIELD. What would you say the average per kilowatt hour is for industrial use in California?

Ms. BURT. You know, Mr. Chairman, I don't have that with me directly but I can certainly get back to you with that information.

Mr. WHITFIELD. I am assuming that it—I mean, I am not complaining about it or anything, but I am assuming it must be much higher, because if you have residential use really cutting down on their consumption, and then that is low as the average utility bill in America, that must mean the industrial use must be a lot more expensive.

Ms. BURT. Thank you, Mr. Chairman, let me clarify a little bit more. We actually have energy efficiency programs that span across all of our customers. So within our energy users that are high industrial customers are refineries, and we have many in California. We have oil producers in California, we have food processors within our service territory. We have programs that work directly with each of those types of businesses to lower their energy costs——

Mr. WHITFIELD. But even though the individual bills may be low, why is it that the production is so high, the cost?

Ms. BURT. Well again, the energy policies across California are designed to encourage conservation, encourage energy efficiency. On the industrial side, however, again, what the industrial customer—and frankly, what our commercial customers and residential customers care about are the size of their monthly bills. And the size of their monthly bills are among the lowest in the Nation.

Mr. WHITFIELD. The size of your——

Ms. BURT. Of their monthly bills, so their usage is——

Mr. WHITFIELD. And we are talking about who and here now, residential users?

Ms. BURT. Mr. Chairman, actually all of our customers. The size of their monthly bills are among the lowest——

Mr. WHITFIELD. Are among the lowest in the country?

Ms. BURT. Yes, among the lowest in the country. They certainly aren't the lowest, but they are among the lowest.

Mr. WHITFIELD. Mr. Crouse, let me ask you a question. The Section 433 prohibits the use of fossil fuels in new or modified federal buildings by the year 2030 or so. Now you were testifying on behalf of the Combined Heat and Power Association. Wouldn't a prohibition such as that make it more difficult on the adoption of high efficiency technologies, such as combined heat and power for federal buildings?

Mr. CROUSE. Well, I think it certainly could. One of the opportunities, though, is to look at biogas or other means of destructing organic waste to use, then, the fuel or the natural gas, the methane that comes off of the anaerobic digesters, or in some cases, gas that would come from other processes on those bases. The other, you know, option would be for us to look at using natural gas as a fuel, as a transition fuel, and look down the road at possibly using those new fuels that come online and the new products that would become available in that timeframe, to use them, including some of the new biofuels that are looking at being generated from algae and from other sources.

Mr. WHITFIELD. OK. Mr. Kosisko, my time is running out, but I did pay attention to what you did with Archema down in my district. That $300,000 annual savings was quite impressive, and I want to thank you for mentioning that.

At this time, I recognize the gentleman from Illinois, Mr. Rush, for 5 minutes.

Mr. RUSH. Ms. Burt, you talked in your testimony about PG&E's comprehensive approach to energy efficiency. You included different strata of individuals and demographic groups in your statement. The question that I have is do some of these outreach programs that you discussed, have you engaged young people, young students in some of this outreach and could you speak to the educational activities and initiatives that you have with the youngest of our citizens?

Ms. BURT. Thank you, Mr. Rush. Yes, absolutely, Congressman Rush, we—our programs do contain a very large component of education, both—primarily in the post-high school area. In fact, we have three education centers across our service territory, one in Stockton, one in San Francisco, and one in the East Bay area that are really focused on training and developing even job skills within energy efficiency. We have got the oldest existing training facility in Stockton that has been in place since 1978, and I believe we have trained something in the neighborhood of over 91,000 people to really go out and be productive in the jobs arena around really being energy auditors, installing weatherization, all of the different phases of energy efficiency within those three centers. So we have a pretty broad record on that.

Mr. RUSH. So you create some jobs with these programs? I am trying to focus on young, even younger than high school. It seems the earlier we include energy efficiency and an understanding of the energy demand, energy sector, the energy issues, including costs, but also efficiencies, the earlier we include that in the education of our younger children, the more we change the culture. I think we will have some tremendous benefits. Do you engage, say, even at the grade school level?

Ms. BURT. Yes, Congressman Rush, we do. We have several programs. One of them is our Solar Schools Program where we really engage elementary age students around energy in totality. So renewable resources, the value of solar—we actually install solar panels on schools and use them in demonstration—classroom demonstration pieces. We have a number of other classroom demonstrations, both around energy efficiency and energy in general within the school systems that are used throughout our service territory.

Mr. RUSH. In your opinion, how is the Federal Government faring in these areas? Are there some things that we are doing—are we doing enough as a Federal Government to raise the level of consciousness of our grade school-level students, high school-level students? Are we doing enough as a Federal Government?

Ms. BURT. Thank you. That is a wonderful point. I think all of us can do more to engage the next generation around energy, and not just energy production, but using energy efficiency as a source of production. And I think learning what new technology—and again, the combining of really this new—the new IT and smart grid with what energy efficiency can do is going to be an amazing future for that generation. I think the Federal Government can do more. I think we can all do more to encourage education.

Mr. RUSH. Thank you, Mr. Chairman. I yield back.

Mr. WHITFIELD. Gentleman yields back.

At this time, I recognize the gentleman from Texas, Dr. Burgess, for 5 minutes.

Mr. BURGESS. Thank you, Mr. Chairman. I appreciate the recognition.

Ms. MacIntosh, let me ask you. You heard the testimony of Dr. Hogan and the first panel. Do you work with the—with their office, the Department of Energy Efficiency and Renewable Energy?

Ms. MACINTOSH. We do. All of the member companies of the Federal Performance Contracting Coalition work hand-in-hand with the Department of Energy. They oversee the indefinite delivery and definite quantity contracts that we all operate under to implement energy savings performance contracting for the Federal Government.

Mr. BURGESS. Now you referenced that there, in fact, was a congressional mandate that required some of this performance standards. Do you recall when that congressional mandate was passed? In your written testimony, you referenced 1986 and said implementation was occurring in the '90s. So—and this is a well-established pattern, is that correct?

Ms. MACINTOSH. Correct.

Mr. BURGESS. This is not something that is new that should be——

Ms. MACINTOSH. Performance contracting? Oh, no.

Dr. BURGESS [continuing]. A surprise to——

Ms. MACINTOSH. It should not be a surprise to anyone.

Dr. BURGESS [continuing]. Dr. Hogan? Well——

Mr. WHITFIELD. Ms. MacIntosh, would you mind using Mr. Crouse's microphone, because we—and——

Ms. MACINTOSH. Is this a little better?

Mr. WHITFIELD. Yes, that is better.

Mr. BURGESS. Whoa, super. And you know, I was making the point—and not just an academic one—in Congress, we get criticized for passing mandates and then not living under them ourselves. I referenced how in my own personal life I have made energy efficiency decisions that were based upon what I would consider would be the correct market signals. And yet, we have a great big glorious federal building here, the Rayburn Building. I am fortunate enough to have an office here. Yes, indeed, they did change all the lighting around back in 2007 or 2008, but when I look at the biggest source of energy loss, it has got to those single pane windows that are in existence in the Rayburn Building, in the Cannon Building, in the Longworth Building. I don't get to go over on the Senate side, but I suspect you have got the same thing over there. So did you do an audit for the Department of Energy on, say, the Rayburn Building, like we have mandated that other industries do on their structures?

Ms. MACINTOSH. Yes, that is correct, and that was done in the 2008–2009 timeframe. A comprehensive audit was performed for all of the House office buildings. The same was also done for the Senate office buildings.

Mr. BURGESS. Yes, we will ignore the Senate for right now, since they are ignoring us. Would it be fair to say that—I mean, lighting, yes, it is a significant expense. To me, it would have made more sense—I mean, had I been doing this in my private life and I wanted to change all my lighting, I would have waited until a bulb burned out and then replaced it with an LED or a CFL, if that was my inclination. To go in and change all the lights around—basically during a congressional recess, I mean, that was a pretty expensive undertaking. I have got no idea what happened to the old light bulbs. I hope they gave them to another country so that they could use them. But it almost seems like that was the obvious—the low-hanging fruit in this endeavor, but if you really want to look at where the energy efficiency exists in an older building like Rayburn or Cannon or Longworth, it is going to be in the window treatments, not in the lighting structures.

Ms. MACINTOSH. Mr. Terry, the beauty of the energy saving performance contracts—excuse me, Mr. Burgess—it was the direct line of sight. The beauty of the energy savings performance contracting program is that you are supposed to look at things from a holistic standpoint. So energy savings were generated from lighting, certainly, but that was really only one of the many measures that were implemented. The real meat of an ESPC, typically, is in the places you don't see. It is in the chiller plant, it is in the boiler plant, it is in the direct digital control systems of a facility that measure and monitor and modulate temperature, for example. All of those systems, including water systems as well, were addressed in all of these buildings. You know, that audit that was performed at the time is also intended to be a very comprehensive menu of opportunities that we could implement to generate savings.

Mr. BURGESS. Yes, we are going to run out of time. You notice the chairman has a very quick gavel——

Ms. MACINTOSH. Certainly.

Dr. BURGESS [continuing]. When it comes to me, but could you perhaps supply my office with that audit and perhaps provide us a little direction as to what has been implemented and what has been—what is waiting? Because again, I would like to give people some reassurance that we are living under the same rules that we are making for other people——

Ms. MACINTOSH. Agreed.

Dr. BURGESS [continuing]. And that the smart thing to do is to respond to appropriate market signals and not the congressional mandates.

Thank you, Mr. Chairman, for your indulgence. I am going to yield back the final 2 seconds.

Mr. WHITFIELD. You are welcome, Dr. Burgess. I gave you an extra 50 seconds the last time, so—at this time, I recognize the gentleman from California, Mr. McNerney, for 5 minutes.

Mr. MCNERNEY. Thank you, Mr. Chairman. I want to welcome you to Washington, Ms. Burt, for your testimony here this morning. I had the privilege of visiting a PG&E training facility in Stockton, and with Chris Foster—it was about a year ago, and it is certainly state-of-the-art. It is very impressive. Do you think that that facility and facilities like that are producing enough trained workers, or is there an additional need for additional facilities to meet the market demand right now?

Ms. BURT. Thank you. Thank you very much, and it is a delight to be here, Congressman. We are certainly happy to be here from California.

That facility in particularly and the other two, the sister facilities that we have, the facility in San Ramon, which really trains and really does a lot of research and work around the food industry and emerging technology, and then the one in San Francisco, which is really focused on architects and building and really design. I will tell you, they are kept consistently busy. And as you mentioned, the one in Stockton has actually been in existence since 1978, and we have produced 91,000 trained workers. Our own workforce, we have about 700 people directly working for—on my team that do energy efficiency, and then we hire in our communities another 2,000 practitioners within weatherization, and these are contractors and we train them. We also trained a number of contractors in the most recent funding, the ARA funding that was available. So I must say that we don't find lack of need for training. There always seems to be—I looked at the Pacific Energy Center just the other day, and I think there were 950 separate classes that were being offered. And I know last year in that facility alone, we trained—and that, I think, is the smallest of our facilities—we trained about 8,000 workers.

So it is certainly an area as energy efficiency becomes more a part of the solution nationally that we should look at, you know, and I think if we can get to the point where energy efficiency is considered in other places as it is in California as a part of the generation mix, just as a generation plant would be, then I think we may need to look at more training facilities.

Mr. MCNERNEY. Thank you. How do you see the EV market affecting PG&E's business plan over the next decade?

Ms. BURT. Well, thank you again. We are very excited about the electric vehicle market. It does have challenges with it because again, the distribution grid traditionally built across our service territory as well as others is in need of upgrading. We are in the midst of making our grid much smarter to really integrate electric vehicles and other renewable resources, but we are very excited about electric vehicles and what they offer, particularly for the environmental benefits and for our customers' benefits. We know that in our service territory—I will tell you, my customers and your constituents are very excited about using electric vehicles. So I think you can expect to see us do more on that.

Mr. MCNERNEY. Thank you.

Mr. Gayer, would you say that big improvements in energy efficiency would have a stimulative impact on the national economy?

Mr. GAYER. I think that market-driven improvements in energy efficiency are good for the well-being of the economy for sure. When you get to certain programs to stimulate, I think it is a little bit dicier as far as whether or not it is worth the cost. You would have to really see what is the labor being employed and what would they have been doing otherwise. In a time of great unemployment, I think there is much more evidence that there is such a case, but if you are talking about the long sweep of history, I think the evidence is weaker. But certainly, energy innovation and energy efficiency innovation is good for the economy.

Mr. MCNERNEY. Thank you.

Mr. Elliott, is there anything that you would—that would give us a better return on investment than energy efficiency in terms of energy investments?

Mr. ELLIOTT. Congressman, at this point I think energy efficiency represents one of the best investments that is available in the marketplace. We are in an environment right now, in spite of the current low natural gas prices, where many of the other energy sources are increasing in cost, as has already been noted in the case of gasoline pricing right now, and investment in energy efficiency represents an opportunity to improve the U.S. GDP by reducing outflow of funds to foreign countries. There is also the issue that investment in energy efficiency makes other technologies equally accessible. For example, investments in energy efficiency can enhance the cost effectiveness of renewable energy by reducing the amount of energy that is required.

Mr. MCNERNEY. Thank you, Mr. Chairman.

Mr. WHITFIELD. Thank you.

At this time, I recognize the gentleman from Ohio, Mr. Latta, for 5 minutes.

Mr. LATTA. Thank you, Mr. Chairman, and thank you very much to our panel for being with us today.

If I could, Mr. Gayer, if I could start with you. I apologize for my voice. It is allergy season. But I found your testimony interesting, because you kind of hit home to my district. I represent 60,000 manufacturing jobs in northwest, west central Ohio that we—some of our companies are very large, some are very small. We have a great need for base load capacity out there, and I go through factories, I mean, literally all the time. And probably in the last, I am going to say 5 months, I have been through about 150 facilities in my district. And I find it interesting in your testimony what you are talking about, because I hear this from my folks back home all the time, you know. They see these mandates coming down from Washington, and again, they are in a global—most of these people are on a global marketplace and they are out there very concerned about making sure that they can produce a product that is competitive, that—not only in this country, but around the world.

But in your testimony, I found it interesting. You were talking about that—you said there were a number of reasons why the market warranted an approach of setting a price of pollution as cost effective, and then regulations such as energy efficiency mandates, and you say that the one-size-fits-all energy efficiency mandates ignore the substantial diversity of preferences, financial resources, and personal situations. And I tell you, that hits home to my district. If I can just ask you, then, you know, when you talk about that, you said that—you testified that the energy efficiency standards could actually reverse some of the energy savings resulting in negligible environmental benefits. Could you expand on that?

Mr. GAYER. Yes, sure. First, I think it is important in all these questions to distinguish between—a lot of people are talking about innovation and energy efficiency, and I think that is a good thing, and when it is driven by the market, it is accounting for their preferences and the diversity of taste and financial circumstances. The problem comes when you have an agency that essentially uses certain—imposes mandates and essentially is asserting that certain preferences are in some sense invalid.

Mr. LATTA. Could you give me a couple of examples of——

Mr. GAYER. Well, I mean, it is a very simple thing. The way you do it is these net present value calculations. You look at—the agency will say well, we think for this appliance fuel costs are going to be this in the future. We think the appliance will last this long. We think you are going to use it this many times, and we kind of figure out is the higher cost today worth it for you to get the savings later, but it is not accounting for other characteristics of convenience and feature and your particular circumstance. And this happens, I think, most egregiously when it comes to commercial products. I mean, you have companies that—as I think you are alluding to, that are very narrow profit margins, they are in very competitive industries. Fuel costs might be a huge part of their operating costs, and essentially they are being told you are not doing a good job, considering the tradeoffs here, and I think my response to the presumption is they probably are doing a pretty good job of considering the tradeoffs, because they have circumstances that can't be measured from the regulator's perspective. And so the presumption should be that they actually know what they are talking about. Again, there are plenty of incentives for energy efficiency for that firm, and I think that is good, but we don't want—I don't think we should just mandate that—ignore their other preferences, and I think that is what the market is good at accommodating.

My bigger point is a lot of the tech supporting these rules are written from the angle that they are helping the environment, but what I have just described is really consumer protection. It is not environmental protection, it is saying that you are making a mistake by buying an uneconomic product. We, the regulator, are going to correct that. I don't think there is evidence that there is a need for consumer protection, but my point is that is a very different thing than designing a regulation to say hey, we have got to worry about pollution. You have your circumstances, but you are not considering that you are emitting pollution. Let us address the pollution, and you wind up with very different regulations.

Mr. LATTA. Let me follow up for just a second where you were talking about consumers. You know, what is best for the consumers out there, then, the energy efficiency improvements for market forces, or energy efficiency from the regulators?

Mr. GAYER. Oh, well certainly the former, because the former actually considers they get to consider the other tradeoffs and the other characteristics that either drive their consumer preferences, or in the case of businesses, buying these products, their bottom line. Essentially that is the premise, is I get—I am better at spending money that affects my bottom line than somebody else is, and the presumption should be that. Again, if you are trying to adjust environmental externalities, which I alluded to, I won't consider that in my consumption decision, and that is, I think, a strong role for the regulator there. But there needs to be a distinction between are we trying to protect the environment or are we really just consumer protection?

Mr. LATTA. All right. I think that, you know, again when I am going through my facilities back home that the folks back there, you know, they are worried about that bottom like, and you know, they all want to make sure that there is clean air and clean water. And at the same time, they want to make sure they are providing the jobs out there for the people in the communities, because that is absolutely central.

Mr. Chairman, with that, I thank you for your indulgence and I yield back.

Mr. WHITFIELD. Thank you.

At this time, I recognize the gentleman from California, Mr. Waxman, for 5 minutes.

Mr. WAXMAN. Thank you, Mr. Chairman.

Energy efficiency standards set a minimum floor for the efficiency of appliances and other products. Over the last 25 years, these standards have played a key role in improving the efficiency of the appliances we all have in our homes. They save consumers billions of dollars every year by lowering utility bills, but some economists argue that energy efficiency standards are a bad idea. They say that the costs of the standards outweigh the benefits, and that they reduce consumer choices. They also argue that any cost effective efficiency measures would be taken anyway, even without the standards, and Mr. Gayer made these arguments today.

Dr. Elliott, what do you think? Do the costs of these standards outweigh the benefits, or do consumers come out ahead?

Mr. ELLIOTT. Congressman, I want to say that I am—in our view and based on our research, consumers do come out ahead, and I think we can get some very good examples on this. Perhaps one of the longest regulated products in the marketplace is the refrigerator today. My wife and I had the opportunity to replace one recently, and the number of choices that we had in buying this one compared to the one we bought 25 years ago, the amenity values, the cost, the—were all substantial.

Mr. WAXMAN. Let me ask you this. Do the standards reduce or increase consumer choice?

Mr. ELLIOTT. I think our experience, at least looking at things like lighting products, looking at things like automobiles, looking at things like refrigerators, washing machines, they have increased our consumer choice. We have more options, we have more amenities. Part of this is a simple fact that we have stimulated the manufacturers to redesign products which they have no motivation otherwise to redesign.

Mr. WAXMAN. You, in your testimony, talked about huge savings for major efficiency improvements. Would we have seen benefits in the absence of efficiency standards, or are there market barriers that would have prevented cost effective efficiency improvements from being made? You talked about an incentive for manufacturers. Are there barriers to them or they just don't think about it because they don't have to?

Mr. ELLIOTT. I mean, I think it is a complex issue, and as with most things, you know, these are not simple decisions. A lot of this comes down to information and we talk about in an economic environment where we have perfect information. Consumers don't have perfect information. They have lack of information. They are not given or don't have access or the time—we call that transaction cost—to be able to make the choices that may——

Mr. WAXMAN. Well how about the choices that manufacturers make? Are there barriers to them making efficiency choices?

Mr. ELLIOTT. Absolutely. Part of it is there is no change in the marketplace. In the case of a manufacturer, if we have a static situation in the marketplace and there is no dynamic there, they are not going to necessarily innovate. And so the opportunity, I think, is standards allow them to innovate and we have seen over the last 25 years in the manufacturer's products that are regulated by standards coming to understand, and in many cases, they have been beneficial to the marketplace.

Mr. WAXMAN. All right, thank you.

Ms. Burt, PG&E has a lot of on-the-ground experience implementing programs to incentivize energy efficiency. Do consumers take every cost effective energy efficiency measure on their own, or are supporting policies necessary?

Ms. BURT. Thank you, Congressman. We would agree that supporting policies are necessary and, in fact, we do make many, many, many of our programs available directly to the consumer. We also give them a lot of information. But that simply alone doesn't do the trick. We also have incentives to manufacturers, so for example, the manufacturer that is manufacturing a refrigerator, you know, our goal in California, as you probably know, is to work collaboratively with manufacturers across the country——

Mr. WAXMAN. And you have done that very well. I am sort of moving forward because I only have a limited time, but I wanted to ask you, first of all, you testified PG&E efficiency programs result in energy savings that saved your customers $20 billion and avoided the need to build 25 large power plants. These efficiency initiatives are cheaper than building new power plants, aren't they?

Ms. BURT. Yes, sir, they are, and——

Mr. WAXMAN. And what is PG&E's experience with appliance efficiency standards and State building codes? Are these onerous government mandates or are they cost effective ways to drive energy efficiency improvements?

Ms. BURT. Well, thank you. Our view of codes and standards is they are part of the portfolio of energy efficiency. We work on codes and standards. We work upstream with manufacturers. We work with cities. We work with governments to create incentives before the standards are set. So it is not as though the standard is set first, you know. Our view of the world is let us incent the more energy efficient refrigerator, more energy efficient televisions, and then let the standard evolve as the market pulls. And that has really been very effective in California, as you know.

Mr. WAXMAN. Well, I commend you for what you have done in California. Thank you very much.

Mr. WHITFIELD. Gentleman's time is expired.

I recognize the gentleman from Texas, Mr. Olson, for 5 minutes.

Mr. OLSON. I thank the chairman and welcome the witnesses. You start here in the morning, now it is the afternoon. So thank you for your time, your expertise, and most importantly, your persistence.

Mr. Kosisko, I would like to thank you for helping me to tour ABB's facility in Houston last year. In your testimony, you mentioned barriers to investment in industrial efficiency, lack of a clear business case, inadequate funds for financing, and a general lack of information. Could you expand on what NEMA and IEEC are doing? Is there a particular success story that stands out to you?

Mr. KOSISKO. Thank you, Congressman, for the question.

NEMA, IEEC, and ABB are all working within the industry to increase awareness, which I think is one of the key impediments to adopting energy efficiency technologies into the industrial space. Let me give you an example. If you look at a typical industrial motor, for instance, that industrial motor, over its life cycle, 2 percent of its total cost to operate is the initial purchase price of that motor. Ninety-seven percent of the cost is the energy utilized over its lifetime, but yet, there are decisions made on a daily basis by various industrial customers on the initial procurement price of that motor, and I think it is widely made because of the lack of understanding and general information available. NEMA and IEEC within ABB, we do a lot to promote awareness and improve visibility of the types of products and systems and services that will help in industrial energy efficiency.

Another example, we have a show each year, Automation and Power World, that we sponsor at ABB where we bring in over

2,000 industrial users into a conference. We have over 400 seminars. A good portion of those seminars are focused on energy efficiency and the types of products, systems, and services and other methods that could be used within the industrial environment to reduce energy consumption and make industry more competitive here in the United States.

Mr. OLSON. Now I am questioning—being from Texas, one thing I worry about is our grid reliability. Our State, our margin for excess capacity is very slim now, and that is largely because of overregulation by the Obama Administration, our vast growing population, and conflicting federal agency laws that force a power provider to choose between one agency and another in direct conflict. I used the last Congress to this Congress to adjust that factor, but I am intrigued by the Volt/VAr grid optimization technology you have. Can you tell me how that would work to improve the efficiency of the electric grid and improve grid reliability?

Mr. KOSISKO. We have several technologies that help actually improve the efficiency of transmission and distribution of power and grid reliability. One of the most predominant is our high voltage direct current technology and the transmission of energy. This allows for much lower losses in the transmission of high voltage across longer distances, and helps us to better connect the grid, whether it is with traditional power sources or whether it is with alternative power sources and renewable power sources. So that is just one example. It typically reduces losses by about 10 percent, which certainly is a terrific improvement when you look at the amount of energy that gets transmitted across those lines.

We also provide software that helps manufacturers and grid and utilities to better manage the grid, improve its reliability, improve demand response so at peak seasons or at peak times during the day, we could better produce energy in a more effective way with lower cost fuels and better fuels. Just a few examples. So we have several technologies in that space.

Mr. OLSON. Thank you.

My final question is to you, Mr. Crouse. In your oral testimony, you mentioned the Federal Government picking winners and losers in the energy sector, largely through the RFS, renewable fuel standards, as a challenge to combined heat and power. I am also aware of a company back home called TAS, which faces similar challenges. They are trying to do a waste heat to power model of operations. Can you briefly describe the differences between combined heat to power, waste heat to power, and microturbines?

Mr. CROUSE. Certainly, I will try. Thank you for the question, Congressman.

You know, waste heat to power is typically taking an existing thermal energy store—source and using it in a device to generate additional electricity or make useful, you know, products or energy out of it. Microturbines and other CHP generation technologies are very similar in how our products are applied. We install the generator, and then the thermal energy is used typically with inside the facility of the host client to increase the overall efficiency of the plant. So we are able to use the electrical energy and the thermal energy to make hot water steam, chilled water. You know, one of the challenges we faced is the evaluation is far more complex for

CHP than it is for changing light bulbs or putting in high efficiency motors or VFDs, so the challenge is customers tend to shy away from more complex transactions and/or payback scenarios than the simpler ones. That is one of the uphill battles that we have.

Mr. OLSON. Thanks. I am out of time. I yield back.

Mr. WHITFIELD. Gentleman's time is expired.

At this time, I recognize the gentleman from New York, Mr. Tonko, for 5 minutes.

Mr. TONKO. Thank you, Mr. Chair.

First, an observation. I have heard so many comments here today about—from the panel about what the market rule, what the private sector—the agents have changed and that things will happen, and I find it interesting. There was a great call for policies, for standards, for regulation, for incentives, for codes, for implementation of those items above, and calling for investments and R&D appeal. So I think it is a very telling statement here today.

I would first go to Ms. MacIntosh, please. You state in your testimony that the barriers to increase usage of an ESPC are difficult to quantify. I would ask, what role do energy prices play in a decision to use an energy savings performance contract?

Ms. MACINTOSH. That is a very good question. Energy prices obviously dictate the breadth with which we can apply an energy savings performance contract to a facility, because all of the project implementation costs and care and feeding of an ESPC are covered by the energy savings and the energy cost savings that are generated by those improvements. The areas where you have high energy rates are obviously going to have an easier time of doing a performance contract than areas where energy rates are more competitive.

Mr. TONKO. And then how are the changes in energy prices in the term of a contract addressed? How do those changes get incorporated into the contract?

Ms. MACINTOSH. What we do in the course of developing an energy savings performance contract is a lot of historical analysis of how energy rates have changed for that particular customer over time, and then we utilize a lot of sources through Department of Energy, through NIS, and other areas on what forward projections are supposed to be, and then we look to put together a conservative value on what we believe the energy prices are going to be, a floor, if you will, to utilize throughout the term of the contract.

Mr. TONKO. Back in my New York State days working with energy policy and implementation, we held a hearing with data centers. Do you see the application with data centers being a real thing?

Ms. MACINTOSH. We are just starting to see that as a real possibility in energy savings performance contracting because of their high energy draw, and there is an awful lot of technology advancement that is happening in the IT and data center arena. So it certainly is an opportunity for us to incorporate ESPC in that market.

Mr. TONKO. Thank you.

Mr. Crouse, the barriers to expanded deployment of CHP may be many, but finding the upfront capital, I have to believe, is a big thing, the capital investment. Have the energy savings performance contracts been used much by the private sector to install CHP?

Mr. CROUSE. Certainly. We have customers that use the energy savings model in the private sector as well as in the government sector to deploy our technology and other CHP technologies.

Mr. TONKO. And where in our industrial applications do you see some of the best opportunities?

Mr. CROUSE. You know, I think you need a customer that is using thermal energy—hot water, steam are the easiest sort of customers. Food processing, cheese, you know, customers in the plastics business are natural targets for us. So those are on the industrial side some of the low-hanging fruit, if you will.

Mr. TONKO. And Mr. Elliott, I assume some of the resistance to new product efficiency standards is the cost to manufacturers of altering their product design and manufacturing process. What is the experience that you have with the product vendors, in terms of perhaps incorporating the message for efficiency of—efficiency standards?

Mr. ELLIOTT. There absolutely is a significant transaction cost for a manufacturer when they do reengineer their products or reengineer their products to incorporate energy efficiency. That said, that also gives them the opportunity to revise their manufacturing processes. For example, in the electric motor industry when we saw motor standards come in, we saw a consolidation of motor designs by the manufacturers and implementation of flexible manufacturing. So this actually allowed them to produce a higher quality product that was accepted by the marketplace as a—on the basis of its performance. So yes, there was cost occurred—incurred by the manufacturers, but what it did was really allow them, in the case of the motors, not only produce a product that met the customers' needs better, but also allowed them to compete globally against many of the low-cost producers who were not being able to produce a product of similar performance.

Mr. TONKO. Thank you.

Ms. Burt, just a comment to your earlier statement. Consumers don't pay rates, they pay bills, so I appreciated the statement that was being given.

With that, Mr. Chair, I will yield back.

Mr. WHITFIELD. Gentleman's time is expired.

At this time, I recognize the gentleman from Virginia, Mr. Griffith, for 5 minutes.

Mr. GRIFFITH. Thank you, Mr. Chairman. I will follow up on some comments that were made earlier, and maybe in the previous panel for some of it. I would like to say—I am going to ask you a question in a minute about that Christiansburg facility, but I do look forward to going up there and seeing it in action at some point in time, but I am going to get you to do a little science on it for me, Mr. Crouse.

Before that, I would like to say to you, Mr. Kosisko, thank you so much for having a facility in the Ninth District of Virginia. It is doing great work there, and our biggest problem is is that because it abuts a mountain, we have got to find space to expand, and I hope that it will still be in the Ninth District of Virginia, but we don't have that many flat places. But anything I can do to help you all find facilities for the current facility or anything else you would like to move to my district, I am more than happy to do, and I appreciate all the work that you are doing.

Ms. MacIntosh, I would like to get a copy of the inventory or survey of the buildings on at least the House side as well. I love the windows, but I agree with Dr. Burgess, there has got to be something we can do a little more efficient than the current windows that we have. I will confess that I like to open those windows from time to time, particularly when the weather is nice, and I would hate to lose that, but also, I understand that we have got to have some energy efficiency.

That being said, going back to a previous panel, I would comment that I do worry a bit about not having buildings that breathe a little bit, because then the indoor air pollution does go up, as Mr. McKinley pointed out, and so that is something we do have to put in the overall equation.

Mr. Crouse, coming back to you, I would ask so that you can explain it to me, because I am not an engineer. I was a lawyer before I came to Congress. You have got a 65 kilowatt microturbine installation in the town Christiansburg waste water treatment plant, and you indicated in answers to questioned earlier that a lot of those facilities where these are located, they use it onsite. I am trying to figure out—and they may not, but does Christiansburg use that energy onsite, or does it—do they wheel it off somewhere else?

Mr. CROUSE. Thank you for the question, Congressman. They certainly use it onsite. Waste water treatment plants are unique in that they do a lot of water pumping. They also use the thermal energy to heat the digesters, so especially in the winter months, you know, to keep the chemical composition, the temperature correct in the digester, they use the thermal energy from their CHP system, and then the electricity is just—reduces the amount of purchase power that they have from the utility, because typically they do not generate enough digester gas to supply all of their electrical requirements at a waste water treatment plant.

Mr. GRIFFITH. All right. Thank you very much.

I should mention that ABB does a lot. When I toured their facility there in Bland, I did note that they pointed out a lot of things that they were doing to keep their energy costs under control and to be very efficient at that facility. I would also have to note that I went back for, I don't know, a second or third tour to the large Volvo facility in my district, and they are doing all kinds of things. They have got a couple of windmills, they have got solar panels. They have installed passive solar in a number of places where there—because they are skilled at doing a lot of these things, they have actually done a lot of it themselves. But the one that I found the most interesting that I think folks maybe want to pay attention to is that somebody on their team—they have suggestion boxes and give out rewards. Somebody on their team figured out that because they have 2,000-plus people who are captive in the factory, they all know where the drink machines are and where the snack machines are, and so they took the light bulbs out of them and they were really surprised at how much electricity they saved. So when we are talking about efficiencies, sometimes simple things work very well in that regard.

Mr. Gayer, I have only got a minute left, but I was wondering if you could comment on refrigerators since that came up earlier, because one of the things I have noticed is, well, I think we all ought to have the most efficient equipment that we can have. If you have got a refrigerator that is struggling on, you might stay there if the cost is high to do something else, and a lot of the innovations I have seen have been technologically driven as opposed to energy efficiency, because I can't imagine that water and ice in the door as opposed to having to reach inside is a whole lot more efficient. Maybe it is. Can you expand on that and help me out?

Mr. GAYER. Yes, a few things. One is I agree with Mr. Elliott, the choice has expanded over the last few decades in all appliances, but I think that is market driven and certainly not due to mandates, which by their nature, restrict choice. And you are exactly right, one of the reasons these don't work that effectively or cost effectively to reduce energy is because people sometimes hang on to their older products longer, especially if it is a big ticket item, and it is going to cost more money due to a different—a new regulation.

Mr. GRIFFITH. And do you have any data that would indicate how much the price of a—percentage-wise or otherwise that—how much the price of a refrigerator has been impacted by——

Mr. GAYER. I don't have it with me. There is a—primarily in the vehicles, when one deals with vehicles too. There is always an impact whenever you raise CAFE AE1 standards, you have to worry about you get a slower turnover of the fleet and new vehicles tend to be more fuel efficient. I don't have the numbers offhand, though.

Mr. GRIFFITH. All right, thank you, sir.

Mr. WHITFIELD. Gentleman's time is expired.

At this time, I recognize the gentlelady from California, Ms. Capps, for 5 minutes.

Mrs. CAPPS. I want to thank the chairman for calling today's hearing. Thank you to all of our witnesses for a long day of testimony.

I think it is a great topic. Increasing energy efficiency is critical to our Nation's energy future, and as is clear from today's testimony, the private sector is doing a great job of innovating and bringing new energy efficient technologies to customers. But the federal policy, I believe, also plays a critical role in this process. Neither the Federal Government nor the private sector on its own does as good a job as we want to have done when they all work together. But working together, these public-private partnerships can lead to great advancements that create jobs and can save consumers money, but also spur innovation and benefit the environment. I see it every day back home in my district on the Central Coast of California. I represent two world-class research universities: Cal-Poly San Luis Obispo and the University of California at Santa Barbara. Research conducted at these public universities is frequently spun off into very successful local companies which I have visited, like Soraa and Transphorm, and many others. These companies continue to innovate and develop new technologies, and they are creating jobs at the same time, spurring economic growth.

So my first question is to you, Mr. Crouse. Your company is similarly innovating and staying at the forefront of your industry. In your testimony, you mentioned federal R&D funding as an important contributor to your company's growth. Could you elaborate on that just for a minute, because I want to ask other questions, too, but how has Capstone benefitted from federal R&D funding?

Mr. CROUSE. Thank you. I will be as quick as I can.

The—we have several programs currently that we are working towards efficiency and reliability, so through the DOE, we have a 250 and a 370 kilo microturbine that we are developing that will improve the electrical efficiency of our product and broaden the number of applications it can go into to get higher overall efficiencies. And then we are working on other fuel types, syn gas and other things. Some of our original technology was developed in cooperation with the public sector as well.

Mrs. CAPPS. So you are a good example for the rest of us.

My second question goes to you, Ms. Burt. Of course, these energy efficient technologies not only create jobs and support small businesses, but they also benefit consumers. I want to focus on this intersection between technology and energy and how it really makes a difference in the lives of the people, and that is actually the bottom line. Ms. Burt, we all know how these technologies can reduce energy use in our homes and businesses, and lower cost for consumers, but I am curious about the efficiency improvements being made to our energy infrastructure. For example, could you discuss what efficiency technologies PG&E is deploying on the infrastructure side and how this is going to benefit consumers in the long run?

Ms. BURT. Thank you. That is a very good point. We are—again, this is the intersection between technology and energy, and it is very evident in the smart grid that is being deployed. Within California and our distribution network, we are deploying a device called a FLISR, and that is not a very catchy name, but it stands for fault location isolation, and service restoration, and it literally takes any kind of interruption along the circuits that have the device from being a typical 1 to 2 hour outage to being less than 5 minutes. And as we deploy those, we have deployed—about 135 circuits are completely deployed to date. By the end of this year, we will have 400 circuits deployed, and I am really happy to say that in 2012, we had the highest reliability we have experienced in the history of our company. So we are quite pleased with how intelligence and energy efficiency works within the grid as well.

Mrs. CAPPS. And when that disruption in service happens, you know, there is a ripple effect on how it impacts your customers.

Finally, Ms. Burt, I want to touch on a key point that you made in your testimony about energy efficiency training. PG&E—and I am thinking about the facilities I have in my district—your Pacific Energy Center has been training students in energy efficiency for many years. I am curious about the demand for this kind of training. Have you seen enrollment in your training courses increasing in recent years? If so, why do you think that is? In other words, is this catching on?

Ms. BURT. Thank you, Congresswoman. I do believe that we have seen enrollment increasing, particular with the ARRA funding and the weatherization and the cities and counties and the jobs that were created within the State of California. Our role in that—we weren't a part of the funding, but our role in that was to train and properly train——

Mrs. CAPPS. Right.

Ms. BURT [continuing]. The workforce. So we have seen a consistent increasing interest in these sorts of jobs, because they are very relevant.

Mrs. CAPPS. And I saw this firsthand during the recession. The weatherization of older homes—what is it, any structure that is over 10 years old, maybe it is even less than that?

Ms. BURT. Yes.

Mr. CAPPS. Can benefit cost-wise, bottom line-wise, and then you can train unemployed people, give them a job. It is not very sophisticated in many ways, focusing on just older homes, putting in more efficient windows, window sills, the win-win with more people working, and the lower energy cost for maybe a couple living on a fixed income. It just—it does really—over the long haul really have an impact.

Thank you very much for your time.

Mr. WHITFIELD. The gentlelady's time is expired. At this time, I recognize the gentleman from Illinois, Mr. Kinzinger, for 5 minutes.

Mr. KINZINGER. Thank you, Mr. Chairman, and thank you all for coming. I really appreciate it.

As has been discussed today by our first few panels, improving energy efficiency in America will play a pivotal role in increasing U.S. energy productivity and making America more energy secure. The benefits from implementing energy saving techniques and technologies are felt by nearly every part of society through higher productivity, reduced energy costs, lessened environmental impacts, and a return of billions of dollars to our economy that was previously going to waste. As we move forward to promote adoption of energy saving technologies and improve awareness of their benefits, promoting the facts outside of the light of partisan politics will be crucial.

Recently it was my honor to be nominated to serve as an honorary vice chair to the Alliance to Save Energy, a bipartisan group of members of Congress, corporate CEOs, and organizational leaders focused on promoting the benefits of energy saving technologies and encouraging their adoption. I am excited to be working with this diverse group, and believe it can serve as a model for problem solving across the partisan divides, which we kind of need nowadays.

At this time, I ask unanimous consent that the Alliance Commission on National Energy Efficiency Policy Energy 2030 Report be included for the record.

Mr. WHITFIELD. Without objection.

[The information appears at the conclusion of the hearing.]

Mr. KINZINGER. The benefits of adopting energy efficient technologies are undeniable. Congress must work to educate consumers and businesses to these benefits, allowing for the private sector to move forward, upgrading our energy infrastructure.

I want to commend private industry for taking the steps to ensure energy efficiency. I particularly want to thank the pay TV industry, which includes cable operators, Bell companies, satellite providers, and consumer electronics manufacturers for their agreement announced last year to make sure that consumers' set top boxes are even more energy efficient. This is a great precedent for the private sector, stepping up to the plate and doing the right thing without government mandates.

Mr. Kosisko, in your testimony you mentioned a 2011 study by the Economist Business Intelligence Unit in which businesses were asked to identify the main barriers to investment and industrial energy efficiency. By far, the most popular response was a lack of clear cut financial case for the energy efficiency investments. How can government work with organizations and companies like yours to get out the facts and make the clear cut case for companies to make energy efficient upgrades?

Mr. KOSISKO. Thank you, Congressman. You know, as I mentioned before, I think that education, I think that promotion and creating visibility in the marketplace is going to be crucial to us moving forward. Certainly, you know, there is a competition for capital. When you look at private investment in industrial companies, they are going to make decisions based on how they can most effectively use the capital over the next 2 to 3 to 4 years. Some of these technologies have longer payback periods, so I think it is important that we provide the level of education so that they can make targeted decisions in certain technologies that will have shorter payback periods, produce results for them in a shorter timeframe, but also, I think that we need to look at what we can do in a smart way to promote them in using these technologies that may have longer payback periods, but will be crucial for us in maintaining our competitiveness from an industrial perspective in this global economy.

Mr. KINZINGER. Well thank you, and I think even having these hearings is a good start.

Ms. Burt, in your written testimony you commend the work and recommendations of the Alliance to Save Energy's Commission on National Energy Efficiency Policy, which issued a report, Energy 2030, highlighting several policies concerning existing technologies for policy makers to include to consider. Of those recommendations to increase energy productivity is for the government to lead by example. You also mentioned that Pacific Gas and Electric Company is currently completing a project for NASA Ames Research Center near Mountain View, California. This project encompasses more than 100 buildings and covers in excess of 2.5 million square feet, and allowed NASA to save 9 gigawatt hours of electricity, 1.3 million therms of natural gas, and more than 15 million gallons of water annually. With results this substantial, could programs with similar amounts of savings be duplicated at other federal agencies? If so, what are the main challenges that we face in doing that?

Ms. BURT. Yes, thank you, Congressman. They absolutely can be duplicated. In fact, we have three currently underway and 11 that we are hoping to move forward with within our service territory. What are the main area of improvement is really in the contracting. What we have found is that as we work with NASA Ames, the VA, the IRS in Fresno, the FAA in another part of our service territory, it is a complete recontracting process. So if we could find some sort of simple standardization for these sorts of contracts for the utility services contracts, I think that would benefit both sides.

Mr. KINZINGER. That sounds great, perfect time, too. I yield back.

Mr. WHITFIELD. Thank you, Mr. Kinzinger.

At this time, I recognize the gentleman from Illinois for an additional question.

Mr. RUSH. Ms. Burt, I do have one quick question. I am very impressed with what PG&E is doing in California, and are there similar programs that you are aware of in Illinois or Chicago, in terms of your training programs?

Ms. BURT. Thank you, Congressman. I am just not that well-versed in Illinois. I am very, very well-versed in California, but not in Illinois.

Mr. WHITFIELD. Thank you all very much, and before we conclude, I am just asking unanimous consent that the following materials and statements be entered into the record from Arkema Corporation, the American Chemistry Council, the Alliance for Industrial Efficiency, Heat is Power Association, and Pew Charitable Trust.

Without objection, I would enter these into the record.

[The information appears at the conclusion of the hearing.]

Mr. WHITFIELD. Thank you all once again for your time and traveling to come to Washington. We appreciate your testimony and we look forward to working with all of you, and hope the next time we have a hearing on efficiency, which we will soon, that we will have just as many people stay throughout the entire hearing.

So thank you all very much, and with that, the hearing is adjourned and the record will be open for 10 days.

[Whereupon, at 1:36 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

PREPARED STATEMENT OF HON. JOHN D. DINGELL

Mr. Chairman, energy efficiency is one of the simpler ways for us to achieve energy independence and security. By making the vehicles, appliances, and buildings we use every day more efficient, we can get more bang for our energy buck.

Recently, the cable industry announced new efficiency standards for the cable boxes we use to watch and record our favorite shows. These improvements will result in half of the energy currently consumed and estimates are that the new efficiencies will cut consumers' electricity bills by approximately $1.5 billion. To speed up efficiency improvements for existing boxes, the industry will release a software update that will immediately result in energy savings of 20 to 30 percent on current devices.

The cable industry is to be commended on this forward thinking to adopt practices that can take effect now and drastically improve efficiency moving forward. As our country looks to new sources of energy such as fossil, nuclear, and renewable, we must also look for the low-hanging fruit that help us address this issue.

In addition to this innovative thinking by industry, I also believe that industry must continue to work with regulators because good energy policy and good economic policy go hand in hand. By collaborating with industry and consumer groups, the Federal government can develop standards that can be cost-effective for both industry and consumers while maintaining our energy security.

There was a time, not too long ago, when we could work on a bipartisan basis to develop ways for American companies to compete and innovate. The Energy Independence and Security Act of 2007 was probably the most recent example of that bipartisanship. It was signed into law by President Bush and supported by many members of this committee on both sides of the aisle including the chairmen of this subcommittee and of the full committee.

We cannot pretend that industry does not have good intentions or that Federal regulations are the root of all economic problems. We must all work together if want to find the best solutions to invest in our future and secure our energy independence and security.

EMBARGOED - FOR RELEASE DECEMBER 6, 2012

Contact:	Laurie Ann Phillips, CEA 703-907-7654 laphillips@CE.org *www.CE.org*	or	Brian Dietz, NCTA 202-222-2358 bdietz@ncta.com *www.NCTA.com*

Set-Top Box Energy Conservation Agreement Expected to Save U.S. Consumers $1.5 Billion Annually

Nation's top cable, satellite, telco TV providers and manufacturers commit to unprecedented energy efficiency measures

Arlington, Va., December 6, 2012 – Fifteen industry-leading multichannel video providers and device manufacturers that deliver service to more than 90 million American households, are launching an unprecedented Set-Top Box Energy Conservation Agreement that will result in annual residential electricity savings of $1.5 billion or more as the commitment is fully realized, the Consumer Electronics Association (CEA) and National Cable & Telecommunications Association (NCTA) announced today.

Participating companies include providers (listed according to number of customers) Comcast, DIRECTV, DISH Network, Time Warner Cable, Cox, Verizon, Charter, AT&T, Cablevision, Bright House Networks and CenturyLink, and manufacturers Cisco, Motorola, EchoStar Technologies and ARRIS. Through the voluntary, five-year Set-Top Box Energy Conservation Agreement, which goes into effect January 1, 2013, these companies commit to the following:

- At least 90 percent of all new set-top boxes purchased and deployed after 2013 will meet the U.S. Environmental Protection Agency (EPA) ENERGY STAR 3.0 efficiency levels. Based on market projections for set-top box deployments, this will result in residential electricity savings of $1.5 billion annually, as the agreement is fully realized.

- For immediate residential electricity savings, "light sleep" capabilities will be downloaded by cable operators to more than 10 million digital video recorders (DVRs) that are already in homes. In 2013, telco providers will offer light sleep capabilities, and satellite providers will include an "automatic power down" feature in 90 percent of set-top-boxes purchased and deployed.

- Energy efficient whole-home DVR solutions will be available as an alternative to multiple in-home DVRs for subscribers of satellite and some telco providers beginning in 2013.

- "Deep sleep" functionality in next generation cable set-top boxes will be field tested and deployed if successful.

"Providing American consumers with innovative services that deliver great video content and reduce in-home energy costs is win-win for customers and participating companies," said Michael Powell, NCTA President and CEO. "Multichannel video providers and device manufacturers are proud to participate in this unprecedented initiative, and we will continue to pursue even more ways to reduce the overall energy footprint of our services."

According to the EPA, which administers the ENERGY STAR program, set-top boxes that are ENERGY STAR-qualified are, on average, 45 percent more efficient than conventional models. The new energy conservation initiative will produce more energy savings overall, and five years earlier than originally anticipated by the U.S. Department of Energy (DOE) in its most recent review of set-top box energy conservation issues. Prior to this agreement, 2018 was the earliest date that any DOE set-top box standards would have been implemented.

"Our industry today commits to a comprehensive initiative that will lead the way to energy savings for consumers in this popular and rapidly evolving product category," said Gary Shapiro, President and CEO, CEA. "The Set-Top Box Energy Conservation Agreement will protect innovation and consumer choice while reducing energy use and saving money."

Companies involved in the new Set-Top Box Energy Conservation Agreement will meet regularly to review and update energy efficiency measures, and to host ongoing discussions with the DOE, the EPA and other interested government agencies and stakeholders on new technologies and equipment. To create accountability and support transparency, the agreement's terms include detailed processes for verification of set-top box performance in the field; annual public reporting on energy efficiency improvements; and posting of product power consumption information by each company for its customers.

Note on Methodology:

The $1.5 billion estimate of ENERGY STAR 3.0 (ESv3) savings takes into account the replacement of DVR and non-DVR set-top boxes with set-top boxes that meet ESv3 energy efficiency levels. It also accounts for the continued trend by consumers to use more DVRs. The estimate adopts the most recent projections from energy advocates of consumer demand for more DVRs in a "business as usual" trend and then assumes that the projected demand is satisfied with DVRs meeting ESv3 efficiency levels.

About CEA:

The Consumer Electronics Association (CEA) is the preeminent trade association promoting growth in the $206 billion U.S. consumer electronics industry. More than 2,000 companies enjoy the benefits of CEA membership, including legislative advocacy, market research, technical training and education, industry promotion, standards development and the fostering of business and strategic relationships. CEA also owns and produces the International CES – The Global Stage for Innovation. All profits from CES are reinvested into CEA's industry services. Find CEA online at www.CE.org, www.DeclareInnovation.com and through social media: .

About NCTA:

NCTA is the principal trade association for the U.S. cable industry, representing cable operators serving more than 90 percent of the nation's cable television households, more than 200 cable program networks and industry equipment suppliers. The cable industry is the nation's largest broadband provider of high-speed Internet access, serving more than 45 million customers, after investing more than $186 billion to build two-way interactive networks with fiber optic technology. Cable companies also provide state-of-the-art digital telephone service to more than 24 million American consumers.

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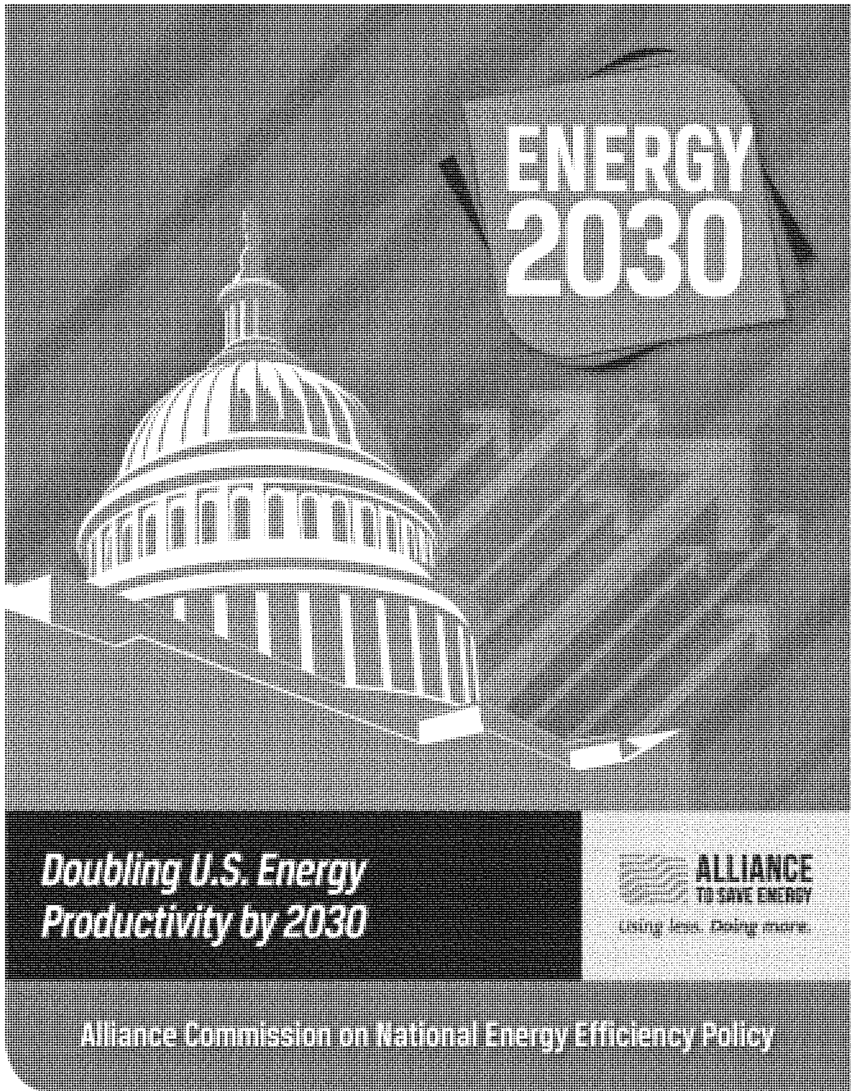

FEBRUARY 7, 2013

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FOREWORD

As co-chairs of the Alliance Commission on National Energy Efficiency Policy, we are pleased to present this comprehensive report that can set our nation on a path to double our energy productivity and make our economy more competitive. Over the past year we have worked with our commission members and the Alliance staff to produce a bipartisan plan that has the support of all the major groups in energy efficiency.

This comprehensive report reflects the thoughtful, in-depth efforts of the Commission. We considered a wide range of policies and technologies that have the potential to increase our energy productivity and allow us to get more return from our nation's energy dollar, and we selected those that have the best chance to help us achieve that goal. The Commission itself is a diverse group of national leaders that generously donated their time and expertise to this bipartisan effort, and we want to thank them for their selfless efforts.

The nation – both the public and private sector – finds itself at the heart of one of the greatest challenges facing our society; to create new sustainable energy solutions for the future and develop an energy system that can supercharge our economic prosperity for the 21st century. The Alliance Commission on National Energy Efficiency Policy has helped chart this course towards that future.

The report's stated goal of doubling energy productivity by 2030 is an aggressive, yet achievable goal. Increased energy productivity is a worthy pursuit, with multiple benefits related to growing and strengthening our economy, as well as supporting strong environmental stewardship. This blueprint provides a path for federal, state and local officials to make policy decisions that will unleash investment in energy productivity and allow us to bolster our energy security.

We look forward to helping advance a diversity of energy efficiency policy solutions, especially those developed and championed through the critical public-private partnerships emphasized in the Commission's report.

Mark R. Warner
United States Senator
Commonwealth of Virginia

Thomas B. King
President
National Grid US

INTRODUCTION

I am pleased and excited to present the recommendations and final report of the Alliance Commission on National Energy Efficiency Policy. This ambitious endeavor – dubbed ***Energy 2030*** – is the culmination of a year's worth of research, collaboration and hard work by those involved.

Created and led by Senator Mark Warner (D-Va.) and National Grid US President Tom King, the Alliance's Commission includes energy thought leaders from business, academia, government, and the non-profit sector. In collaboration with technical and international advisory councils, the Commissioners shaped their policy prescriptions to address some of the most pressing matters of our time: improving economic performance and global competitiveness; enhancing the quality of life for all Americans; driving technological innovation; and increasing the reliability, resiliency and security of our energy infrastructure – all while ensuring a healthy and clean environment.

For decades energy efficiency has been America's most abundant, affordable and accessible energy resource, and the policies and strategies that support it, many crafted by the Alliance, have benefited our nation's people, economy and environment. In keeping with this Alliance history and recognizing the urgent need to drive our economy forward, ***the Commission established an ambitious goal of doubling U.S. energy productivity (getting twice as much from each national energy "dollar") by 2030***.

The Commission has concluded that this aggressive goal can be realized through greater investment, modernization and education. ***Energy 2030*** is carefully crafted to appeal broadly to lawmakers of both parties and the general public, and to ensure that we maximize energy productivity in every aspect of our economy – from family homes to the shop floor to the ways we move people and goods.

On behalf of the Board of Directors, Associates and staff of the Alliance, as well as energy efficiency advocates worldwide, my sincerest thanks and appreciation go to all of those involved in creating ***Energy 2030*** – a clarion, national goal and a plan for how to act quickly to achieve it. The Alliance will work to make certain that the goal of doubling U.S. energy productivity is embraced widely and fully, and that the Commissioners' tireless work ultimately translates into actionable policy offerings and best practices for businesses and consumers.

If you are not yet part of ***Energy 2030***, please join us. By working together, we can make today's challenge of achieving greater energy productivity tomorrow's reality.

Kateri A. Callahan

Kateri Callahan
President of the Alliance to Save Energy

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SUMMARY COMMISSION RECOMMENDATIONS

The United States can double its energy productivity[1] by 2030 using cost-effective technologies and practices. Benefits to the nation from achieving this goal would be monumental. According to the economic impact modeling described later in this report, the net benefits could be over $1,000 a year in average household savings in utility and transportation costs, over a million added jobs, a one-third reduction in carbon dioxide emissions, and a similar reduction in oil imports. The Alliance Commission on National Energy Efficiency Policy urges policy makers and the private sector to take immediate and concerted action—based on the recommendations below—to grow our economy and create jobs while using less energy and reducing associated costs, environmental harm and security impacts.

We recommend three overarching strategies to meet this energy productivity goal:

- **UNLEASH INVESTMENT** in energy productivity throughout the economy,
- **MODERNIZE REGULATIONS** and Infrastructure to improve energy productivity, and
- **EDUCATE AND ENGAGE** consumers, workers, business executives, and government leaders on ways to drive energy productivity gains.

Because energy productivity gains are cost-effective, we believe these strategies can be implemented without burdensome mandates or massive government spending. However, to achieve this goal and its benefits, some public-private partnerships, and targeted government investments will be needed, and some rules will need to be reformed and strengthened. Thus we make the following policy recommendations for federal, state, and local governments, as well as the private sector (more details on each recommendation appear later in this report).

UNLEASH INVESTMENT IN ENERGY PRODUCTIVITY

Well over a trillion dollars in cost-effective energy savings opportunities are available in the United States, but achieving the savings will require the investment of hundreds of billions of dollars. Currently, a broad energy efficiency finance sector does not exist. Action is needed to provide capital for investments to increase energy productivity.

RECOMMENDATIONS

- **Make financing more easily available for energy efficiency projects:**
  - Make more capital available by enabling institutional investors to buy energy efficiency financial obligations on a large scale using securities based on uniform contract structures and better performance data.
  - Establish state and local programs for financing of efficiency measures, which may use repayment on utility bills or on property tax bills (the capital could be provided by institutional investors).
  - Consider household energy and transportation costs when underwriting mortgages to allow for larger or more attractive loans for homes with lower monthly costs.
- **Advance energy productivity through federal tax reform:**
  - Reform federal energy efficiency tax incentives so that they focus on high efficiency technologies and measures and on promoting innovation and market transformation.
  - Adjust commercial and industrial depreciation schedules to encourage investments that can boost energy productivity.
- **Support energy productivity innovation and market adoption:**
  - Increase federal investment in basic and applied research, development, demonstration, deployment, and technical assistance.
- **Governments lead by example:**
  - Apply innovative best practices to government buildings and vehicle fleets.
  - Make all cost-effective efficiency improvements to federal buildings using private financing and public funds

[1] *Energy productivity is the level of economic activity achieved using a given amount of energy, or dollars of Gross Domestic Product divided by the total energy used in the country.*

MODERNIZE REGULATIONS AND INFRASTRUCTURE

Governments, businesses, and individuals will be spending trillions of dollars to modernize our nation's infrastructure (such as smart energy grids, and multi-model transportation networks) and other capital (such as green building, advanced air conditioners, and hybrid vehicles). As all of these systems use energy, these investments will provide a tremendous opportunity to improve energy productivity. Action to reduce energy waste will also help achieve the goals of modernization, which include economic growth, reliability, clean air and water, and consumer cost savings.

RECOMMENDATIONS

» **Create a national "Race to the Top" style energy productivity competition targeted at states and communities:**

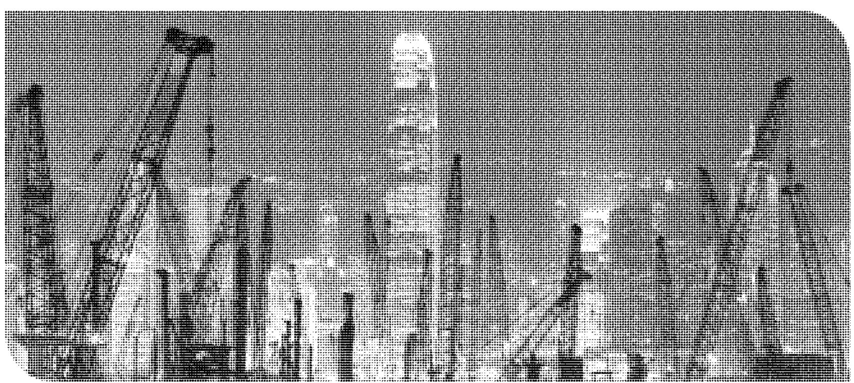
- Incentivize innovation and adoption of best practices by state and local governments based on energy productivity improvements, investments, and regulatory reform. States would receive technical assistance and funding based upon policy and regulatory reforms like those recommended in this report on building energy codes and disclosure, efficiency programs and financing, utility reform, and transportation planning and investments.

» **Use energy productivity to achieve regulatory and planning goals:**

- Adopt utility policies that make full use of all cost-effective demand-side management (end-use energy efficiency and demand response) as a resource. Such state-level policies may include broad and targeted savings goals, financial incentives for utilities, time-variant customer rates, fair treatment of combined heat and power and other distributed resources, and harmonized program evaluation.
- Advance regional and local transportation and land use plans that promote energy productivity by improving access to work, services, school, and play, and by increasing transportation options including safe walking, biking and public transportation. Provide funding and technical assistance to enable efficient development patterns and transportation infrastructure that is consistent with the regional and local plans.
- Use energy efficiency as an emissions reduction strategy in environmental regulations.
- Ensure major government and regulated infrastructure spending on energy grids, transportation infrastructure, and water and waste systems increases energy productivity.

» **Strengthen building, equipment, and vehicle efficiency standards:**

- Steadily and aggressively increase the stringency of building energy codes, with quick adoption and effective compliance measures.
- End current delays and update federal appliance and equipment, vehicle, and manufactured housing efficiency standards to maximum technologically feasible and economically justified levels.

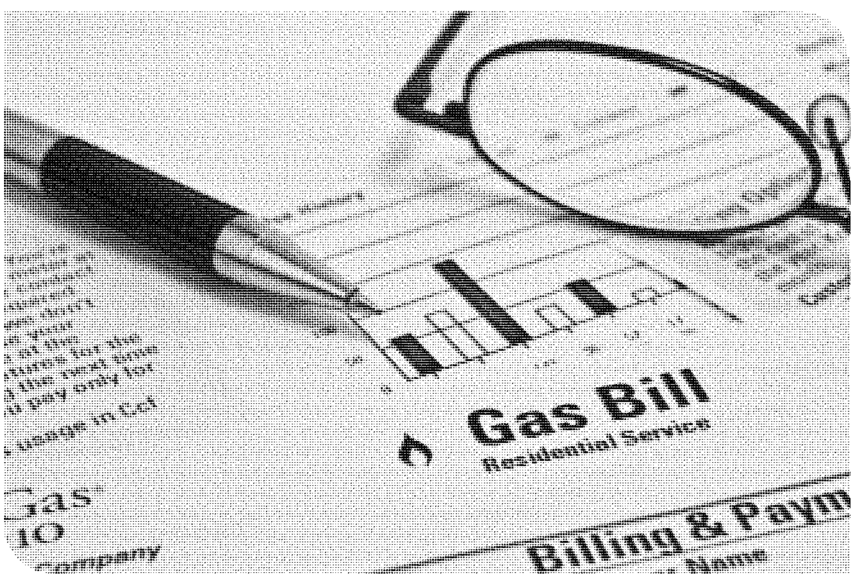


EDUCATE AND ENGAGE STAKEHOLDERS

Successful adoption and implementation of policies that will enable a doubling of U.S. energy productivity requires the engagement and leadership of stakeholders across the economy. The current deficit information, coupled with our human tendency to revert to the inefficient status quo or norm, are major barriers to greater energy productivity. Action is needed to provide easy access to reliable, useful information and to encourage consumers, workers, business executives, and government leaders to engage in reducing energy waste.

RECOMMENDATIONS

- **Provide information on building energy efficiency and energy use:**
  - Develop effective building energy ratings, benchmarks, and disclosure methods for commercial and residential buildings; require periodic disclosure in commercial buildings and disclosure at time of sale or rental in residential buildings; and incorporate the information in building appraisals and real estate listings.
  - Enable customers and third parties authorized by the customers to access their energy usage data, while ensuring customer privacy.
  - Develop harmonized energy use labels with discrete ratings for appliances and vehicles that are coordinated with building energy labels.
- **Improve corporate energy management and transparency:**
  - Effectively manage corporate energy use and report on energy productivity as part of corporate sustainability reporting.
- **Develop educated consumers and trained technicians:**
  - Develop school and university curricula on energy use and productivity, conduct consumer campaigns, develop technical certifications, and provide related workforce training and continuing education.



WHY DOUBLE U.S. ENERGY PRODUCTIVITY?

The Alliance Commission on National Energy Efficiency Policy (the Commission) adopted the goal of doubling U.S. energy productivity by 2030 relative to 2011 levels. Energy productivity means the level of economic output divided by the total energy used to achieve it, and can be expressed as dollars of Gross Domestic Product (GDP) per unit of energy consumed (in British thermal units—Btu). Meeting that target can deliver multiple large benefits to the United States, including enhanced economic competitiveness, technological innovation, greater energy reliability and security, and strengthened stewardship of our environment and natural resources.

The Commission's energy productivity target is aggressive but achievable. Figure 1 shows how the Commission's goal compares with the reference (or business-as-usual) case projection of the U.S. Energy Information Administration (EIA) 2012 Annual Energy Outlook.

Over the last 40 years, the United States has made significant gains in energy productivity. In 1970, about $63 billion of GDP in year 2005 dollars were produced per quadrillion Btu (quad) of energy used in the United States.[2] In 2011, the figure was about $135 billion per quad.[3] The Commission's goal is for the U.S. economy to achieve $270 billion (in 2005 dollars) of GDP for each quadrillion Btu consumed in 2030.

If not for U.S. energy productivity gains since the early 1970s, the United States would need to consume about 50% more energy—with concomitant impacts on energy bills, oil imports, energy reliability and security, and environmental quality—to deliver today's GDP. Another way to think of this is that energy efficiency is our "first fuel," contributing more to the national economy than any individual fuel or source of energy supply. Figure 2 graphically illustrates the point.

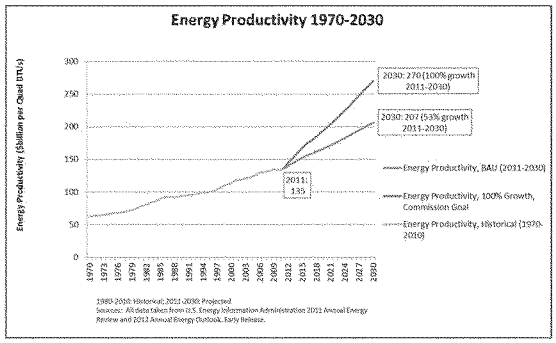


Figure 1. Historic and Projected U.S. Energy Productivity as Compared to the Commission Goal (billion 2005 dollars of GDP per quadrillion Btu)

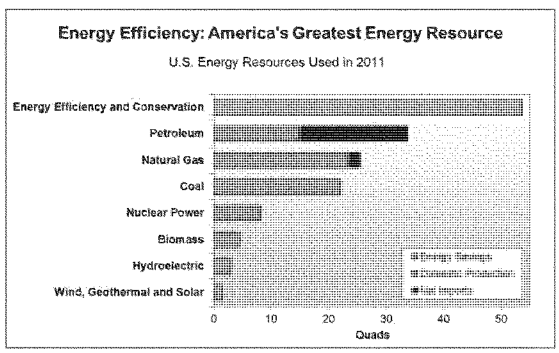


Figure 2. Energy Efficiency: America's Greatest Energy Resource
Note: Energy savings are based on energy efficiency improvements since 1973.
Source: Alliance to Save Energy 2013

2 Energy consumption data from U.S. Energy Information Administration, "Table 1.1 Primary Energy Overview, Selected Years, 1949-2011." ; GDP data from U.S. Department of Commerce, "Current-Dollar and 'Real' Gross Domestic Product" spreadsheet.

3 U.S. Energy Information Administration, "Annual Energy Outlook 2012 early release." The Commission agreed to use the reference case of this AEO release as a baseline.

Our enhanced energy productivity came from a combination of factors, including policies and changes in technology, economic structure, and demographics. Improvements in material and water productivity, from reduced waste and increased recycling, also contributed to national energy productivity because significant amounts of energy are required to process and distribute materials and water in the economy.

The Commission found large energy productivity gain potential across all economic sectors and fuels (although its national economic productivity goal does not suggest a goal of doubling energy productivity in each individual sector). Each major sector is itself a large consumer of energy as shown in Figure 3, which provides a snapshot of current and projected energy use in the United States.

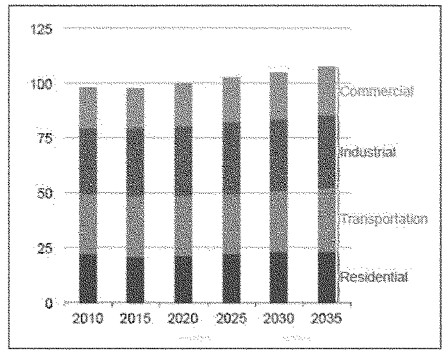


Figure 3. Primary U.S. energy use by end-use sector, 2010-2035 (quadrillion Btu

While the United States has made significant energy productivity progress over the last several decades, the nation cannot afford to rest on its laurels. Indeed, heightened international economic competition; stresses on American energy, transportation, and other physical infrastructure; continued economic and geopolitical vulnerabilities to energy price shocks (despite increased North American oil and natural gas production); and multiple environmental challenges associated with energy all indicate a need to strengthen U.S. efforts to enhance energy productivity.

Productivity of energy use, like productivity of capital, labor, and material inputs, is integral to economic competitiveness. Companies that make the most efficient and effective use of inputs to production—more bang for the buck and, in the case of energy, more bang for the Btu—tend to be more profitable and competitive than less productive firms in their industries. Regionally and nationally, higher energy productivity of companies and public sector institutions can lead toward enhanced prosperity and quality of life not only because of the greater productivity and competitiveness of businesses but also from greater efficiency in public services and infrastructure, more reliable and secure energy services, and reduced public health and environmental effects of energy-related pollution and degradation.

Although energy productivity is just one factor that contributes to economic well-being, it is noteworthy that a number of industrial countries exhibit higher levels of energy productivity than the United States does, and that major emerging economies are experiencing energy productivity growth. Figure 4 illustrates energy productivity trends for selected countries, though the graph should be used with caution since differing national industrial structures, climate, size, and other factors affect energy productivity.

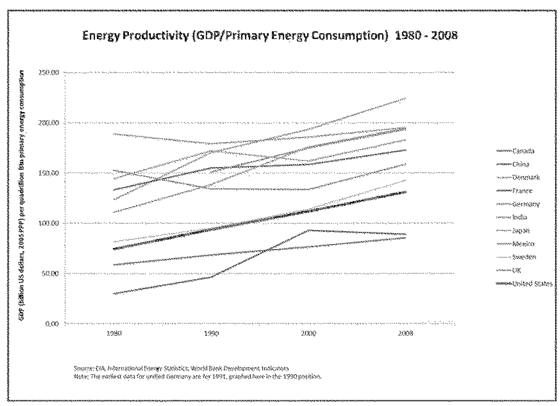


Figure 4. Energy Productivity Comparisons of Selected Countries

At the Commission's request, the Rhodium Group modeled potential impacts of doubling U.S. energy productivity between now and 2030. The Rhodium Group used engineering studies to identify cost-effective investment opportunities in the building, industrial, and transportation sectors. The integrated energy-economic model suggests that $166 billion (year 2010 dollars) in energy productivity investments each year could yield a net annual savings of over $327 billion nationwide in 2030 and yield a net employment increase of almost 1.3 million jobs in that year. Per household savings are estimated at about $1,000 per year and national industrial output could increase by $100 billion in 2030 due to reduced energy costs. The Rhodium Group's analysis also points to significant reductions in carbon dioxide emissions (down to 4 billion tons or 33% below 2005 levels) as well as sulfur dioxide and nitrogen oxides emissions. Further, lower oil imports and higher energy productivity would decrease American vulnerability to oil price spikes, reducing direct costs of spikes by up to 30% relative to business-as-usual. The model projects that in 2030, the United States would import 7% of its energy demand rather than 12% in the business-as-usual case.[4]

The next section of this report describes principal findings of the Commission and briefly summarizes some significant points from the supporting research reports.

COMMISSION FINDINGS

The Commission relied on a series of research reports and a systems integration report (described in the "Background Research for Policy Development" section) to establish the current status and potential for energy productivity in various economic sectors. This section first summarizes top level cross-cutting findings from the report. This is followed by a discussion of barriers and opportunities to energy productivity improvement and an examination of cross-cutting themes of investment, technology, human behavior, and government and governance.

TOP LEVEL FINDINGS:

There is potential to greatly improve American energy productivity across all sectors of the economy using existing technologies and practices and by developing new technologies and approaches.

Energy productivity improvements offer multiple benefits to individual firms and consumers as well as to the nation and society as a whole. Among these benefits are greater economic productivity and competitiveness; technological innovation; consumer and business cost savings and reduced vulnerability to energy price volatility; more reliable and secure energy systems; and reduced adverse environmental impacts.

Energy productivity gains come from energy-specific investments and also are co-benefits of investments undertaken primarily for other reasons. New capital stock tends to be more energy efficient than older stock. So industrial plants refurbished or expanded to improve production rates or product quality can also deliver greater energy (and material and labor) productivity. Likewise, building renovation and upgrades, old vehicle replacement, and infrastructure enhancements offer energy productivity improvements.

Numerous hurdles impede implementation of currently cost-effective energy productivity investments and hinder the development of new technologies and practices. These include split incentives between those who make energy decisions and those who pay energy bills, information barriers and uncertainties, first cost and financial return criteria, and some regulatory disincentives, among others. (See also Table 1.)

Public policies can provide tools for overcoming these impediments. These are discussed further in the Commission's recommendations section.

Private sector policies and governance are vital for achieving energy productivity gains since the private sector dominates economic decision making. Some companies have organized themselves to better recognize and implement energy productivity opportunities, through corporate goals, employee incentives and accountability, and use of formal Energy Management Systems, for example. Sometimes working with government agencies, the private sector develops and adopts technical standards, workforce training criteria, and professional norms pertinent to energy management. They can also advance energy productivity among their peers and through their supply chains.

4 Rhodium Group, "American Energy Productivity: The Economic, Environmental and Security Benefits of Unlocking Energy Efficiency."

OPPORTUNITIES AND BARRIERS

Table 1 encapsulates selected opportunities and barriers identified in the Commission research reports.

Table 1. Energy Productivity Improvement Opportunities and Barriers

OPPORTUNITIES

EFFICIENCY POTENTIAL:

- Large potential to expand use of currently available best practices and technologies
- Large potential for new, more efficient technologies and processes
- Advances in information technologies and smart and intelligent systems
- Energy efficiency is often the lowest cost energy resource (i.e., often cheaper to save than to buy energy)

INFORMATION, INVESTMENT, AND MANAGEMENT:

- Capital modernization and investments made for other purposes often increase energy productivity as a co-benefit
- Energy management systems integrate energy in corporate decision making, motivate employees and stakeholders to pursue efficiency, and inculcate continual improvement ethos
- Education and training of workers, managers, policy makers, the public
- Improved data and information can:
  - Empower consumers/users to better manage energy
  - Control risks and uncertainties to unleash greater investment
  - Spur adoption of energy efficient technologies and practices
- Government leadership by example as test bed and early market for energy efficient products, technologies, and services

REGULATIONS, PLANNING, AND INCENTIVES:

- Utilities, grid operators, and regulators increasingly value and plan for demand-side resources (energy efficiency, demand response, and CHP); well-crafted rate structures, incentives, and rules can promote utility-customer partnerships
- Increasing recognition of energy efficiency as a means to improve environmental quality, including in air quality planning and regulation, and as further highlighted in the impact modeling section of this report
- Codes and standards can set floor that protects consumers and shifts market
- Tax policies can encourage energy productivity
- Land use and infrastructure planning and approval processes can enhance energy productivity of communities and infrastructure systems

BARRIERS

FINANCIAL BARRIERS:

- High investment hurdle rates (i.e., require high ROI rates and short payback periods)
- High first cost of various efficiency measures
- Cost reducing, including energy savings, investments can be undervalued relative to other investment opportunities
- Macroeconomic uncertainties and weak economy

MARKET STRUCTURE BARRIERS:

- Split incentives (e.g., landlord-tenant relationship) inhibit optimal investment
- Fragmented industries and spillover effects lead to modest levels of R&D
- Diverse utility rate structures, incentives, and regulations have varied, inconsistent impacts on energy efficiency across the states

INFORMATION BARRIERS:

- Insufficient data and information on performance of energy productivity measures
- Energy is a small portion of production costs for many businesses so may not garner strong management attention
- Shortage of skilled, qualified energy managers and analysts
- Manufacturing extension and technical services are modestly supported and limited in scope
- Low public awareness of energy efficiency options and benefits

PRICING AND REGULATORY BARRIERS:

- Tax and depreciation rules that discourage capital investment
- Environmental impacts may not be fully reflected in cost structures
- Moderate natural gas prices in the U.S., while a boon to consumers, may reduce attention to energy savings opportunities

INVESTMENT

In each sector examined—manufacturing, buildings, transportation, and electric and natural gas systems—the opportunities for cost-effective benefits are vast compared to those of the resources made available. For example, McKinsey & Company estimated that $354 billion in building energy efficiency investments during 2009-2020 could yield $685 billion in savings.[5] But in 2010 about $18-20 billion was invested in the sector by a combination of utility energy efficiency programs, Energy Savings Performance Contracts (mainly for public sector buildings), and one-time federal stimulus (American Recovery and Reinvestment Act) spending. There is a great opportunity for additional investment vehicles to profitably finance energy efficiency improvements.

For manufacturing, the National Research Council cited estimated potential savings of 14 to 22% of total industrial sector energy use (4.9-7.7 quads) in 2020 as compared to projected energy use in the reference case. The savings were based on cost-effective technologies that yield at least a 10% internal rate of return or a return greater than the company's cost of capital plus a risk premium.[6]

Uncertainties and risks, capital constraints, corporate strategy, and public policy affect decisions to invest in energy productivity as significantly as they do other investment decisions. Businesses and households can be dissuaded from making energy or other upgrades by high first-costs. Both often demand very rapid payback on investments. Table 2 illustrates typical ranges of returns demanded by different investor categories. Companies often prefer growth investments that expand production and product offerings over cost savings investments (such as for saving energy) even when the cost savings investments offer greater immediate returns. Consumers, businesses, and investors are also affected by uncertainty and perceived risks—will upgrading lighting, replacing an industrial furnace, buying hybrid trucks, or putting money in an energy efficiency investment fund, for example, deliver the desired performance?

Energy productivity investments may be undertaken primarily to achieve energy benefits, but often energy productivity gains are a co-benefit of investments made for other purposes. A broader modernization of manufacturing, renovation of building stock, replacement of vehicles, and upgrade of infrastructure can yield energy productivity gains while simultaneously improving economic productivity and business competitiveness, quality of products and services, and energy and environmental performance. For example, in manufacturing, the growth of scrap-using electric arc furnace mini-mills in the U.S. iron and steel industry has occurred mainly for economic competitiveness reasons but it has also raised energy productivity. Promising opportunities for such investments exist across all sectors of the economy.

Table 2. Illustrative Investment Requirements by Sector

SECTOR	SIMPLE PAY-BACK (YEARS)	RETURN-ON-INVESTMENT (ANNUAL %)
Government	7-30	3-10
Investors	3-7	10-25
Industry	1-4	25-100

Source: Citigroup, Inc. 2012.

These investment issues interact with the particular structures of the different economic sectors. Transportation and mobility related investments can be especially complex because of multiple planes of investment (vehicle purchase, transportation infrastructure, and land use decisions that affect transportation) that involve multiple private and public sector decision makers. Infrastructure and building investments can lock in land use patterns and associated transportation needs. On the other hand, information and communication technology (ICT) investments are providing new opportunities for transportation, such as intelligent transportation systems, logistics and fleet management software, and telework.

For the electric and natural gas infrastructure sectors, changing demand, aging infrastructure, growing interaction of electricity and natural gas systems, integration of variable energy resources such as wind and solar, and potential impacts of electric vehicles add to the challenges and opportunities. A 2011 American Society of Civil Engineers report estimated a need for electricity system cumulative investments of $107 billion by 2020 and nearly $732 billion by 2040 to keep up with projected demand.[7] The sector can benefit from advanced meters, smart grid technology, and smarter end-use technologies that allow for improved system energy productivity while also enhancing safety and security as well as the cost-effectiveness of delivering energy services to customers.

5 Granade, et al., "Unlocking Energy Efficiency in the U.S. Economy," 29, 55.

6 National Research Council, *America's Energy Future: Technology and Transformation*, Table 4.10.

7 American Society of Civil Engineers, "Failure to Act: The Economic Impact of Current Investment Trends in Electricity Infrastructure."

Further, electric and natural gas ratepayer-funded end-use energy efficiency and load management programs could help meet the demand at a lower cost. Electricity ratepayer programs saved an estimated 112 billion kWh of electricity in 2010, enough to power nearly 10 million homes or nearly 3% of U.S. electricity consumption in 2010.[8] Natural gas ratepayer programs saved U.S. customers 81 trillion Btu in 2010, or about 0.33% of U.S. natural gas consumption.[9] In 2011 electric and natural gas efficiency programs invested $8 billion in energy efficiency and load management programs.[10]

This investment discussion has focused on physical capital. However, other forms of investment are also important. Investments in R&D are critical to developing new technologies. Related investment in technology demonstration and validation as well as in technical assistance can facilitate the deployment of energy productivity enhancing technologies and practices. Further, investment in human capital, for the workforce that operates and maintains machines, buildings, facilities, vehicles, and infrastructure is also critical to operational and behavioral efficiency.

TECHNOLOGY

Energy productivity technological improvements stem from plant level innovations and from formal R&D. Both new technology and the spread of existing best practices offer a large scope for enhancing energy productivity. Opportunities exist for widely applicable technologies (such as heating and cooling systems, motors, and automated controls), as well as for processes that are specific to individual industries or types of facilities (such as specialized manufacturing operations). Material efficiency and recycling are important to energy productivity since large amounts of energy are used to produce, process, and distribute materials and water; wasted and discarded materials are wasted and discarded energy.

Buildings, industrial systems, infrastructure, and transportation systems are all complex with numerous interacting parts that should be viewed holistically in order to maximize energy productivity. For instance, astute building designers can find using integrated design that high performance windows may allow a smaller, less expensive heating and cooling system to service the building. A lighter, stronger material may take more energy to produce than a conventional material but could yield much greater fuel savings when incorporated into an airplane or car.

Information and communication technologies (ICT) notably promise efficiency benefits across all economic sectors. Real-time building monitoring and control technologies can yield large operational savings. Improved electronic controls in individual vehicles, vehicle telematics and fleet management, intelligent transportation systems, and next generation air traffic control all increase transportation energy productivity. Also, ICT facilitates telework and the substitution of communication for travel. And a smart electric grid can both reduce grid losses and help boost end-use efficiency.

For buildings, available but poorly diffused technologies for lighting, windows, roofing, furnaces, and boilers, as well as building controls, can reduce energy consumption by 30% to 50% compared to the typical building.[11] Emerging technologies in heating and cooling, appliances, lighting, windows, and electronics offer even more. Building energy productivity also requires effective operations and maintenance (O&M), combining training and motivation of building operators with the growing capabilities of building monitoring and control technologies.

For vehicles, there are many technological avenues for fuel economy improvement in addition to ICT areas mentioned above—lightweight materials, engines, transmissions, aerodynamics, tires, and other components. Hybrid drive systems provide further efficiency benefits while developments in plug-in electric and hydrogen fuel-cell systems have the potential to offer greater gains. And many opportunities pertain to rail, marine, and aviation modes as well.

Smart energy grid technologies will also be important for addressing challenges of better integrating electric and natural gas systems, accommodating variable resources such as wind and solar, and handling the potential growth of electric vehicles, which can be either strains or assets to grid reliability and efficiency.

8 *Wallace and Foster, "State of the Efficiency Program Industry," Fig. 23.*

9 *Ibid., Fig. 24.*

10 *Ibid., Fig. 2.*

11 *ASHRAE, "Advanced Energy Design Guides."*

HUMAN BEHAVIOR

All energy productivity activities and decisions are functions of human behavior. Thus, behavior is the ultimate "cross-cutting" theme. People:

» Develop new goods, services, and technologies;
» Buy or adopt energy using products and practices;
» Operate energy using products and practices;
» Can respond to feedback on energy use, price signals, and operational performance to improve decision making; and
» Adopt and implement policies and programs intended to influence others' energy use.

In order to act to improve energy productivity, a person or company must first pay attention to the issue and the potential benefits, then be convinced that one or more measures are a good idea and make a decision to act, and finally have the knowledge and skills to implement the measures. All these actions are influenced by information and uncertainties over performance, costs, benefits, and risks of products, technologies, and practices and by ways people make or avoid decisions given the uncertainties.

For organizations, corporate structures and cultures are key to establishing effective patterns of behavior. Corporate commitments, lines of responsibility and accountability, employee recognition and incentives, and formal energy management systems (such as those conforming to the ISO 50001 standard) can encourage energy productivity gains just as companies previously organized to advance quality and environmental management (including through ISO 9000 and ISO 14001 standards for quality and environmental management systems). Table 3 lists the "Seven Habits of Efficient Companies" identified by William Prindle as key elements in organizing companies to achieve energy efficiency gains.[12] The Dow Chemical Company is just one example of a company that motivates employee innovation, helping the company to reduce energy consumption per pound of product by 40% since 1990, saving a cumulative $24 billion and 5.2 quads (roughly 5% of a single year's total U.S. energy consumption).[13]

Improving energy productivity also requires a robust, skilled workforce. Well-trained operators and maintenance staff are needed to optimize energy management in industrial operations, buildings, transportation systems, and physical infrastructure. Recognized technical credentials can help companies better identify qualified employees and contractors while helping advance career opportunities for workers with pertinent training.

Table 3. The Seven Habits of Highly Efficient Companies

1. Efficiency as a core strategy.
2. Leadership and organizational support is real and sustained.
3. The company has smart efficiency goals.
4. The strategy relies on a robust tracking and measurement system.
5. The organization puts substantial efforts into efficiency.
6. The energy efficiency strategy shows demonstrated results.
7. The company effectively communicates efficiency results.

Derived from Prindle, "From Shop Floor to Top Floor," table ES-1, p. vii

In buildings, owners and builders decide on building components that affect energy use; building operators affect energy use through operations and maintenance (O&M); and occupants exert control over many types of energy-using equipment. Energy management can be affected by building energy use feedback and benchmarking systems, building staff training and occupant education, social norms and marketing, and financial incentives. Behavior based energy efficiency approaches, such as energy feedback systems, can empower building operators and individual households to better manage their energy use and costs. An Environmental Defense Fund study estimated a $3 billion potential annual savings if simple monthly comparative energy-use reports were sent to residential customers nationally.[14]

Within the transportation sector, significant energy productivity opportunities lie in providing greater transportation choice and to consumers and motivating different behavior. This includes more efficient vehicle choices and more efficient driving as well as alternatives to personal automotive travel, including public transit, bicycling, telecommuting, the development of more walkable communities. Energy productivity benefits of mobility choice can also include energy cost savings, reduced traffic congestion, improved community quality of life, and an improved environment.

12 Prindle, "From Shop Floor to Top Floor," 84.
13 Dow Chemical Co. Responsible Care Awards Program submission for "Dow Ringwood Site Cuts Energy Consumption by 56,000 MM BTU/yr."
14 Davis, "Behavior and Energy Savings: Evidence from a Series of Experimental Interventions," 2.

GOVERNMENT AND GOVERNANCE

Federal, state, and local governments can influence energy productivity, directly and indirectly, in many ways. The list of pertinent government policy topics is long—R&D, technology demonstration and validation, technical assistance, education and training, voluntary programs, tax provisions, utility ratemaking and regulation, financial regulation, information and disclosure, efficiency standards, land use and facility siting, transportation and water infrastructure, environmental regulations, public procurement, intellectual property, antitrust, and others. This subsection focuses on some (but not all) areas germane to energy productivity, with additional discussion accompanying the Commission's policy recommendations.

The broader term, governance, includes public and private sector policies, management systems, industry standards, and professional norms, all of which can play significant roles in advancing or impeding energy productivity improvements depending on how they are designed and implemented. Private sector governance is critical to advancing energy productivity since it is the private sector that is the primary performer of economic activities. As discussed previously, corporate and organizational governance can create, or thwart, motivations for managers, employees, and other stakeholders to identify and undertake energy productivity improvements.

R&D and deployment activities can be directly supported by government or encouraged through R&D, demonstration, public-private consortia, tax, technical assistance, intellectual property, and other policies. Federal support of R&D at national laboratories, universities, and companies has been critical to innovation in energy efficiency. Both broad technical assistance programs such as Manufacturing Extension Partnership and targeted efficiency deployment programs help bring the innovations into use and improve American manufacturing competitiveness.

***Tax and depreciation** rules* can have significant direct and indirect energy impacts. Tax policies can offer favorable tax treatment for energy-efficient products and activities or they can provide broader incentives (for example, through accelerated depreciation schedules) for capital investment, which can indirectly favor energy productivity growth. Tax policies can also encourage R&D, training, and other pertinent activities. Some tax policies, such as depreciation provisions, can have reduced or, perhaps, favorable fiscal impacts on the Treasury compared to other measures.

Utility regulation and ratemaking processes have been, and will remain, critical to energy productivity advancements. Electric and natural gas utilities are highly regulated. Their motivation and ability to support energy efficiency is highly dependent on the legal and regulatory framework in which they operate, including how utility commissions determine rates, criteria for allowable investments, and incentives or mandates to pursue energy efficiency. As noted previously, utility ratepayer programs fund billions of dollars of energy efficiency projects annually, delivering significant electricity and natural gas savings. Also, there is interest in "on-bill" finance or "on-bill" repayment, in which energy utility bills are used as the vehicle for repayment of loans or other financial obligations.

Financial regulations can improve or hinder opportunities for profitable energy productivity investment. Federal statutes govern allowable corporate structures, such as master limited partnerships and real estate investment trusts, for certain investment activities. These laws can affect the ability of business to favorably package energy efficiency investments to investors. There may be opportunities for the federal government to facilitate securitized secondary markets for energy efficiency and productivity investments. Further, where there is a nexus of mortgages to the federal government and its related government-sponsored entities (GSEs), rules could support consideration of energy costs in mortgage underwriting. Also, rules could remove impediments to property assessed clean energy (PACE) financing mechanisms, which allow homeowners to repay energy upgrade financing via their property tax or other local charges.

Information, data, and energy disclosure policies are important to overcome the information barrier—the energy efficiency of a building, appliance, or vehicle is not readily apparent. Product energy labeling (such as those for automobiles and some appliances) and building energy use disclosures (starting to be required in several U.S. and foreign jurisdictions) give consumers useful information to make purchasing and leasing decisions. Voluntary programs, such as Energy Star, can identify higher efficiency products and buildings. Utility regulations and voluntary programs such as Green Button can provide consumers their own energy usage information in order to better manage home and business utility energy use. The federal government also could facilitate the collection and analysis of energy efficiency measure performance data that would be useful for stimulating development of privately capitalized investment funds and, potentially, securitized secondary markets for energy efficiency.

Voluntary programs, both publicly and privately administered, can play important roles in promoting energy productivity products and practices. For instance, the Energy Star label—supported by EPA and DOE—is widely recognized by consumers as signifying energy-efficient products. Some manufacturers and builders have significantly increased the energy efficiency of their products in order to earn the label and appeal to consumers. The U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) building program has become a valuable certification in portions of the commercial real estate market. The DOE established a Superior Energy Performance program to encourage and recognize industrial and commercial companies that implement energy management systems that conform to the ISO 50001 standard. Voluntary labels, designations, and certifications can help transform markets, pushing energy productivity levels upward.

Codes and standards for buildings, vehicles, appliances, and other equipment have delivered remarkable gains in energy productivity and savings for consumers, and promise to deliver still more in the future. The codes and standards have been so successful that non-regulated equipment is a fast growing portion of total energy use, raising the issue of covering more categories (including electronics) and larger systems. Compliance, especially with building energy codes, also is an issue. Although codes and standards generally apply to new equipment and construction, a few localities have begun to impose requirements on building operational performance or retrofits, such as a retro-commissioning (building system tune-up) provision in New York City that will apply to large commercial buildings.[15]

Land use and infrastructure planning and approval processes are usually implemented primarily by state and local governments. State and local authorities have a major responsibility for not only building and maintaining surface transportation infrastructure, but also often operating public transit systems. They also provide multi-modal transportation accommodations such as sidewalks, pedestrian signals, bicycle lanes, electric vehicle charging stations and other features. Land use and transportation infrastructure decisions have long term, deep impacts on energy consumption patterns. Improvements in regional and local planning have shown large benefits for energy productivity. The federal government also has a large role in funding surface transportation and can provide guidance, incentives, and performance criteria. Also the federal government, often in partnership with state and local authorities, has strong inference on aviation, rail, and maritime transport systems.

Environmental regulations and policies can better recognize energy efficiency as a means to improve environmental quality, including in air quality planning and regulation. Environmental regulations can be made more innovation friendly and conducive to energy efficiency as an environmental compliance strategy if they are well designed.

Leadership by example is a role that all levels of government can play. As the federal government is the nation's largest energy user, its purchasing power can propel markets for energy efficient products and services, whether for equipment, buildings, or transportation, while saving taxpayers money through reduced energy expenses. State and local governments are collectively even larger energy buyers and markets for energy services and high efficiency facilities and products. And government, particularly federal agencies, can serve as a test bed for emerging technologies and practices that meet government mission needs but which can also have spin-off applications in the broader civilian economy.[16]

15 Sobin and Steele, "NYC, DC, SanFran & Austin: Cities Use Local Policies to Make Buildings More Efficient."

16 The Department of Defense, Environmental Security Technology Certification Program, operates an installation energy test bed to demonstrate and validate technologies for meeting defense installation mission needs (Marqusee, "Military Installations and Energy Technology Innovation.") while the General Services Administration has an analogous test bed program.

COMMISSION RECOMMENDATIONS

Based on the findings from the research reports, the Alliance Commission on National Energy Efficiency Policy developed this set of unanimous recommendations for federal, state, and local governments as well as the private sector, with the intention of doubling energy productivity by 2030. While we believe that doubling energy productivity will be cost-effective and bring benefits to consumers, businesses, and the nation, a large number of barriers will prevent success without concerted government and private sector action.

The recommendations were selected based on an assessment of their potential impact, their political viability, and their implementability. Because energy productivity decisions are made by everyone, most of the recommendations cut across economic sectors. As many of the recommendations seek national harmonization and state or local implementation, the federal, state, and local recommendations often are intertwined.

The recommendations are organized under three overarching strategies:

» **UNLEASH INVESTMENT** in energy productivity throughout the economy—well over a trillion dollars in cost-effective energy savings opportunities are available in the United States, but achieving the savings will require investment of hundreds of billions of dollars;

» **MODERNIZE REGULATIONS** and Infrastructure to improve energy productivity—investments by governments, businesses, and individuals to modernize our nation's infrastructure and other capital (buildings, equipment, vehicles) provide tremendous opportunity to improve energy productivity; and

» **EDUCATE AND ENGAGE** consumers, workers, business executives, and government leaders on ways to drive energy productivity gains—to succeed we need to develop human capital throughout the economy.

UNLEASH INVESTMENT

MAKE FINANCING MORE EASILY AVAILABLE FOR ENERGY EFFICIENCY PROJECTS

Convenient and affordable financing is vital in order to provide the hundreds of billion dollars in investment needed to double energy productivity and to overcome the barrier posed by the high initial cost of many measures. But there currently is little financing specifically for energy efficiency investments other than the Energy Savings Performance Contracts and Utility Energy Service Contracts, which are used mostly for government buildings (discussed later in this section). In particular there is a need for a "secondary market" for energy efficiency loans and other financial obligations, essentially selling the obligations wholesale to investors to free up capital for more projects. There is an additional need for better valuation of the cost savings from energy efficiency that enable borrowers to pay back loans.

Make more capital available by enabling institutional investors to buy energy efficiency financial obligations on a large scale using securities based on uniform contract structures and better performance data:

» The Alliance to Save Energy should convene a consortium of financial institutions, rating agencies, energy efficiency program evaluators, and others in the private sector, to work with the federal agencies to foster a secondary market for energy efficiency financial obligations. The consortium should draft uniform contract language, underwriting guidelines, and energy data requirements (for obligations that depend on energy performance) to allow for sufficient scale of consistent financial obligations to interest investors. The consortium should also gather reliable data on energy efficiency and loan performance of projects in order to better quantify the risks.

» State and local governments should work to aggregate and resell loans in secondary capital markets, such as in the Warehouse for Energy Efficiency Loans (WHEEL) program.

Establish state and local programs for financing of efficiency measures, which may use repayment on utility bills or on property tax bills (the capital could be provided by institutional investors):

» States and local governments should work with utilities, the private sector, and the federal government to establish effective energy efficiency financing mechanisms for residential and commercial buildings (including loans, leases, energy services agreements, power purchase agreements). Repayment on utility bills or property tax bills can reduce risk by encouraging timely payment and by allowing an obligation to stay with the building when it is sold. (Of course administrative costs and any impacts on payment of the bills would need to be addressed.) Such financing mechanisms may include:

- On-bill repayment (OBR) programs administered by utilities but with capital provided by third parties, including banks and other investors;
- On-bill finance programs with capital provided by utilities from ratepayer or shareholder funds; and
- Property assessed clean energy (PACE) financing with repayment on property tax bills. The capital is usually obtained by local or state governments issuing bonds for residential buildings and by third parties working directly with the building owner for commercial buildings.

» Congress should direct the Federal Housing Finance Agency, working with the Department of Energy (DOE), to establish guidelines and rules for residential PACE financing that are compatible with mortgage lending practices in order to allow a senior lien like that of property taxes for cost-effective projects.

Consider household energy and transportation costs when underwriting mortgages to allow for larger or more attractive loans for homes with lower monthly costs:

» The Department of Housing and Urban Development (HUD) should improve the accuracy of mortgage underwriting by ensuring that reductions in energy and transportation costs are considered in the underwriting process of loans backed by federal mortgage agencies. Larger loans (or more attractive loans with strict income or assessment requirements) should be permitted for energy-efficient homes and for homes in locations that allow transportation options other than driving because the homes are more valuable and because owners with lower energy and transportation bills are able to make higher mortgage payments.

ADVANCE ENERGY PRODUCTIVITY THROUGH FEDERAL TAX REFORM

Federal tax incentives have played a key role in encouraging market adoption of energy-efficient new homes, home improvements and appliances, new commercial buildings and upgrades, hybrid cars and heavy duty vehicles, and public transportation. But the incentives are not always carefully targeted or kept up-to-date. At the same time the tax code has discouraged business investments with unrealistically slow depreciation—in some cases equipment that typically lasts fifteen years can only be depreciated over 39 years (and the energy costs that would be saved can be expensed in one year). Federal tax reform offers the opportunity to create a more efficient incentive structure.

Reform federal energy efficiency tax incentives so that they focus on high efficiency technologies and measures and on promoting innovation and market transformation:

» Congress should reform and extend federal tax incentives that promote energy efficiency. The incentives should be reformed by strengthening their qualifying criteria, amounts, and durations to ensure that they focus on high efficiency technologies and measures and on promoting innovation and market transformation. One approach would be to direct DOE or EPA to set the specific criteria, preferably based on designations used in market transformation programs, which would allow for more timely and expert response to market changes.

Adjust commercial and industrial depreciation schedules to encourage investments that can boost energy productivity:

» Congress should adjust commercial and industrial depreciation schedules to reflect more accurately the average lifetimes of equipment and measures. Congress should also consider accelerated or bonus depreciation to encourage modernizing capital stock. New equipment, buildings, and vehicles tend to be more energy efficient than old stock. Since depreciation adjustment changes the timing but not the total amount of tax paid to the Treasury, fiscal impacts can be relatively modest (and the increased economic activity may be fiscally beneficial).

SUPPORT ENERGY PRODUCTIVITY INNOVATION AND MARKET ADOPTION

Private R&D budgets are small in many sectors related to energy productivity in part due to the fragmented markets and industry structures and to the spillover of knowledge. Market barriers also prevent adoption and commercialization of new innovations. Thus government support both for R&D and for a wide range of deployment programs has been critical to advances in energy productivity. Often these programs have been most effective in concert: R&D support helps develop technologies, technical assistance and incentives assist early market introduction, information programs spur broad commercialization, and standards ensure that all consumers benefit and push markets forward toward further innovation.

Increase federal investment in basic and applied research, development, demonstration, deployment, and technical assistance:

» Congress should increase support for DOE and other energy efficiency R&D for all economic sectors. The federal government should also encourage private R&D through other policy approaches such as public-private consortia, the R&D tax credit, and supporting challenges or contests.

» Congress should increase support for energy efficiency demonstration, deployment, and technical assistance at DOE, EPA, and other agencies (from Building America to Industrial Assessment Centers to Energy Star to weatherization of low-income homes). DOE should maintain a balanced portfolio of research and deployment programs.

» Federal, state, utility, and other technical assistance providers should coordinate activities to offer companies a unified array of services across energy and non-energy areas. Congress and the states should include energy productivity in manufacturing and agricultural extension services and other technical assistance.

» Federal, state, and local governments should coordinate their efforts to offer, and encourage the private sector to offer, the use of buildings and other facilities as test beds to demonstrate and validate emerging energy productivity technologies and practices, and as early markets for the innovations.

GOVERNMENTS LEAD BY EXAMPLE

The federal government is the largest single energy user, responsible for just over 1% of energy use, in the United States. State and local governments combined own one fifth of commercial building space, with much larger energy use. [17] But beyond their own energy use, governments can serve as highly visible test beds and early adopters of innovative technologies and practices. They also can influence their large base of contractors and suppliers to increase their energy productivity.

Apply innovative best practices to government buildings and vehicle fleets:

» Federal, state, and local agencies should apply innovative best practices to government buildings and vehicle fleets, including (several of these already are required for federal buildings):
- Setting targets for efficiency improvement;
- Implementing energy management systems, including under the ISO 50001 standard;
- Benchmarking, rating, and disclosing of building energy use and efficiency (see below);
- Conducting ongoing or periodic recommissioning to ensure buildings are performing as they were designed;
- Considering location efficiency when siting facilities;
- Procuring innovative high-efficiency equipment and vehicles; and
- Encouraging energy management in supply chains.

Make all cost-effective efficiency improvements to federal buildings, using private financing and public funds:

» Federal agencies should make all cost-effective efficiency improvements in their buildings with annual targets for savings and/or funding. Agencies can use private financing (energy savings performance contracts and utility energy service contracts, under which private contractors and financial institutions are paid from energy savings over time) as well as public funds, especially since appropriations are very tight.

17 USEIA, *Annual Energy Review 2011*, Tables 1.3 and 1.12; D&R International, *Buildings Energy Data Book*, Table 3.2.3.

MODERNIZE REGULATIONS AND INFRASTRUCTURE

CREATE A "RACE-TO-THE-TOP" STYLE ENERGY PRODUCTIVITY COMPETITION TARGETED AT STATES AND COMMUNITIES

State policies including building energy codes, regulation of utility demand-side management, and transportation and land use planning are key drivers of energy productivity. More recently cities have taken the lead on building energy disclosure, community-based building energy upgrade programs, and other areas. But the best practices need wider dissemination. The education "Race to the Top" initiative has spawned significant education reforms and has received broad, bi-partisan support. An energy productivity competition that similarly provides federal resources and rewards states for progress toward becoming more energy productive could spur significant advances in efficiency throughout the nation.

Incentivize innovation and adoption of best practices by state and local governments based on energy productivity improvements, investments, and regulatory reform. States would receive technical assistance and funding based upon policy and regulatory reforms like those recommended in this report on building energy codes and disclosure, efficiency programs and financing, utility reform, and transportation planning and investments.

» The federal government should develop an energy productivity "Race to the Top" to spur state and local energy policy reform as the education initiative spurred education reform, with the goal of doubling U.S. energy productivity by 2030.

» DOE should help states and local governments implement innovative policies and programs, and should develop scoring criteria on energy productivity improvements in the jurisdiction, increased effectiveness of efficiency codes and programs, transportation infrastructure investments, and regulatory reform (because of wide differences between the states, they should be graded on improvements, not on an absolute scale).

» The Office of Management and Budget should work with federal agencies to use these criteria in setting a variety of related federal funding to states and local governments, including as scoring factors in competitive grants.

» The assistance and scoring should focus on policies like those recommended to states and local governments throughout this report.

USE ENERGY PRODUCTIVITY TO ACHIEVE REGULATORY AND PLANNING GOALS

A wide range of regulations and government investments affect energy use in every economic sector. Increasing energy productivity can be an important way to meet the goals of those regulations and investments if they are designed well. Thus electric and natural gas state and utility programs funded by ratepayers are the primary delivery vehicle for energy efficiency in our nation, with budgets over $8 billion in 2011 (more than double those of three years before). [18] The programs avoid much larger investments in power plants, transmission lines, and gas pipelines. Transportation and land-use planning can help reduce the need to drive by creating walkable communities and transportation alternatives. Industrial efficiency measures such as combined heat and power can reduce air pollution while lowering costs. And investments in water and wastewater systems can reduce water losses, thus reducing the power needed to pump and treat the water.

18 *Wallace and Forster, State of the Efficiency Program Industry, 15.*

Adopt utility policies that make full use of all cost-effective demand-side management (end-use energy efficiency and demand response) as a resource. Such state-level policies may include broad and targeted savings goals, financial incentives for utilities, time-variant customer rates, fair treatment of combined heat and power and other distributed resources, and harmonized program evaluation:

» State public utility commissions (PUCs) and municipal and cooperative utilities should adopt policies that make full use of all cost-effective end-use energy efficiency and demand-response resources. Recognizing differences between states, such policies may include:

» Set energy savings and demand reduction goals based on the available cost-effective potential, measure progress toward the goals, and provide incentives to achieve them;

- Set goals, metrics, and incentives to achieve the enhanced benefits of demand-side resources enabled by smart grid technologies;
- Use time-variant rates where appropriate to create actionable price signals to customers based on the real-time cost of energy, accompanied by effective customer education to help them make use of the savings opportunities;
- Adopt utility rate structures that remove financial disincentives to use end-use energy efficiency and demand response resources that benefit customers and create earnings opportunities;
- Ensure that demand-side management programs are available to all customers, including low-income customers; and
- Encourage combined heat and power and other distributed resources where they enhance energy productivity and reliability, are cost-effective, and meet efficiency criteria. Adopt interconnection rules and rates and fees for combined heat and power and other distributed resources that are fair and reasonable (including utility recovery of associated costs and avoidance of cost shifting) and ensure reliability and safety.

» DOE should strengthen its State and Local Energy Efficiency Action Network work to convene states, utilities, evaluation professionals, industry, consumer and environmental organizations, and other stakeholders to develop nationally harmonized evaluation, measurement, and verification (EM&V) approaches and protocols that are credible, transparent, reasonable in cost, and adaptable to regional and state jurisdictional contexts. DOE should also provide technical assistance to states to facilitate adoption of these approaches and protocols.

Advance regional and local transportation and land use plans that promote energy productivity by improving access to work, services, school, and play, and by increasing transportation options including safe walking, biking and public transportation. Provide funding and technical assistance to enable efficient development patterns and transportation infrastructure that is consistent with the regional and local plans:

» Congress should direct the Department of Transportation and the Environmental Protection Agency (EPA) to establish performance standards for long-range regional transportation plans, which are developed by Metropolitan Planning Organizations, to achieve increases in energy productivity for the transportation sector and related environmental goals while improving mobility and connectivity for all transportation modes.

» Metropolitan Planning Organizations and other regional planning agencies should establish or update regional transportation plans and land use plans that meet the standards, and local governments should establish or update local transportation and land-use plans, codes, and zoning that are consistent with the regional plans (both with federal, state, and private sector assistance). This planning should seek to achieve energy-efficient mobility, connectivity, and accessibility.

» Congress (together with and as a catalyst to state governments, local/regional governments, and the private sector) should provide resources and enable directed funding and incentives to promote efficient development patterns and transportation infrastructure that are consistent with the regional and local plans.

Use energy efficiency as an emissions reduction strategy in environmental regulations:

- EPA, state, and local air regulators should, to the extent possible, encourage energy efficiency as an emissions reduction strategy and, as appropriate, allow and credit efficiency measures as compliance options in their regulations and procedures.
- EPA, DOE, and other relevant agencies should collaborate with state and local authorities to facilitate recognition and crediting of energy efficiency in state and regional air quality plans, and should provide guidance and technical assistance to encourage regulated entities to implement energy efficiency as compliance and productivity strategies.

Ensure major government and regulated infrastructure spending on energy grids, transportation infrastructure, and water and waste systems increases energy productivity.

- Utilities and state PUCs should use smart grid capabilities to increase energy productivity, including by targeting demand-side management, providing consumers with detailed use information, and improving system efficiency through better voltage control.
- Congress, the Department of Transportation, and state transportation agencies should direct transportation funding to increase viable transportation options other than driving.
- Congress, EPA, and state and local governments should ensure new water and wastewater infrastructure achieves both water efficiency and energy efficiency, including water use savings, leak reductions and efficient equipment. They also should increase recycling and more efficient collection of municipal solid waste.

STRENGTHEN BUILDING, EQUIPMENT, AND VEHICLE EFFICIENCY STANDARDS

Standards and codes have been among the most effective energy efficiency policies, setting a performance floor for equipment, buildings, and vehicles. They protect consumers (especially some renters and buyers who pay the energy bills but cannot choose the products), lower prices, and spur innovation. They also have enormous potential: New appliance standards could save an estimated 3% of all energy use by 2035 and save consumers a net $170 billion.[19] Potential savings from building codes are similar if they were to be adopted and enforced nationwide. And new vehicle standards are projected to save another 3% of energy use by 2030.

Steadily and aggressively increase the stringency of building energy codes, with quick adoption and effective compliance measures:

- The International Code Council and American Society of Heating, Refrigerating, and Air-Conditioning Engineers, with DOE support, should build on recent 30% energy savings and steadily increase the energy efficiency of their model building energy codes and standards. The updates should continue to be cost-effective, stakeholder-driven, and fuel and technology neutral.
- State and local governments should quickly adopt these updates or more stringent "stretch" codes, and should deploy the resources needed (including resources from building permit fees) to achieve full compliance with the codes.
- HUD should quickly update efficiency requirements for new homes with federally subsidized loans and for public housing, and DOE should quickly update the requirements for federal buildings, based on the most recent model codes.

End current delays and update federal appliance and equipment, vehicle, and manufactured housing efficiency standards to maximum technologically feasible and economically justified levels:

- DOE and the Office of Management and Budget (OMB) should end current delays in setting appliance efficiency standards and make timely updates at the "maximum level that is technologically feasible and economically justified," as required by law.
- DOE and OMB should end current delays and quickly set efficiency standards for manufactured housing based on the most recent model codes.
- Both the federal government and states should set new standards for electronics, industrial equipment, and other products when justified by the energy savings.
- The Department of Transportation and EPA should strengthen the new heavy duty vehicle standards as they extend them.

19 Lowenberger et al., *The Efficiency Boom*, 3, 5.

EDUCATE AND ENGAGE

PROVIDE INFORMATION ON BUILDING ENERGY EFFICIENCY AND ENERGY USE

Car drivers see fuel economy information in every advertisement and receive frequent feedback when they look at the dashboard (especially those with fuel economy gauges). But homeowners and commercial building managers often have no idea about the efficiency of a building. Major appliances are labeled in stores, but even whole tenant spaces in commercial buildings often are not submetered in operation. Better energy information may transform how buildings are designed and operated if it is made available at the right times and in useful ways. New smart technologies provide much more detailed information, while new policies are making the information more available to consumers.

Develop effective building energy ratings, benchmarks, and disclosure methods for commercial and residential buildings; require periodic disclosure in commercial buildings and disclosure at time of sale or rental in residential buildings; and incorporate the information in building appraisals and real estate listings:

» DOE and EPA should engage a stakeholder coalition to develop model building energy ratings, benchmarks, and disclosure methods for commercial buildings and for residential buildings that are based on the best existing systems and practices, user friendly, adjusted to climate regions, and universally available. The coalition should consider inclusion of location efficiency information. DOE should ratify the ratings/benchmarks/disclosure developed by the stakeholders as the national models, and ensure needed comparative data are available and up-to-date.

» The federal government should adopt the national models for use in all federal buildings and, where practical, federally subsidized buildings and buildings with loans from federal mortgage agencies. HUD and DOE should encourage appraisers, lenders, and the real estate industry to incorporate the information into valuation of buildings and real estate listings.

» State and local governments should require disclosure of energy information using the national models in commercial buildings and at time of sale or rental in residential buildings.

Enable customers and third parties authorized by the customers to access their energy usage data, while ensuring customer privacy:

» PUCs should develop rules and procedures that enable customers to access their energy usage data and to authorize third parties to access their data. The data should be accessible in a national standard data format such as Green Button. The rules and procedures should ensure effective privacy protections and address legacy data systems.

Develop harmonized energy use labels with discrete ratings for appliances and vehicles that are coordinated with building energy labels.

» DOE, EPA, and the Federal Trade Commission should develop harmonized energy use labels for appliances and vehicles, coordinated with building labels above, and harmonized product certifications. The labels should show discrete ("categorical") energy efficiency ratings, which have been shown to be more effective with consumers and are used in most other countries. DOE also should study ratings and test methods for building energy subsystems.

IMPROVE CORPORATE ENERGY MANAGEMENT AND TRANSPARENCY

Private sector energy management is critical for achieving energy productivity gains since the private sector dominates economic activity. While specific best practices and standards are important, increasing corporate energy productivity must start with good management and reporting. Corporate goals and commitments, employee incentives and accountability, use of formal Energy Management Systems, and transparent reporting of energy use can encourage energy productivity gains. Companies also can influence the energy productivity of their peers, supply chains, and others.

Effectively manage corporate energy use and report on energy productivity as part of corporate sustainability reporting.

» Companies should effectively manage their energy use, including by implementing the new ISO 50001 standard for energy management systems with certification through DOE's Superior Energy Performance.

» Companies should report on their energy use, energy productivity, and energy efficiency investments as part of corporate sustainability reporting, providing accountability to investors and the public (as comparisons between companies often will be difficult, may need common benchmarks or to compare companies only against their own historical performance).

» Companies should work to encourage improved energy management among their suppliers, customers, and peers in order to make supply chains more cost-effective.

DEVELOP EDUCATED CONSUMERS AND TRAINED TECHNICIANS

In order to succeed, all of these recommendations need people with the skills to implement them. We need government leaders and business executives who understand the importance of energy productivity to our economy, environment, and security. We need construction workers, building and plant managers, city planners, and many other kinds of workers skilled at implementing efficiency measures (and with credentials that prove it). We need consumers who understand what steps they can take to lower energy bills. In other words, we need to invest in human capital as well as physical capital.

Develop school and university curricula on energy use and productivity, conduct consumer campaigns, develop technical certifications, and provide related workforce training and continuing education:

» Companies, professional associations, labor organizations, secondary and higher educational institutions, government, and other stakeholders should collaborate to promote, improve, and, as warranted, develop technical training curricula and credentials to include energy efficiency technologies and practices. These could include training and credentials for energy management (such as energy auditing and building commissioning) as well as incorporating energy content into related technical and continuing education curricula (such as for building trades, vehicle repair, and equipment operation).

» Energy management and productivity should be incorporated in secondary and higher education curricula and continuing education programs, including vocational-technical, architecture, engineering, and business management programs.

» Governments, companies, non-governmental organizations, media, and, as appropriate, educational institutions should collaborate to heighten consumer awareness, understanding, and motivation regarding actions to improve energy efficiency and productivity, using behavioral research to increase the effectiveness of the education.

ECONOMIC IMPACT MODELING

The Commission asked the Rhodium Group (RHG) to analyze the economic, employment, environmental, and security implications of doubling American energy productivity by 2030. RHG conducted the analysis independently of the Commission or participating organizations. Its findings are summarized below. Details on the methodology used for the analysis, as well as detailed results, are available at energy2030.org.

ECONOMIC IMPACTS

The United States can achieve the Commission's goal of doubling energy productivity by 2030 with currently available technology and design practices. To do so, households, businesses, and federal, state, and local governments will need to invest an additional $166 billion a year (in real 2010 U.S. dollars) in building improvements, energy efficient vehicles and industrial equipment, and energy saving transportation systems (Table 4). This investment would both reduce the amount of energy needed to run the American economy and the price of energy for U.S. consumers, lowering overall energy costs by $494 billion a year. Net of investment costs, annual savings to American households, businesses, and government agencies would total $327 billion, and economic growth and energy demand would be decoupled for the first time in recent history (Figure 5).

By 2030 the average household would save $1,039 per year in energy costs, net of the investment required to deliver those energy savings. That is roughly the same as what the average American household spends on education and nearly as much as average household spending on medicine and produce combined. American business would save $169 billion a year, almost as much as the corporate sector paid in federal income tax in 2011. Efficiency improvements combined with lower energy prices would also make energy-intensive industries like chemicals, glass, steel, and cement more competitive internationally. And efficiency improvements in government buildings and vehicles would save taxpayers $13 billion a year, nearly as much as the annual budgets of the Department of Commerce and Environmental Protection Agency combined.

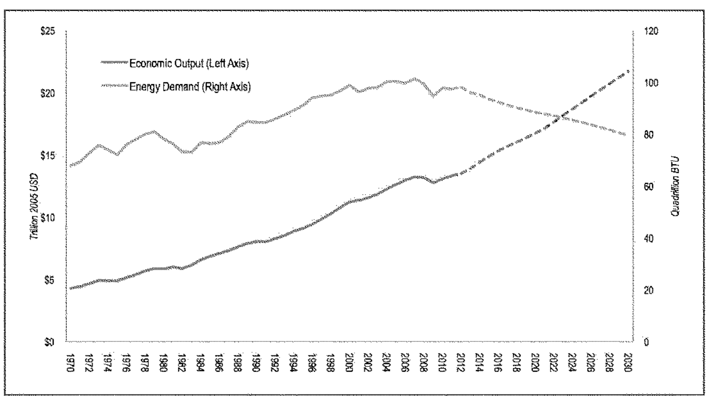


Figure 5: Untying Economic Growth and Energy Demand
Economic output (left axis) and energy demand (right axis) under a doubling energy productivity scenario
Source: BEA, EIA and Rhodium Group estimates

Table 4: Annual Costs and Benefits of Doubling US Energy Productivity
Billion 2010 USD

BY SECTOR

SECTOR	INVESTMENT COSTS	ENERGY SAVINGS	NET SAVINGS
Buildings	$72	$167	$95
Industry	$15	$109	$94
Transportation	$79	$218	$139
Total	**$166**	**$494**	**$327**

BY CONSUMER

CONSUMER	INVESTMENT COSTS	ENERGY SAVINGS	NET SAVINGS
Households	$97	$241	$145
Businesses	$61	$230	$169
Government	$9	$22	$13
Total	**$166**	**$494**	**$327**

Notes: investment costs are annualized using sector-specific interest rates and financing terms. Energy expenditures and savings are in the year 2030 once a doubling is achieved. May not sum to totals due to rounding.

Capturing the benefits of profitable efficiency investments in buildings, industry, and transportation could increase U.S. economic output by as much as 2% in 2030. Doubling American energy productivity would also change the composition of the U.S. economy, redirecting revenue from energy supply to more labor-intensive manufacturing and service sector activities. RHG estimates that successfully achieving the Commission's goal could increase overall U.S. employment by 1.3 million jobs.

ENVIRONMENTAL BENEFITS

Doubling energy productivity would deliver substantial reductions in carbon dioxide (CO2) emissions, providing a cost-effective strategy for addressing climate change. RHG estimates that if the Commission's goal is achieved, U.S. CO2 emissions will decline to 4.65 billion tons by 2020, 22% below 2005 levels. That surpasses America's 17% emission reduction commitment made at the Copenhagen climate change conference in 2009. By 2030, the Commission's goal would reduce U.S. CO2 emissions to 4 billion tons, or 33% below 2005 levels.

Doubling energy productivity will have other environmental benefits as well. RHG estimates that in 2030, sulfur dioxide (SO2) and nitrogen oxides (NOx) emissions would be, respectively, 55% and 45% lower than business-as-usual, yielding important public health benefits.

SECURITY IMPLICATIONS

The recent boom in domestic oil and natural gas supply is reducing American dependence on imported energy. Doubling energy productivity would accelerate this process. RGH estimate that achieving the Commission's goal would reduce net energy imports to 7% of U.S. energy consumption by 2030, down from 19% today. More importantly, it would make the U.S. economy more resilient to future energy price spikes. Even if net U.S. energy imports decline to zero, America will remain part of the global energy market and thus vulnerable to supply disruptions elsewhere in the world. But by doubling energy productivity, the direct economic cost of a global price spike would be reduced by up to 30%.

BACKGROUND RESEARCH FOR POLICY DEVELOPMENT

In addition to the Commission's policy recommendations discussed earlier in this report, the Alliance to Save Energy worked with Commission members, designated representatives, technical advisers, an international advisory council, and other partners to complete seven research reports. The reports address the following areas: the history of energy efficiency; residential and commercial buildings; transportation, land use, and accessibility; manufacturing; smart grid and power generation; and natural gas infrastructure, plus a systems integration report that identifies commonalities and connections among the sector reports. In addition, we contracted for economic impact modeling to project the energy, economic, and environmental implications of national energy productivity doubling (described in another section).

These research reports provide an organized review of existing literature on energy efficiency, assess the current state of efficiency within the economy, and include a collection of best-practice case studies. Each report discusses the cross-cutting issues of investment, technology, human behavior, and government as they relate to opportunities and challenges of increasing energy productivity in the United States. These reports were used to provide the technical basis and support for the Commission's development of recommendations for doubling the nation's energy productivity by 2030.

This section provides a brief overview of each of the research reports. A full version of the reports can be accessed on the Alliance website.

HISTORY OF ENERGY EFFICIENCY

Over the past 40 years, the United States made large gains in energy productivity. Since 1970, the nation expanded its economic output more than three times while the demand for energy grew by only 50%. According to the American Council for an Energy-Efficient Economy (ACEEE), energy efficiency "fueled" about three-quarters of the new demand for energy services since 1970 while conventional energy resources met only a quarter of that demand.[20]

The history of energy efficiency in the United States provides a useful reference and guide to any future national energy efficiency strategy. The energy challenges faced in the 1970s, 1980s, and 1990s offer experiences and lessons likely to apply in coming decades. While the salience of energy and energy efficiency in national policy has waxed and waned over time, a strong architecture of policy tools has developed at federal, state, and local levels. Therefore, this paper aims to outline the history of energy efficiency policies and programs in the United States to better understand how energy productivity increased over the last decades.

RESIDENTIAL & COMMERCIAL BUILDINGS

Buildings account for approximately 40% of all U.S. energy use. Building efficiency in the United States represents an investment opportunity in the hundreds of billions of dollars, with potential savings estimated as high as $1 trillion over the next 10 years – 30% of what we now spend annually on electricity.[21] New and existing building stock can become more efficient and productive through adoption and enforcement of codes and standards, investment in efficiency retrofits, improving technologies, and educating users, among other means.

This report assesses the state of building energy efficiency in order to inform the Commission in its development of policy recommendations for expanding energy productivity in residential and commercial buildings. It examines the unique financing challenges in the buildings sector, an array of available energy productivity technologies, new developments in providing building efficiency information, and recent policy innovations.

TRANSPORTATION, LAND USE & ACCESSIBILITY

Accounting for 28% of U.S. energy use and 71% of its oil consumption, the transportation sector has large effects on national energy productivity, environmental protection, and energy security.[22] Land use planning and development patterns have large effects on how Americans access jobs, services, recreation, friends, and family and on the energy required to do so. Thus, land use and transportation planning are vital to energy productivity advance. However, improving energy productivity also requires more efficient cars, trucks, trains, buses, and planes, as well as some potentially "game-changing" infrastructure improvements for electric-drive vehicles that use batteries or fuel cells. Also, advances in information and communication technologies offer much energy productivity promise, from controls in individual vehicles to intelligent transportation systems to further substitution of communication for transport and travel.

20 *Laitner et al., "Long-Term Energy Efficiency Potential," 4.*

21 *Rockefeller Foundation and DB Climate Change Advisors, Building Energy Efficiency Retrofits, 7.*

22 *Davis, Diegel and Boundy, Transportation, 2-3; 1-23.*

Well-designed policies and strategies coupled with collaboration among federal, state, and local governments offer a large potential to improve the energy productivity of our transportation, land use, and accessibility systems. Furthermore, they support robust economic development and business and employment opportunity, enhanced mobility choice and quality of life, and strengthened environmental protection and energy security. This research report summarizes these opportunities and their potential as well as some of the barriers to achieving that potential.

MANUFACTURING

Manufacturing is vital to American economic well-being, accounting for over 11% of GDP and 60% of exports, and directly employing nearly 12 million workers with above average wages and benefits.[23] The sector consumes 26 quadrillion Btu or about 27% of national energy use.[24] New technologies, improved products and processes, energy management systems, and recovery of otherwise wasted heat and materials all offer opportunities to enhance U.S. manufacturing energy productivity, as well as help strengthen overall U.S. economic productivity. Energy productivity advances can come from energy-focused investments or as a co-benefit of investment undertaken primarily for other competitive reasons. Various barriers impede the adoption of cost-effective energy efficiency measures as well as the development of new efficient technologies and practices. Both corporate management approaches and public policies can help overcome these impediments.

This research report describes industrial energy productivity trends, projections, opportunities, and barriers. It discusses investment, technological, human behavior, and government and governance contexts in the manufacturing sector to help the Commission explore energy productivity policy options.

POWER GENERATION AND SMART GRID

Smart grid technologies offer great potential to increase the efficiency of U.S. power generation, transmission, and distribution while creating a more versatile and reliable electric power grid.

The purpose of this report is to focus on energy productivity, emphasizing power generation as it relates to Smart Grid and Smart Grid implementation as drivers for an improved energy economy that uses cleaner resources and to encourage continued investment in Smart Grid technologies with respect to reliability, security, efficiency and renewable integration, and affordability through this discussion.

NATURAL GAS INFRASTRUCTURE

The outlook for natural gas features a rapidly changing resources base, impacts on different value-chains for the direct-use of natural gas, and increasing coordination of the electric and gas grids. These features provide near term and longer term opportunities to increase energy productivity in the United States

This report focuses on the potential for the U.S. natural gas distribution infrastructure to support the Commission's goal of substantially increased energy productivity.

SYSTEMS INTEGRATION

The Commission recognized at its first meeting that any structure used to describe the energy system in the United States, such as by the sectors addressed in the research reports, would fail to convey fully the interconnectedness of the energy system.

This report identifies major commonalities and interdependencies across the sector-based reports to allow for a systems-thinking approach to policy recommendations.

23 *U.S. Department of Commerce, "The Competitiveness and Innovative Capacity of the United States", 6-1.*

24 *Ibid., 9.*

CONCLUSION

The goal of doubling American energy productivity by 2030 is aggressive but achievable. The potential for improvement in all sectors of the economy is huge. Advancing U.S. energy productivity will not only save money but will also raise overall economic productivity, offering corresponding benefits to business competitiveness, household income, and employment. Energy productivity improvements can also deliver greater energy reliability and security, technological innovation, less vulnerability to energy price shocks, and reduced adverse environmental impacts.

Energy productivity gains can come from energy-focused investments as well as from investments undertaken primarily for other purposes, such as increasing plant production, improving building amenities and performance, modernizing vehicle fleets, and upgrading infrastructure. Energy productivity also increases when materials and water are used efficiently and waste is reduced.

New technologies and techniques are needed--whether plant-floor innovations or products of formal R&D—but enormous gains are also available from accelerating the spread of existing technologies and practices.

Although energy efficiency is often cost-effective and the lowest cost energy resource, numerous barriers impede energy productivity advances. As recounted in this report, there are multiple investment hurdles ranging from a common split between who makes energy decisions and who pays the energy bill, to lack of information on energy efficiency and how to improve it, to management structures and cultures. Upfront costs of efficiency measures, lack of dedicated financing, modest financial resources and trained human resources, poorly designed regulations, and other policies also can impede energy productivity.

The hurdles, however, can be overcome by effective public and private sector policies. Reaping the full economic, jobs, security and environmental improvements that accrue from doubling our energy productivity will require active participation of policy makers at all levels of government, businesses across the economic spectrum and consumers.

- The Commission has assembled a package of recommendations for all of the stakeholders who must be involved if we are to unleash the full potential of energy efficiency. The recommendations are organized around the themes of:
- **UNLEASH INVESTMENT** in Energy Productivity, including innovative financial mechanisms, tax provisions, and support for R&D and deployment activities;
- **MODERNIZE REGULATIONS** and Infrastructure, including a "Race to the Top" style competition to spur action by states and local governments, well-designed regulations and standards, and utility policies and incentives; and
- **EDUCATE AND ENGAGE** Stakeholders, including improved data and information and corporate energy management.

These recommendations are intended to appeal to policy makers regardless of party and are offered not only to the Congress and federal agencies, but also to the broader community of public and private sector policy and decision makers. They are offered with the conviction that energy productivity is critical to securing America's prosperity, strength, and well-being in the years to come.

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ALLIANCE TO SAVE ENERGY

Using less. Doing more.

The Alliance to Save Energy promotes energy efficiency worldwide to achieve a healthier economy, a cleaner environment, and greater energy security. Founded in 1977, the Alliance to Save Energy is a non-profit coalition of business, government, environmental, and consumer leaders.

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ARKEMA

U.S. House of Representatives
Committee on Energy and Commerce
Subcommittee on Energy and Power

Hearing

"American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies"

February 26, 2013

Statement Submitted for the Record

Jeff Hall
Plant Manager
Arkema Inc.
Calvert City, Kentucky Facility

Arkema Inc. appreciates the opportunity to submit written comments to the Subcommittee on Energy and Power of the House Energy and Commerce Committee. Arkema Inc. delivers safe and innovative chemical solutions that meet today's growing demands and is a premier provider of chemicals and materials in the global marketplace.

We appreciate the Committee's interest in highlighting private sector successes in developing and implementing energy efficient technologies. Arkema's Calvert City, Kentucky facility, as well as many of our other 26 facilities in the United States, manufactures and produces chemicals and materials that are used in a variety of applications that help individuals, businesses and organizations achieve increased energy efficiency. We believe there is a strong role that the chemical manufacturing industry can play in helping to create energy solutions for a strong, secure and energy efficient future, and Arkema is proud to play a key part in these efforts.

About Arkema Inc.

Arkema is a diversified chemicals manufacturer and like other multi-national corporations operates facilities around the world. In the United States, we have 25 manufacturing locations and two research centers that collectively employ approximately 2,500 people. Arkema Inc. is the U.S. subsidiary of Arkema S.A., a European-based chemical manufacturing company that operates in North America, South America, Europe and Asia.

Arkema's roots in the U.S., and its participation in international trade, go back to the Pennsylvania Salt Manufacturing Company, which in 1860 became the first entity to export refined petroleum from the United States. The newest operating refrigerant manufacturing facility built in the United States is at our Calvert City, Kentucky plant, which alone employs 270 workers and contributes more than $50 million to the local economy each year.

As a corporation, Arkema is committed to upholding the highest standards for safety and the environment. We strive to meet these goals by optimizing our manufacturing and procurement processes and activities. Our efforts in these areas are also at the forefront of our innovation policy, and they help drive the development of our product offerings.

Materials and Technologies that Promote Energy Efficiency

Arkema produces and manufactures a range of materials and products that have energy efficiency applications and uses. At our Calvert City facility, for example, we produce two products that have energy efficiency uses. Our Kynar® PVDF resin is a tough coating used on the exterior of many buildings, including in high performance cool roof coatings that can provide substantial energy savings to building owners and operators. Arkema also produces fluorochemicals at the Calvert City facility, and these are used as coolant in air conditioners and refrigeration equipment and also in various foam insulation applications that can also help achieve energy savings in buildings.

Arkema also supplies a number of products into the automotive industry that can help auto manufacturers achieve better energy efficiency. From coatings, refrigerants, plastics, polymers, and resins, Arkema serves a number of automobile parts suppliers and manufacturers to foster technological advancements for motor vehicles. Arkema produces materials and products for the auto industry that make vehicles safer, more reliable, more attractive, more environmentally-friendly and more fuel-efficient.

For example, the following Arkema products and materials can be found in a variety of different automotive applications: Rilsan® HT products can significantly reduce weights by replacing a variety of metal and rubber parts and tubes, and since the Rilsan® products are biobased, they are also environmentally friendly; Kynar® PVDF, noted above, is also used in a variety of exterior parts and trim and exhibits high performance in terms of durability and strength; and Plexiglas® is used in a variety of automotive applications.

In addition, other business units produce a variety of materials and stabilizers that are used in many different automotive parts to help produce strong and lighter-weight parts. Other Arkema materials such as thermoplastic and thermoset composites; resins; foamed polymers; carbon nanotubes and lighter-weight sheets that can replace glass in some cases (e.g., sunroofs) are all potential solutions that could help reduce automobile weights and, in turn, reduce fuel consumption and provide greater energy efficiencies.

Additionally, Arkema has technologies that play key roles in energy storage systems and batteries, including materials that can help make such systems less expensive, more environmentally friendly and safer. Arkema coatings and technologies also play key roles in photovoltaic systems and help improve their durability and efficiency. Our work in both of these areas can help contribute to increased energy efficiency for the automotive and building sectors.

Finally, Arkema is involved in various efforts to develop and implement industrial energy recovery technologies. This work includes development of high temperature heat pumps for recovery of waste heat from industrial facilities and other ongoing developments on new fluids for high temperature heat pumps and other energy recovery applications. At our Calvert City facility, for example, we have improved our energy intensity (energy consumed per pound of product produced), and, in 2012, our energy intensity was 17% better than our baseline year. We achieved this greater efficiency through a variety of capital and process improvements at our facility, and these enhanced efficiencies help reduce our manufacturing costs and improve our competitive position.

Our company and our employees are proud of the contributions that we make to help promote and achieve energy efficiency. We believe Arkema materials and the chemical manufacturing industry can help provide critical energy efficiency solutions for the U.S. and the world. Recent data from the American Chemistry Council indicates that chemistry products and technologies save 8 to 10.9 quadrillion BTU's in energy per year for a cost saving of up to $85 billion per year.

As the Committee continues its work in the area of energy efficiency, we urge your support for policies that recognize and encourage the important contributions of materials producers and the chemical manufacturing industry to efforts to promote and achieve energy efficiency improvements. We hope that you will not hesitate to call on us or the chemical manufacturing industry if we can be of assistance.

Thank you, again, for your interest and your consideration.

THE PEW CHARITABLE TRUSTS

February 26, 2013

The Honorable Ed Whitfield
Chairman, Energy and Power Subcommittee
U.S. House Committee on Energy and Commerce
2123 Rayburn House Office Building
Washington, D.C. 20515

The Honorable Bobby L. Rush
Ranking Member, Energy and Power Subcommittee
U.S. House Committee on Energy and Commerce
2322A Rayburn House Office Building
Washington, D.C. 20515

Dear Chairman Whitfield and Congressman Rush:

I am writing to submit comments for today's Energy and Power Subcommittee meeting entitled "American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies hearing." The Pew Charitable Trusts has invested time, energy and resources to identify and promote national policies that will steer private investment into clean energy technologies that results in economic growth, new export opportunities, and greater energy security. Unlocking the potential benefits of greater energy efficiency merits significant discussion, and Pew commends your focus on this important issue.

In recent years, the Pew Charitable Trusts has prioritized acceleration of investment in and deployment of clean energy technologies that hold promise for reducing greenhouse gas emissions, creating jobs and economic opportunity and enhancing our energy independence and national security. Specifically, we believe that prioritization of energy efficiency in the transportation and industrial sectors, combined with deployment of advanced clean energy technologies in the utility and transportation sectors, hold the potential to significantly promote economic growth and energy security and advance U.S. strengths in financial and technological innovation. Successfully implemented, transportation efficiency and electrification, industrial energy efficiency and clean electric generating capacity can help position the United States to be an economic and environmental leader in the 21st century.

Excluding research and development, investment in the global clean energy sector is more than 600 percent higher than in 2004. The U.S. Energy Information Administration estimates that worldwide energy consumption will increase by 47 percent from 2010 to 2035, primarily in developing nations. The International Energy Agency forecasts that clean energy will provide half of the new electric generating capacity installed over the next 25 years. With so much at stake, a global energy race has begun among companies and countries alike and the United States now faces considerable competitive challenges from Europe and Asia, in particular. This competition from abroad has challenged U.S. leadership in the clean energy marketplace, which is dominated by renewable technologies that were pioneered and previously manufactured in this country. Currently, America lags behind other nations on a variety of measures, including clean energy deployment and manufacturing. Even its long-standing edge in innovation is at risk.

To gather expert viewpoints on the status and prospects of U.S. competitiveness in the sector, the Pew Charitable Trusts organized a series of roundtable discussions across the country with clean energy industry leaders, academics and other experts. Throughout 2012, we convened financiers in New York City, manufacturers in Cleveland, innovators in Colorado, solar developers in Atlanta and biomass firms in Mississippi. Finally, we hosted more than 125 business leaders from our Clean Energy Business Network in Washington, DC. During these discussions, key themes emerged regarding industry needs and expectations for policies that the new Congress and administration can adopt to ensure the competitiveness of American industry in the clean energy sector.

First, participants stated that U.S. energy policy lacks a clear sense of purpose. In the past, the energy sector has been successful in meeting public policy goals, such as making affordable electricity universally available in the United States. Similar objectives are needed now to help focus the interests and efforts of scientists, investors and businesses. Long-term goals would dispel the uncertainty that negatively affects the clean energy industry. Leaders noted that competitors in Germany, China and other countries benefit from stable and consistent policy that allows them to invest, plan and raise private capital.

For several decades, U.S. renewable power policies have been episodic. Funding for research has gone through frequent and significant swings, hampering innovation efforts. Similarly, the financial incentives for clean energy technologies have typically been renewed on a short-term basis and sometimes only on an annual basis. The boom-and-bust nature of U.S. clean energy programs makes it extremely difficult for emerging industries to develop the supply chains and business models needed to establish a foothold in the competitive global marketplace. In addition, uncertainty shakes the confidence of potential investors and keeps capital on the sidelines.

We also gleaned important information about profound market challenges: overproduction, tight credit markets and stiff industry competition and consolidation—conditions that have occurred in the early stages of other emerging industries, from automobiles to computers. Industry leaders were heartened by the prospect of emerging export opportunities, falling prices and development of new private financing mechanisms. They are bullish on the long-term outlook for American innovation and manufacturing. Ultimately, these leaders believe that the rapid decline in the cost of clean energy technologies—though difficult for industry to manage—is good for consumers, competition and the sector as a whole. Participants were confident of the ability of American industry to succeed as the clean energy marketplace expands, provided that there is consistency and consensus in policy.

As documented in our January 2013 report *Innovate, Manufacture, Compete*, policy priorities identified by industry participants include establishment of a broad national clean energy standard; increased investment in energy R&D; time-limited incentives for private investment; removal of barriers that create an uneven playing field in the energy marketplace; support for U.S. clean energy manufacturing; and enhanced trade policies to expand markets for U.S. goods and services.

This report did not explore issues related to industrial energy efficiency, which can reduce costs for US manufacturing, provide grid reliability and spur job creation and private investment. As you may know, major studies have indicated that industrial energy efficiency could be increased by as much as 80 gigawatts by 2020. Last year, the Obama Administration set a national goal for increasing industrial energy efficiency by at least 40 gigawatts by 2020 through an Executive Order. The executive order is a critical first step at helping U.S. industry improve efficiency, and additional steps to double combined heat and power capacity by 2020 could result in 600,000 new jobs, $140 billion in private investment, and a three percent reduction in total energy consumption according to the Oak Ridge National Laboratory. Some of the policies that can expand industrial efficiency technologies include modifications to the investment tax credit, innovative financing solutions that lower up-front costs and open access to broader investment pools, and technical assistance that helps local policymakers identify and eliminate other barriers.

In addition to making U.S. industry more competitive, industrial efficiency technologies like combined heat and power can help businesses and critical facilities including hospitals and emergency shelters prepare for weather-related disasters. During Hurricane Sandy, facilities that had made investments in industrial efficiency often maintained power and heat after neighboring buildings experienced blackouts. Co-op City in the Bronx, Princeton University in New Jersey, and New Milford and Danbury Hospitals in Connecticut all kept the lights on and were able to continue providing essential services when many others could not. Recently, New York University's

Langone Medical Center, which lost power during the storm, announced its intention to invest $250 million in an "energy building" and complete a cogeneration plant near the facility that would allow the hospital to generate nearly 100 percent of its power needs on site. Preventative measures like these can help save lives and reduce future recovery expenditures.

More efficient use of U.S. energy resources has significant potential to promote new private sector investment that promotes U.S. manufacturing and exports and strengthens American energy security. Thank you for your attention to this matter, and Pew welcomes the opportunity to be a resource as you and your colleagues discuss future policy actions to address these issue.

Sincerely,

Phyllis Cuttino
Director, Clean Energy Program
The Pew Charitable Trusts

The Alliance for Industrial Efficiency

February 25, 2013

Congressman Ed Whitfield
Chair, Subcommittee on Energy and Power of the Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515

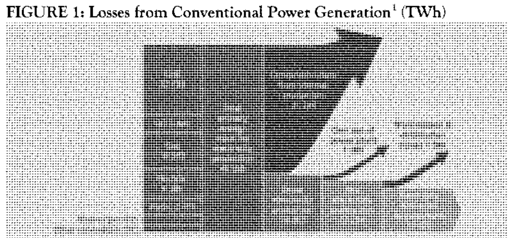
Congressman Bobby Rush
Ranking Member, Subcommittee on Energy and Power of the Committee on Energy and Commerce
2268 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Whitfield and Ranking Member Rush:

The Alliance for Industrial Efficiency (AIE) is pleased that the Subcommittee on Energy and Power is holding a hearing to assess opportunities in energy efficient technologies, particularly in the area of industrial efficiency. The Alliance is a diverse coalition representing the business, environmental, labor and contractor communities and is committed to enhancing manufacturing competitiveness through industrial energy efficiency. We want to emphasize the economic and reliability benefits associated with Combined Heat and Power (CHP) and Waste Heat Recovery (WHR) and ask that this letter be submitted for the official Hearing Record.

U.S. power generation is woefully inefficient – and has not improved since Dwight Eisenhower occupied the White House. In fact, as Figure 1 (below) illustrates, roughly two-thirds of energy inputs (68 percent) are simply wasted, with a mere 32 percent actually delivered to customers. Ratepayers subsidize this inefficiency by paying for power that never reaches the end user. The unfortunate results are lost competitiveness and jobs, as well as increased pollution.

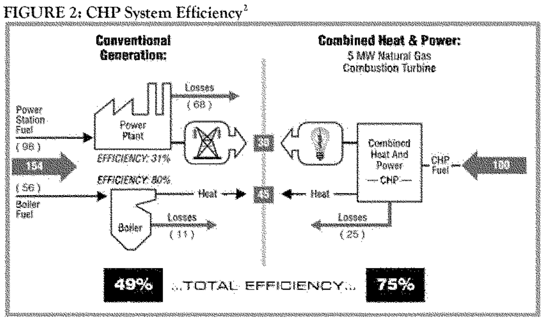
FIGURE 1: Losses from Conventional Power Generation[1] (TWh)



[1] International Energy Agency, 2008, "Combined Heat and Power: Evaluating the benefits of greater global investment," at 6 (Figure 3) (http://www.iea.org/papers/2008/chp_report.pdf).

Fortunately, cleaner and more cost-effective alternatives already exist in the form of Combined Heat and Power. Indeed, by capturing and reusing waste heat, a CHP system can convert what would otherwise be wasted energy into additional electricity and useful thermal energy (heat). This approach reduces costs and increases energy efficiency – allowing utilities and companies to effectively "get more with less." As Figure 2 illustrates, total energy use is significantly greater with conventional separate heat and power generation (here 154 units) than it is under combined heat and power (here 100 units).

FIGURE 2: CHP System Efficiency[2]



The related opportunity for energy savings using Waste Heat Recovery can provide new sources of electricity and useful thermal energy simply by recovering the heat and steam produced in a variety of industrial processes that otherwise would be emitted into the atmosphere.

By dramatically reducing electric power demand (and related energy costs) for industrial sources, combined heat and power can help make U.S. manufacturing more competitive. For instance, the ArcelorMittal steel facility in East Chicago, Indiana, reports $100 million in annual electricity savings from WHR and CHP.[3] Industrial CHP facilities can use the money they save on energy to expand production and employment. Such savings are already being realized at thousands of locations nationwide. According to the Department of Energy Database, 3,850 CHP and WHR installations already produce 82 gigawatts of clean and efficient power around the country.[4]

What's more, CHP and WHR projects can increase the reliability of our power sector, by ensuring that manufacturers, universities and hospitals "keep the lights on" during extreme weather events that can compromise the electric grid. We witnessed these benefits this winter during Superstorm Sandy, when many communities in the Northeast and Mid-Atlantic went without power. Yet Co-Op city, a 60,000-

[2] U.S. EPA, "Output-Based Environmental Regulations Fact Sheet" (http://www.epa.gov/chp/state-policy/obr_factsheet.html) (Note that this figure is for illustration only. CHP performance relative to separate heat and power depends on numerous site- and project-specific factors).
[3] Chris Steiner, "Gray is the New Green," *Forbes*, Sept. 15, 2008 (http://www.forbes.com/forbes/2008/0915/054_2.html).
[4] CHP Installation Database developed by ICF for ORNL and DOE, 2012 (http://www.eea-inc.com/chpdata/index.html).

resident community in New York with a CHP system, still had heat and light.[5] Similar success stories exist across the region.[6]

The potential for increased deployment of CHP and WHR is great. Indeed, in 2008, the Department of Energy's Oak Ridge National Laboratory (ORNL) found that CHP could produce 20 percent of U.S. electric capacity (or 156 gigawatts of new, clean power) by 2030.[7] This addition is equal to the capacity of more than 300 conventional power plants. According to ORNL, such full-scale deployment would generate $234 billion in new investment and create nearly one million new highly-skilled, technical jobs,[8] in the design, construction, installation and maintenance of CHP equipment.

On August 31, 2012, the Administration took a first step to challenge the nation to realize this potential by issuing an Executive Order (EO 13624) establishing a goal of increasing CHP deployment by 50 percent (40 gigawatts) by the year 2020. We commend the Administration for recognizing the benefits of industrial efficiency; however, we believe Congress should support a more aggressive deployment goal, as reflected in The Smart Energy Act, which was introduced with bipartisan support by Representatives Bass and Matheson, and others, in the 112th Congress. A provision in this legislation contained a goal of *doubling* CHP deployment during the same period. This bold vision is needed to advance technologies that are vital to our economy and to our nation's electric reliability. This ambitious goal is also consistent with the seminal 2008 ORNL report.

CHP's and WHR's technical capacity clearly exceeds the Executive Order goal. In October 2010, ICF Consulting published a report – "Effect of a 30 Percent Investment Tax Credit on the Economic Market Potential for Combined Heat and Power" – assessing the technical market potential for CHP (exclusive of WHR) in the industrial, commercial/institutional, and multi-family residential market sectors in the U.S., finding that such potential approached 64 gigawatts in the industrial sector and 68 gigawatts in the commercial sector.[9] These findings were reaffirmed in a 2012 DOE-EPA report released alongside the industrial efficiency Executive Order.[10] Relatedly, analysis done for the EPA-DOE interagency Technical Assistance Program found that simply installing CHP in the industrial coal and oil boilers covered by the Boiler MACT Rule would produce in excess of 21 gigawatts of new CHP capacity – more than half of the Administration's recently announced goal.[11]

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[5] Williams, Diarmaid., Nov. 11, 2012, *Lessons Learned from Hurricane Sandy* http://www.cospp.com/content/cospp/en/articles/2012/11/lessons-learned-from-hurricane-sandy.html

[6] Pew Charitable Trusts, *Industrial Efficiency Technology Kept the Lights on During Hurricane Sandy* (compendium of articles and key excerpts available online at http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Other_Resource/clen-Sandy_Breifing_Web_Dec2012.pdf).

[7] Oak Ridge National Laboratory (ORNL), Dec. 1, 2008, *Combined Heat and Power: Effective Energy Solutions for a Sustainable Future*, at 4 (http://www1.eere.energy.gov/industry/distributedenergy/pdfs/chp_report_12-08.pdf).

[8] *Id*

[9] Commercial and Industrial CHP Potential from ICF's "Effect of a 30 Percent Investment Tax Credit on the Economic Market Potential for Combined Heat and Power (USCHPA-WADE ITC Study), Table 3 and Table 4, on p. 11 and p. 12 respectively (http://www.uschpa.org/files/public/USCHPA%20WADE_ITC_Report_FINAL%20v4.pdf). "The estimates of CHP technical potential are based on thermally loaded CHP systems sized to serve on-site electrical demands at target facilities and do not include export capacity", so the potential would be even higher if that were factored in.

[10] U.S. EPA and U.S. DOE, Aug. 2012, "Combined Heat and Power: A Clean Energy Solution," at 13. (http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_clean_energy_solution.pdf).

Unfortunately, many manufacturers are not able to realize the competitiveness benefits of CHP and WHR because of existing utility policies that often discriminate against distributed generation and limit the ability of manufacturers to get their electricity into the markets. These obstacles recently chilled a proposed project at a large silicon manufacturer in West Virginia. The industrial facility had planned to capture hot gases from its silicon furnaces to generate more than 60 megawatts of electricity. The company planned to use the money saved on electricity to finance an additional silicon furnace and increase its workforce by 20 percent. The project was ultimately tabled, however, because West Virginia Alloy could not sell its excess power into the grid. Elsewhere, unreasonable standby rates and interconnection fees make CHP and WHR projects cost prohibitive. Congress should support policies that lower these barriers. For instance, last spring, Governor Kasich worked with the Ohio General Assembly to develop legislation (SB 315) that allowed CHP to count toward compliance with the state's energy efficiency standard and allows WHR count toward either the state energy efficiency or renewable standard. Such measures help overcome barriers to industrial efficiency and allow U.S. manufacturers to realize the full economic benefits of CHP and WHR.

The Administration also can stimulate demand for CHP and WHR by encouraging deployment of CHP and WHR systems in federal buildings and procuring it when Washington is purchasing electricity. As the largest electricity user in the country, the federal government can save taxpayers money, reduce pollution, drive markets for CHP and WHR, and serve as a model for the private sector. Congress should thus support policies that encourage federal deployment and procurement of CHP and WHR.

We believe CHP and WHR provide a scalable, cost-effective approach to increasing manufacturing competitiveness and enhancing electric reliability. We look forward to working with your Subcommittee and the full Energy and Commerce Committee to explore policy options to help realize the full potential of these technologies.

Sincerely,

David Gardiner
Executive Director
Alliance for Industrial Efficiency

Statement by the American Chemistry Council

U.S. House of Representatives Energy and Commerce Committee

Subcommittee on Energy and Power

"American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies"

February 26, 2013

The American Chemistry Council* welcomes the opportunity to comment on private-sector successes and opportunities in energy efficient technologies. The chemical industry plays a critical role in providing solutions that increase energy efficiency in buildings and pave the way towards the near-zero energy buildings of the future. Many effective chemical industry products – including a range of energy efficient plastics – are already available and in wide use today and new and better technologies are constantly being developed.

According to the International Energy Agency's Energy Technology Perspectives 2012 report, the building sector is directly or indirectly responsible for about 32% of global energy consumption and for 26% of global total end-use energy-related carbon dioxide (CO2) emissions. Huge amounts of energy – over 970 million tonnes of oil equivalent in 2009 - are required for space heating and space cooling in the global building stock due to heat gains and losses from building envelopes. The energy requirements and associated greenhouse gas (GHG) emissions are substantial in cold and hot climates alike. Overarching climate goals can only be reached with major contributions from the building sector.

The amount of residential and commercial building stock in Europe, Japan, and the U. S. is projected to increase from 59 billion square meters in 2000 to 93 billion square meters in 2050. With this growth in building stock, energy use for building heating, cooling, and water heating would increase by almost 60% and GHG emissions would rise from 3,400 million metric tonne carbon dioxide equivalent ($MtCO_2e$) in 2000 to 5,200 $MtCO_2e$ in 2050 if no improvements were made to the energy efficiency of new and existing buildings.

Improvements in new stock and gradual removal of older, less efficient stock are not enough to offset the growth in stock. Although tightened standards for new construction would hold the increase in GHG to 300 $MtCO_2e$ from 2000 to 2050, this is still a net increase of nearly 10% in building sector GHG emissions. In order to achieve net reductions in building energy use and associated GHG emissions while building stock increases, the energy efficiency of the large existing stock of residential and commercial buildings must also be improved. Combining better energy efficiency standards for new buildings with a moderate rate of renovation of 2000 building stock would result in a 12% decrease in energy and GHG by 2050, while tighter new building standards combined with a more ambitious renovation rate could result in a 23% reduction in energy use and GHG compared to 2000.

To better understand how the products of chemistry contribute to energy and GHG savings in residential and commercial construction, the International Council of Chemical Associations (ICCA) commissioned a Building Technology Roadmap (http://www.icca-chem.org). The report, released last November, focused on the potential savings from five chemically derived building technologies that are commercially available today: insulation, pipe and pipe insulation, air sealing, reflective roof coatings and pigments, and windows.

According to the ICCA report, energy-saving products installed in homes in the United States prevented nearly 283 million tons of CO_2 emissions in 2010—equivalent to the greenhouse gas emissions of 50 million passenger vehicles. Studies show that if this trend continues, more than seven billion tons of emissions can be avoided by 2050 in the United States alone—equivalent to the CO_2 emissions of more than 1.2 billion passenger vehicles.

Averaging at least 75 percent of the heat loss in households, single-family homes provide most of the potential for energy savings within the residential sector. In 2010, the cumulative energy savings from chemically derived building products in U.S. residential buildings was 46 times greater than the energy required to produce the products.

In 2050, the amount of GHG savings attributed to the value chain for chemically-derived building products (insulation, piping, air barriers and sealing materials, cool roof coatings and pigments) is based on their expected market shares by decade. By 2050, the GHG savings attributed to these products is 970 (MtCO2e) for the moderate renovation rate and over 1,100 MtCO2e for the ambitious renovation rate. Use of energy efficient plastic-frame windows adds another 300 to 370 MtCO2e of GHG savings, where the chemically derived content of the window assembly plays a major role for to the overall performance of the window.

Over time, the emission savings realized by the users of chemically derived building products are many times greater than the energy and GHG impacts for their production. The products continue to accrue use phase savings throughout their life in the building. By 2050, the cumulative net GHG savings (use phase savings minus production impacts) for the chemically-derived building products installed in the buildings from 2000 and 2050 could be 30,000 MtCO2e for Europe, Japan, and the U.S.2

The chemical industry has already made great strides in providing energy efficient solutions to the building sector, and continues to advance acceptance and use of energy efficient building products through efforts such as:

□ Participating in projects that demonstrate how low energy houses, passive houses and zero emission buildings are realistically achievable and cost effective over time for society and the individual investor alike;

□ Sponsoring life cycle assessment studies to provide credible, science-based data quantifying the net energy and GHG benefits over the full life cycle of chemically derived building technologies;

□ Continuing to invest in research and development of new and improved products that achieve higher levels of energy efficiency over longer lifetimes, leading to greater GHG savings;

□ Cooperating with the value chain □ from architects to craftsmen □ with the objective of ensuring proper use and installation of energy efficient building products.

In addition to the chemical industry's own activities, it is critically important that other stakeholders such as governments, policymakers, institutions, associations and buildings energy efficiency value chain also take actions needed to ensure that the full potential of energy saving building technologies are realized. These actions include:

□ Ensuring that the regulatory environment and building codes support inclusion and enhanced deployment of energy-efficient chemically-derived technologies;

□ Providing incentives needed to increase renovation rates and foster new technologies;

□ Utilizing international forums as a platform to harmonize building standards, exchange key information resources, and facilitate dialogue between policy makers, industry experts, and other stakeholders regarding energy efficient buildings;

□ Creating greater awareness of the economic and social benefits of high energy efficiency in buildings through collaborative efforts of governments, industry, institutions, and associations.

In conclusion, The ICCA Buildings Technology Roadmap report focuses on the chemical industry's contributions to energy and GHG savings in the buildings sector, including the benefits of high performance plastic foam insulation, plastic pipe and pipe insulation, reflective roofing, products and materials used to reduce energy loss due to air infiltration and heat loss, and chemically-derived components of energy-efficient windows. The objective of this report is to provide thorough, credible, scientifically based analyses that quantify the net benefits of the production and deployment of chemically derived building products. Industry and regulators can use this information to guide decisions and actions needed to achieve the substantial reductions in global warming impacts that are possible through greater use of chemically-based building products.

The Chemical Industry has an important, if not crucial, role to play in increasing energy efficiency in buildings and in helping to pave the way towards the near-zero energy buildings of the future, with many technical solutions that are already available or are in development.

*The American Chemistry Council (ACC) represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a $760 billion enterprise and a key element of the nation's economy. It is one of the nation's largest exporters, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.

The Heat is Power Association
2215 South York Road
Suite 202
Oak Brook, IL 60523

Statement of
The Heat is Power Association

House Committee on Energy and Commerce
Subcommittee on Energy and Power

A Hearing on American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies

February 26, 2013

The Heat is Power Association

The Heat is Power Association is the not-for-profit trade organization of the Waste Heat to Power (WHP) industry. The Association is committed to educating a variety of stakeholders about the benefits of WHP as a reliable, abundant, and emission-free source for electricity and an economic driver for global competitiveness. We support policies at the local, state, and federal levels that recognize WHP for its emission-free characteristics akin to renewables. Our members include WHP technology manufacturers, project developers, industrial end users, component manufacturers, packagers, research institutions, and other industry associations and stakeholders. A list of the association's membership is included as Attachment 1.

About Waste Heat Recovery and Waste Heat to Power

Waste heat recovery (WHR) is the capture of heat generated as a byproduct of industrial processes and the use of that waste heat for useful thermal applications or for WHP. Using heat that would otherwise be lost to the atmosphere helps reduce energy costs for industrial users.

A WHP system works by capturing waste heat at the source and converting it to electricity through heat transfer. No combustion. No emissions. Across America today, a vast amount of waste heat is being generated and lost. Oil and gas plants, compressor stations along pipelines, landfill gas engines, and energy intensive industries, including steel mills, paper plants, refineries, chemical plants, and cement kilns, generate massive quantities of industrial waste heat suitable for WHP applications.

The process used to convert industrial waste heat to power is identical to the process used to convert geothermal energy to electricity. Both processes use the same technologies and produce the same emission-free electricity as other renewable resources from a heat source. Whereas geothermal resources occur naturally in the ground in selected areas, waste heat occurs at sites across the country as a by-product of industrial processes. WHP can provide base load, emission-free power for use onsite to improve efficiency or it can be sold to the grid.

A recent Environmental Protection Agency (EPA) study[1] estimated that the waste heat produced by American industry could generate 10 GW of emission-free electricity annually, enough to power 10 million American homes, produce $3 billion in savings for industry, and create 160,000 new American jobs.

Technologies that Transform Waste Heat to Power

WHP encompasses a suite of technologies and applications that can improve industrial energy efficiency anywhere heat is vented or wasted, from energy intensive industries like those listed above to general manufacturing and pipeline compressor stations. Steam turbine technology has been used for WHP systems since the 1970's. More recently, technologies based on the Organic Rankine Cycle (ORC), Kalina Cycle, and the Sterling Engine, proven in the geothermal and solar thermal industries, are being used to capture waste heat at lower temperatures and at smaller scales than the more traditional steam cycles used in the power industry. Thermoelectrics, high-pressure CO_2 working fluids, and other new developments are creating additional opportunities for our industry to convert waste heat economically to electric power. Through the application of these technologies, industrial waste heat is no longer just a byproduct – it is a source for emission-free electricity, just like traditional renewables.

Waste Heat to Power Project Examples

The following three projects illustrate how waste heat to power can offer reliable, emission-free power, enhance efficiency and reliability, and improve US competitiveness.

North Lake Energy, LLC, East Chicago, Indiana, developed by Primary Energy for ArcelorMittal in 1996 & Upgraded in 2012

Primary Energy originally worked with ArcelorMittal to identify an opportunity to more efficiently utilize byproduct fuel from ArcelorMittal's principle blast furnace (No. 7), and use it to produce up to 75 MW of emission-free electricity. Project highlights:

- Built and owned by Primary Energy
- Steam delivered by ArcelorMittal from their existing blast furnace gas recovery boilers
- Increased reliability of the electric energy supply for ArcelorMittal's plant operations
- Substantially reduced energy costs compared to purchased power alternatives
- Supplies more than 20% of ArcelorMittal's electricity requirements
- Uses an onsite byproduct fuel that had principally been flared as waste heat
- Recognized by the EPA in 2007 for high environmental efficiency

In 2009 ArcelorMittal won an industrial energy efficiency grant with the Department of Energy to add an additional boiler to reduce flared byproduct gases from 22% to 5%. The new ArcelorMittal boiler was commissioned in 2012 and the North Lake project was upgraded to 90 MW of emission-free electricity. The project produces 215,000 fewer tons of carbon dioxide when compared to other plants using separate heat and power sources.

Gas Compression Facility, Edna, TX, developed by Gulf Coast Green Energy using ElectraTherm's Green Machine in 2010

Gulf Coast Green Energy teamed with a natural gas compression services company, a South

[1] EPA Waste Heat to Power Systems Paper: http://www.epa.gov/chp/documents/waste_heat_power.pdf

Texas natural gas field, and ElectraTherm to recover waste heat from an existing gas compressor engine. This was the first commercial stationary engine application in the US of the Green Machine, a modular, waste heat to power device that generates fuel-free, emission-free electricity utilizing Organic Rankine Cycle (ORC) and proprietary technologies. Project highlights:

- Generates emission-free electricity for use onsite from waste heat generated by GE Waukesha 5794 engine
- Provides a local source of power for oil production equipment
- Reduces the existing plant's retail electric purchases
- Increases engine efficiency by decreasing cooling requirements for the engine; the waste heat removed by the Green Machine to produce power increases the engine cooling capacity, allowing the compressor to operate at greater output during the high summer temperatures of West Texas
- Produces 25–35 kWe emission-free and fuel free electricity; similar projects can be up to 65 kW depending on engine size, waste heat capture scheme, and ambient conditions

Nucor Steel agreement with Seattle City Light to turn waste heat into power, anticipated online in 2014

Seattle City Light entered into an innovative energy conservation contract with Nucor Steel, its largest customer, to turn Nucor's waste heat from manufacturing processes into energy. Project highlights:

- First waste heat recovery project to get credit as an energy conservation measure under the state of Washington Energy Independence Act (I-937), a 2006 clean energy ballot initiative which requires utilities with more than 25,000 customers to acquire 15% of their energy needs through new renewable energy sources by the year 2020 and achieve all available cost effective energy conservation measures
- Will produce a maximum of 5,450 MWh per year
- Projected to save enough energy to heat 540 Seattle homes for a year
- Utility will provide financial support of $0.02 per kWh over the 12-year life of project, comparable to current wholesale power price during a historically low period
- Using waste heat recovery means carbon-free clean energy

While all three projects above are in the US developed by domestic companies, many US WHP companies are doing most of their business in Europe and Asia. This is because the legislative and regulatory environment for WHP in the US often does not promote this type of industrial energy efficiency, making it difficult for US manufacturers to implement it at their sites.

US Incentives for Other Energy Efficiency and Renewable Technologies, including CHP, Solar and Wind

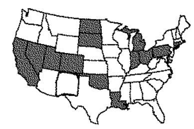
Combined Heat and Power (CHP), another type of energy efficiency technology, benefits from various incentives and has a clear track record in the US for producing energy efficient power and improving industrial energy efficiency. Although some waste heat recovery applications are considered a type of CHP, many WHP applications are not, as they do not involve the simultaneous generation of heat and electricity from a single fuel source. This distinction is important because it precludes WHP from receiving the same tax treatment as CHP.

Likewise, renewable resources that produce emission-free electricity are eligible for federal investment and production tax credits and other incentives to compete in the marketplace. Although the power produced from waste heat resources is the same as the power produced from renewable resources—both are emission-free and do not require additional combustion—WHP does not enjoy comparable incentives.

Government and regulatory support for renewable forms of emission-free electricity such as wind and solar has diverted investment away from WHP. Since the 2006 inclusion of an investment tax credit for solar power in the US tax code, annual solar installation has grow by over 1,600 percent, a compound annual growth rate of 76 percent[2]. Given similar tax treatment, industrial waste heat could provide enough emission-free electricity to power 10 million American homes, provide hundreds of thousands of new American jobs, and support critical US manufacturing industries. And Americans want more waste heat to power. A 2010 poll conducted by FTI Consulting found that an overwhelming majority (70%) of Americans support a proposal to provide tax credits for installing waste heat capture technology.

State Support of Waste Heat to Power

Currently, fourteen states—CA, CO, CT, IL, IN, LA, MI, NV, ND, OH, OK, SD, UT, and WV—provide incentives for WHP in their Renewable Portfolio Standard (RPS) or Energy Efficiency Resource Standard (EERS)[3]. WHP needs these incentives to compete in the marketplace with traditional resources such as low-priced coal and natural gas, and subsidized renewables which, like WHP, generate emission-free electricity.



States with policies favorable for WHP

The National Association of Regulatory Utility Commissioners (NARUC) has also recognized the many benefits of WHP. At its 2013 Winter Meeting in Washington, state regulators enacted a resolution supporting inclusion of WHP technologies in state and federal clean energy policies and programs (Attachment 2). NARUC support of WHP and encouragement of more states to follow suit is a clear indication of the power of WHP to contribute to overall improvements in industrial energy efficiency.

Recommendations to Help Establish Waste Heat to Power in the US Marketplace

There are a number of ways the federal government could help improve the legislative and regulatory

[2] Solar Energy Industries Association: http://www.seia.org/policy/finance-tax/solar-investment-tax-credit

[3] A review of the 14 state programs that include waste heat in their RPS or EERS refer to it as waste heat recovery, waste energy recovery, recycled energy, industrial cogeneration, bottoming cycle CHP, a qualified energy recovery process, waste gas and waste heat capture, a resource that makes efficient use of waste heat, and industrial by-product technologies.

climate for WHP projects.

Offer the investment or production tax credit for WHP. Currently, WHP does not qualify for any investment or production tax credit (ITC/PTC) under sections 45 or 48 of the US Tax Code (whereas traditional CHP does). A 30% ITC, as is available to other emission-free renewable resources, would encourage WHP development and help move the US toward our clean energy and industrial efficiency goals.

Make master limited partnerships (MLP) available to WHP. Currently, master limited partnerships do not include WHP. Proposed legislation would expand MLPs to include certain technologies in Sections 45 or 48 of the US tax code. Since WHP is not currently in section 45 or 48, however, it would not qualify under the proposed MLP legislation as introduced to the 112th Congress. Allowing WHP and other distributed generation resources to take advantage of MLP structures would enhance the attractiveness of WHP for investors and industrial waste heat producers. Qualifying WHP under the ITC or PTC could be another avenue to allow WHP to take advantage of MLP legislation under consideration.

Explicitly require or incent WHP in federal legislation, including any federal Clean Energy Standard or Renewable Electricity Standard. A number of states provide incentives for WHP in their RPS and EERS, and equate WHP with renewables given that WHP produces emission-free electricity. WHP could be included in federal portfolio standards, grants, energy loans, or other energy programs, as well. Ohio SB 315 is a good model for including WHP in RPS legislation.

Recognize WHP's potential in industrial energy efficiency. The President's Executive Order Accelerating Investment in Industrial Energy Efficiency (August 30, 2012) calls for deploying 40 GW of new, cost-effective industrial CHP by 2020. A similar target for WHP would encourage additional industrial energy efficiency by a group of technologies that, although related to CHP, do not typically qualify as CHP in legislation and regulations. DOE and EPA should specifically emphasize WHP applications in their programs, as well. The agencies call WHP a type of CHP, but as noted above, since WHP does not receive any of the regulatory incentives or benefits of CHP, it is not treated like CHP in the marketplace. Its potential contribution to industrial energy efficiency is therefore often overlooked.

Fund the Waste Heat Registry. The Energy Independence and Security Act of 2007 (EISA) included a requirement for the EPA to develop a Waste Heat Registry that would help industrials and technology providers identify opportunities for potential projects. This provision received no funding, however, and EPA abandoned the initiative. The waste heat registry remains a very important potential resource to help develop the WHP industry.

Include WHP in RFPs for alternative, clean or emission-free energy, particularly in DOD programs. In 2012, the US Army, acting through its Engineering & Support Center in Huntsville, Alabama, issued an RFP for renewable energy vendor qualifications. The RFP solicited vendor qualifications for procurement of up to $7 billion in renewable and alternative energy supplies under long-term power sale arrangements. The solicitation included alternative energy, but WHP did not qualify. While the federal government may not control many industrial facilities, it nevertheless does have some waste heat producing operations that could be used to generate emission-free electricity.

Address borriers to entry for WHP technologies and projects. The FERC should promote markets for WHP by eliminating unfair and unwarranted costs and delays associated with interconnection, standby power, and access to the grid.

America's Responsible Energy Future includes WHP

WHP could provide the energy equivalent of over 60,000,000 barrels of oil annually. We cannot continue to ignore this ready, proven, reliable, and emission-free resource that supports American jobs, key industries, and the environment. As policymakers debate our energy future, we urge you to make WHP an integral component of industrial efficiency policy and a comprehensive energy strategy.

The Heat is Power Association appreciates this opportunity to offer its views and looks forward to working with Congress, the Administration, and the states to improve industrial efficiency and American competitiveness.

To learn more about WHP and The Heat is Power Association, visit heatispower.org or email susan@heatispower.org.

Members 2013

ERE-1 Resolution Supporting the Inclusion of Waste-Heat-to-Power Technologies in State and Federal Clean Euergy Policies and Programs

Sponsored by the Committee on Energy Resources & the Environment
Adopted by the NARUC Board of Directors February 6, 2013

WHEREAS, Waste-Heat-to-Power is the process of capturing heat discarded by an existing energy conversion process and using that heat to generate power; and

WHEREAS, Waste-Heat-to-Power generates power with no new fuel and without combustion or related emissions; and

WHEREAS, Energy-intensive industrial processes – such as those occurring at refineries, steel mills, glass furnaces, pipeline pump and compressor stations, and cement kilns – all release hot exhaust gases and waste streams that can be harnessed with well-established technologies to generate electricity; and

WHEREAS, Opportunities exist for cost-effective applications of Waste-Heat-to-Power technologies in commercial and institutional energy systems; and

WHEREAS, The recovery of industrial waste heat for power is a largely untapped type of Combined Heat and Power (CHP), which is the use of a single fuel source to generate both thermal energy (heating or cooling) and electricity; and

WHEREAS, Waste-Heat-to-Power is a form of distributed generation that provides environmental and economic benefits; and

WHEREAS, Waste-Heat-to-Power is similar to CHP in that it can help industrial energy consumers to use most efficiently fuels consumed onsite to deliver energy; and

WHEREAS, On August 30, 2012, President Obama signed an Executive Order to accelerate investments in industrial energy efficiency, calling for 40 GW of new Energy Efficiency and CHP by 2020, including Waste Heat to Power; and

WHEREAS, In support of the Executive Order, the Department of Energy (DOE) and Environmental Protection Agency (EPA) released a new report: Combined-Heat-and-Power: a Clean Energy Solution that provides a foundation for national discussions on effective ways to achieve 40 GW of new, cost-effective CHP, including Waste-Heat-to-Power, by 2020; and

WHEREAS, Accelerating investment in industrial energy efficiency in an efficient and costeffective manner benefits manufacturers, utilities, and consumers and can improve American manufacturing competitiveness and create jobs while improving the nation's energy system and reducing harmful emissions; and

WHEREAS, Waste-Heat-to-Power has been omitted from some clean energy policies, including the federal investment tax credit, many State renewable and clean energy portfolio standards, energy efficiency resource standards, and various utility rebate programs and investments; and

WHEREAS, Fourteen States have recognized Waste-Heat-to-Power technology for inclusion in their State renewable and clean energy portfolio standards and/or energy efficiency resource standards; now, therefore be it

RESOLVED, That the Board of Directors of the National Association of Regulatory Utility Commissioners convened at its 2013 Winter Committee Meetings in Washington, D.C., is committed to working with the Waste-Heat-to-Power, Combined-Heat-and-Power, utilities and the broader energy efficiency community to help ensure that Waste-Heat-to-Power technologies are included in discussions on energy efficiency, distributed generation and clean energy technologies and are considered in the development of policies to allow for the more rapid adoption of waste heat-to-energy technologies, including explicit eligibility of Waste-Heat-To-Power in State energy efficiency resource standards and for consideration in State renewable and clean energy portfolio standards.

Sponsored by the Committee on Energy Resources & the Environment
Adopted by the NARUC Board of Directors February 6, 2013

Department of Energy
Washington, DC 20585

June 10, 2013

The Honorable Ed Whitfield
Chairman
Subcommittee on Energy and Power
Committee on Energy and Commerce
U. S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

On February 26, 2013, Dr. Kathleen Hogan, Deputy Assistant Secretary for Energy Efficiency, Office of Energy Efficiency and Renewable Energy, testified regarding "American Energy Security and Innovation: An Assessment of Private-Sector Successes and Opportunities in Energy Efficient Technologies."

Enclosed are the answers to 13 questions that were submitted by Representatives Michael C. Burgess, Bill Cassidy, Peter Welch and you to complete the hearing record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, at (202) 586-2031.

Sincerely,

Christopher E. Davis
Deputy Assistant Secretary
for Congressional Affairs
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Bobby L. Rush, Ranking Member

QUESTION FROM CHAIRMAN WHITFIELD

Q1. Late last year, the Pay-TV and consumer electronics industries came together and agreed upon a voluntary Energy Conservation Agreement ("Pay-TV Agreement"). The agreement will result in the deployment of more energy efficient set-top boxes. The Pay-TV Agreement is already bringing tangible energy efficiency gains and promises significantly more.

a. Does the Department plan to move forward with its own proposed set-top box rulemaking, despite the execution of the Pay-TV Agreement? If so, when would the Department's rule go into effect and when would energy efficiency gains begin to be realized?

A1a. At this time, DOE has taken an initial step in moving forward with its regulatory rulemaking activities to develop an energy conservation standard for set-top boxes. DOE issued an initial Notice of data availability (NODA) analysis on February 28, 2013, that presents DOE's initial analysis estimating the potential economic impacts and energy savings that could result from promulgating a regulatory energy conservation standard for set-top boxes. DOE has not yet proposed an energy conservation standard for set-top boxes. Any proposal would be made through a public notice and comment process and a final rule would follow. Absent a consensus agreement, compliance with a DOE promulgated standard would be approximately five years after the publication of the final rule. Energy efficiency gains would begin to be realized at this point.

b. Why has the Department been reluctant to follow the Administration's preference for voluntary/market solutions that are already delivering savings?

A1b. The Department encourages the development of market-based solutions that are a result of a consensus from all relevant parties and has recently finalized several rules through consensus agreements. In the case of set-top boxes, DOE had a rulemaking in process, which it suspended for a six-month period in 2012 following a request from Pay-TV, consumer electronics industries, and energy efficiency advocates to provide these stakeholders time to negotiate a voluntary agreement. The Department is now proceeding with the rulemaking, with DOE issuing an initial Notice of data availability (NODA) analysis on February 28, 2013, that presents DOE's initial analysis estimating the potential economic impacts and energy savings that could result from promulgating a regulatory energy conservation standard for set-top boxes. DOE has not yet proposed an energy conservation standard for set-top boxes, and any future proposed standard would not be binding on products for approximately five years after the publication of the final rule, in addition to the time that would be required to complete the rulemaking process. DOE welcomes the voluntary agreement industry has developed, but also notes that it is with a subset of the participants originally involved in the negotiation.

DOE has an obligation to ensure that standards maximize the economically justified, technically feasible energy savings potential identified by a thorough analysis and as part of a notice and comment rulemaking. However, DOE recognizes that there are multiple paths forward to ensure that the maximum economic benefits and energy savings from increasing the efficiency of set-top boxes are achieved, and DOE strongly encourages and will consider any non-regulatory consensus agreement as an alternative to a regulatory standard.

c. What steps does the Department intend to take to work cooperatively with the signatories to the Pay-TV Agreement to develop energy efficiency savings and promote innovation outside of rulemaking proceedings?

A1c. The Department of Energy (DOE) intends to work cooperatively with Pay-TV and the consumer electronics industries to improve the efficiency of set-top boxes. DOE has already taken several steps to work with industry representatives to develop energy efficiency savings and promote innovation outside of the rulemaking process. DOE suspended its rulemaking activities for a six-month period in 2012 to allow stakeholders, including Pay-TV, the consumer electronics industry, and energy efficiency advocates, time to attempt to negotiate a non-regulatory agreement to be considered in lieu of a rulemaking. The parties negotiating did not reach an agreement during that period. On February 28, 2013, DOE released a notice of data availability so that stakeholders could access and review DOE's assessment of cost and benefits of efficient set-top boxes.

DOE encourages stakeholders, including signatories to the Pay-TV Agreement, to provide any relevant information and input to inform DOE's regulatory activities for these products. DOE has, and will continue to meet with Pay-TV and the consumer electronics industry to ensure that we are collectively providing U.S. consumers with energy-efficient products with energy use information developed using a standardized Federal testing protocol.

DOE also encourages these entities to participate in the recently formed Federal Advisory Committee for Appliance Standards (ASRAC), which is a transparent, open process to advise DOE on future regulatory activities.

QUESTION FROM CHAIRMAN WHITFIELD

Q2. Energy Savings Performance Contracts (ESPCs) have been available to federal agencies for over 20 years but have been underutilized.

a. What barriers at the federal level are preventing or deterring greater utilization of ESPCs by federal agencies?

A2a. Through ESPCs, Federal agencies can complete energy savings projects and meet energy and water savings goals without up-front capital costs paid from direct appropriations. From FY 1998 to FY 2013, DOE's Federal Energy Management Program facilitated $2.7 billion of private-sector efficiency investments in Federal Government facilities through the use of DOE IDIQ performance-based contracts, which will result in guaranteed energy cost savings of approximately $7.2 billion over the life of the energy-saving measures, without any up-front investments from the American taxpayer. To increase uptake of this valuable performance contracting methodology for investing in energy efficiency, the Presidential Performance Contracting Challenge directed the Federal government to enter into a minimum of $2 billion in performance-based contracting by December 2013. As of April 2013, 313 projects worth $2.2 billion in energy upgrade projects have been identified and more than $560 million in projects have already been awarded. The Federal government views the end date to this Challenge as a marker in a sustained effort to use performance contracts at Federal agencies. This Challenge has helped reinvigorate use of ESPCs and UESCs throughout the government, and we anticipate they will be increasingly utilized into the future, particularly given the fiscal climate and the continued need for efficiency investments in Federal buildings. Efforts around contract and project standardization, training, process simplification, project facilitation, and the establishment of goals are all key ingredients to helping ESPCs become "business as usual" in the Federal government, creating momentum for further projects.

Despite the benefits of using ESPCs, increasing the utilization of this contracting mechanism has faced some barriers. One of the most significant is the fact that this type of contracting process is different from what most Federal agencies are used to performing and requires contracting officers well-trained in performing and managing these types of contracts. Thus, agencies have had trouble implementing these types of contracts due to a lack of institutional expertise, and need significant outside assistance.

b. Are there other areas, such as in the federal vehicle fleet, where innovative uses of ESPCs can be used to promote cost savings to the federal government, as well as the use of alternative fuels?

A2b. Currently, the statutory authority limits the use of ESPCs to improvements applied to Federal buildings that are owned by the government. The Federal government has studied the potential use of ESPCs in the Federal fleet environment, but has not identified specific approaches.

QUESTION FROM CHAIRMAN WHITFIELD

Q3. In 2011, President Obama directed federal agencies to enter into $2 billion worth of Energy Savings Performance Contracts (ESPCs).

a. What is the current status of the President's ESPC initiative?

A3a. As you note, the White House issued a memorandum to the heads of executive departments and agencies committing the Federal Government to enter into a minimum combined $2 billion in performance contracts by the end of 2013. As of April 2013, agencies have identified 313 potential projects with an estimated $2.2 billion investment value. This current pipeline of projects is proceeding at pace to be completed on time: 64 projects already have been awarded with an investment value of more than $560 million; and 249 projects are in the development pipeline, with expectations of being awarded. An additional 40 projects are in earlier stages of development. The Federal government views the end date to this Challenge as a marker in a sustained effort to use performance contracts at Federal agencies. This Challenge has helped reinvigorate use of ESPCs and UESCs throughout the government, and we anticipate they will be increasingly utilized into the future, particularly given the fiscal climate and the continued need for efficiency investments in Federal buildings.

b. What is the biggest barrier to achieving the President's $2 billion goal?

A3b. As you note, the White House issued a memorandum to the heads of executive departments and agencies committing the Federal Government to enter into a minimum combined $2 billion in performance contracts by the end of 2013. The agencies have already made significant progress identifying 313 potential projects with an estimated $2.2 billion investment value. This current pipeline of projects is proceeding at pace to be completed on time: 64 projects already have been awarded with an investment value of more than $560 million; and 249 projects are in the development pipeline, with expectations of being awarded. An additional 40 projects are in earlier stages of development. The Federal government views the end date to this Challenge as a marker in a sustained effort to use performance contracts at Federal agencies. This Challenge has helped reinvigorate use of ESPCs and UESCs throughout the government, and we anticipate they will be increasingly used into the future, particularly given the fiscal climate and the continued need for efficiency investments in federal buildings.

One of the most significant barriers to use of ESPCs is the fact that this type of contracting process is different from what most Federal agencies are used to performing and requires contracting officers well-trained in performing and managing these types of contracts. Thus, agencies have had trouble implementing these types of contracts due to a lack of institutional expertise, and need significant outside assistance. The Presidential Performance Contracting Challenge and associated efforts around contract and project standardization, training, process simplification, project facilitation, and the establishment of goals are all key ingredients to helping ESPCs become "business as usual" in the Federal government, creating momentum for further projects.

QUESTION FROM CHAIRMAN WHITFIELD

Q4. Dr. Hogan testified during the hearing that the Department serves in a technical capacity during the development of the building energy codes.

a. Please describe this involvement in greater detail.

A4a. The Department seeks to advance energy efficiency in the International Energy Conservation Code (IECC) and Standard 90.1 by strengthening the code where cost-effective, and improving the criteria to be more easily understood, applied, implemented, and enforced. DOE participates in the IECC development process by developing code change proposals for submission to the International Code Council (ICC). Prior to submitting code change proposals to the ICC, DOE publishes draft code change proposals that it has developed, along with documentation of concepts, for public review and comment. DOE also contributes to the development of ANSI/ASHRAE/IES Standard 90.1 by participating in committee meetings, as well as providing technical and analytical support to the committee. For both the IECC and Standard 90.1, DOE conducts necessary technical analyses to document the validity of DOE code change proposals.

In developing concepts for submission to the ICC, DOE conducts a series of analyses to evaluate energy savings and economic impacts of potential code change proposals. DOE recently updated its cost-effectiveness methodology based on feedback gathered during a public input process (September 2011 RFI: http://www.gpo.gov/fdsys/pkg/FR-2011-09-13/html/2011-23236.htm). The DOE methodology and resulting analysis is available for reference and use by outside parties. In developing code change proposals for the IECC, DOE references all analysis and supporting documentation as required by the ICC. Analysis performed by DOE should be considered on a technical basis, and does not represent an endorsement of any particular individual or organization. DOE publishes the results of its analysis, along with supporting energy simulation models, for review and use by outside parties. Proposals submitted by DOE for the 2015 IECC, as well as any accompanying analysis, can be accessed at https://www.energycodes.gov/development.

b. Does the Department participate in advocacy during building code development, either in support of or in opposition to, changes or updates? If yes, please provide examples of such advocacy.

A4b. The Energy Conservation and Production Act, as amended, requires DOE to participate in the development of the International Energy Conservation Code (IECC) for residential buildings and Standard 90.1 for commercial buildings. The development process for each respective code is as defined and administered by the International Code Council (ICC) and the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE). As part of these development processes, DOE evaluates specific energy saving measures, and proposes code changes targeting reduced overall building energy consumption or increased code compliance. DOE participation in code development processes may include drafting proposed code language, gathering public input on changes proposed by DOE, or conducting technical analysis to inform and support proposed changes. DOE may also present and/or testify on behalf of DOE-proposed code changes, or proposals submitted by others relative to DOE-proposed changes.

When the model code is updated (i.e., publication of the IECC or Standard 90.1), DOE performs a *Determination of Energy Savings* (http://www.energycodes.gov/regulations/determinations). In the event of an affirmative

DOE determination, states are required to review the updated code version. DOE also provides assistance in the form of technical analysis, informational resources, and tools intended to help states and local enforcement jurisdictions in adopting and complying with updated codes.

QUESTION FROM REPRESENTATIVE BURGESS

Q1. You mentioned during your testimony that DOE has had numerous discussions with the Commodity Futures Trading Commission (CFTC) regarding rising gas prices. What collaborative efforts have DOE and the CFTC identified to address rising gas prices?

A1. The Department of Energy is sensitive to the impact high gas prices can have on families and businesses. DOE has not directly collaborated with the Commodity Futures Trading Commission as part of its efforts to address rising gas prices. However, as Dr. Hogan's testimony indicated, the Department, through its existing authorities, is working in conjunction with other Federal agencies across the government, including the Departments of Transportation, Agriculture, Interior, and Defense and the National Science Foundation to address high gas prices and reduce the amount of money families spend at the pump every year.

QUESTION FROM REPRESENTATIVE BURGESS

Q2. Which offices within DOE are working with the CFTC to address rising gas prices?

A2. Dr. Hogan's testimony indicated that EERE engages in conversations across the Federal government regarding short- and long-term solutions to high gasoline prices. While EERE has significant collaboration across the Federal government to reduce gasoline consumption, it is not directly working with the Commodity Futures Trading Commission. EERE's cross-government coordination efforts in this area include state and local governments in addition to other Federal agencies.

QUESTION FROM REPRESENTATIVE BURGESS

Q3. What effect does DOE expect any collaborative efforts with the CFTC will have regarding gas prices?

A3. Dr. Hogan's testimony indicated that EERE engages in conversations across the Federal government regarding short- and long-term solutions to high gasoline prices. While EERE has significant collaboration across the Federal government to reduce gasoline consumption, it is not directly working with the Commodity Futures Trading Commission. EERE's cross-government coordination efforts in this area include state and local governments in addition to other Federal agencies.

QUESTION FROM REPRESENTATIVE BURGESS

Q4. Has DOE provided any specific recommendations to the Architect of the Capitol (AOC) for ways the Congressional office buildings can reduce their energy consumption that the AOC was not already considering?

A4. The Department of Energy (DOE) through the Federal Energy Management Program (FEMP) has provided technical assistance as well as access to financing resources to facilitate and expedite the implementation of energy-saving projects for the Architect of the Capitol (AOC). FEMP also provides these services to all of the Federal agencies.

FEMP has worked with the AOC's Office of Sustainability to provide its engineers with technical assistance on an array of energy modeling tools and software to help them select the best energy analysis tool for their facilities. The technical assistance has helped the AOC perform their own energy use analyses rather than relying on outside vendors, allowing them to manage the energy use of the Capitol Complex more effectively and at lower costs.

The AOC has also worked with the Department to implement energy saving performance contracts (ESPCs) to make significant energy-saving improvements in several of its buildings at no additional cost to the taxpayer.

The latest public energy report from the AOC can be found here.

http://www.aoc.gov/sites/default/files/AOC_EnergyReport_FULL_2011_FINAL_508_091712.pdf

QUESTION FROM REPRESENTATIVE BURGESS

Q5. Has DOE provided guidance to all agencies and federal buildings regarding how to reduce energy consumption?

a. What is the status of implementation of any such recommendations?

A5a. DOE has published all guidance required under Section 432 of the Energy Independence and Security Act of 2007 (EISA), which prescribes a framework for facility energy and water management and benchmarking for Federal agencies. The statute includes the following requirements for Federal agencies:

- Designate covered facilities and assign facility energy managers for ensuring compliance of covered facilities subject to the requirements;
- Conduct comprehensive energy and water evaluations;
- Implement identified efficiency measures;
- Follow up on implemented efficiency measures;
- Report to DOE on covered facilities' energy use, evaluations, projects, follow-up, and analysis; and
- Benchmark metered buildings that are, or are part of, covered facilities.

DOE has published the following guidance pertaining to these requirements:

- *Facility Energy Management Guidelines and Criteria for Energy and Water Evaluations in Covered Facilities* (http://www1.eere.energy.gov/femp/pdfs/eisa_s432_guidelines.pdf: This document contains guidelines and criteria for meeting requirements within Section 432 of EISA, including defining facilities covered by the provision, designating facility energy managers to ensure compliance, and conducting comprehensive energy and water evaluations.

- *Guidance for the Implementation and Follow-up of Identified Energy and Water Efficiency Measures in Covered Facilities* (http://www1.eere.energy.gov/femp/pdfs/eisa_project_guidance.pdf): This guidance pertains to the implementation and follow-up of energy and water efficiency measures identified and undertaken in Federal facilities. This guidance also provides context for how these activities fit into the comprehensive approach to facility resource (energy and water) management outlined by the statute and incorporates by reference previous DOE guidance released for Section 432 of EISA and other related documents.
- *Building Energy Use Benchmarking Guidance* (http://www1.eere.energy.gov/femp/pdfs/eisa432_guidance.pdf): This document contains guidance for benchmarking of federal facilities recommending the use of Energy Star Portfolio Manager benchmarking tool.

To date, Federal agencies have reported evaluating 73 percent of their covered facilities and identified potential energy and water efficiency measures totaling $9.5 billion in potential investment.

b. Has DOE identified any recommendations for reducing energy consumption that were not identified by private energy audits of federal buildings?

A5b. Most federal buildings have not undergone private energy audits. DOE's guidance under Section 432 of the Energy Independence and Security Act of 2007 (EISA) provides agencies recommendations on how to perform energy audits to identify all cost-effective energy and water saving opportunities. In addition to guidance required under Section 432 of EISA for use of energy and water efficiency measures in federal buildings, DOE has issued the following guidance related to operations and maintenance best practices:

- *Operations & Maintenance Best Practices, A Guide to Achieving Operational Efficiency*

  http://www1.eere.energy.gov/femp/pdfs/omguide_complete.pdf: The guide highlights O&M energy efficiency programs that could save 5 percent to 20 percent on energy bills without a significant capital investment.

- *Commissioning for Federal Facilities*

  http://www1.eere.energy.gov/femp/pdfs/commissioning_fed_facilities.pdf: This is a practical guide to building commissioning, recommissioning, retrocommissioning, and continuous commissioning.

- *Metering Best Practices: A Guide to Achieving Utility Resource Efficiency*

  http://www1.eere.energy.gov/femp/pdfs/mbpg.pdf: The guide features information about energy and resource metering at federal facilities, including metering requirements under the Energy Policy Act of 2005.

QUESTION FROM REPRESENTATIVE CASSIDY

Q1. In our dialogue you claimed the availability of energy efficient mortgages and cited the problem in a lack of awareness among potential consumers about such mortgages. Can the Department please provide information about the availability and accessibility of such mortgages for home builders?

A1. The Department of Energy does not administer or manage this type of loan, but information is available through the Housing and Urban Development Department's Federal Housing Administration. Please see: http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/sfh/eem/eemhome.

QUESTION FROM REPRESENTATIVE CASSIDY

Q2. In our dialogue you stated that there is conversation ongoing through the codes organizations on how to have a performance-based path get to an outcome in a least-cost way. You also mentioned that the DOE is not part of the code-making but instead participates in energy-savings determinations relative to the code. However, DOE does participate in the development of energy codes, provides code change proposals and seeks to advance energy efficiency by advocating for more stringent energy codes. Additionally, ECPA and subsequent energy bills have authorized the Department of Energy to provide technical assistance and incentive funding to the states to update their state building energy codes. Can you please identify the statutory authority for this action? If the language in the ECPA is interpreted to allow for this, please explain that justification.

Furthermore, in the 2012 version of the IECC, it specifies the use of foam insulation over structural wood panels in certain climate zones. Does DOE plan to support the elimination of such product specific mandates in the 2015 version of the IECC?

A2. The statutory authority for DOE participation in energy code development is identified in Section 307 of the Energy Conservation and Production Act (ECPA), as amended (42 U.S.C. 6836). This section mandates that DOE shall support the upgrading of voluntary building energy codes for residential and commercial buildings, providing assistance to improve the technical basis for codes and determining cost-effectiveness and feasibility. It also directs DOE to review the technical and economic basis for voluntary energy codes and participate in the industry process for review and modification.

Statutory authority for state technical assistance and incentive funding is established in Section 304 of ECPA, as amended (42 U.S.C. 6833). This section directs DOE to provide the technical assistance necessary for states to implement the requirements related to updating residential and commercial building energy codes and authorizes incentive funding to states to be used to update building energy codes, and to implement the updated codes.

Further information about DOE's statutory authority regarding building energy codes can be accessed at https://www.energycodes.gov/about/statutory-requirements.

With regard to product specification within the 2012 IECC, DOE believes that the prescriptive wall insulation requirements achieve reasonable efficiency improvements in residential buildings, while maintaining neutrality with respect to construction materials. The presence of continuous insulation does not necessitate an exclusion of wood products. The code allows for flexibility in choice of wall assembly designs, some of which allow for the use of wood products to reduce or eliminate thermal bridging effects. Beyond prescriptive requirements, the IECC also contains multiple performance-based compliance options. These options are available at the discretion of the builder, and have not changed in recent code editions.

QUESTION FROM REPRESENTATIVE CASSIDY

Q3. Studies have shown that energy savings in the 2012 IECC is roughly 30 to 40% more efficient than the 2006 IECC. At this point the stringency of the code has reached the point of diminishing returns on the building envelope and in many cases high efficiency equipment is the most cost-effective means to save energy. I understand that the Department of Energy has reviewed the concept of reinstating equipment trade-offs toward code compliance, but ultimately decided *not* to support this proposal for the 2015 IECC proposal. Can you indicate how this decision was evaluated?

A3. DOE evaluated several concepts for potential submission to the 2015 International Energy Conservation Code (IECC), and ultimately did not submit a proposal targeting the reinstatement of equipment tradeoffs. The allowance for energy to be traded between residential building envelope and mechanical systems is a concept that previously existed in the code, but was removed by the IECC governing body following the 2006 IECC. DOE understands that, while some IECC members remain in favor of the equipment tradeoff, others support different methods of achieving whole-building energy savings. In developing proposals for the 2015 IECC, DOE solicited public comments on draft code changes. Stakeholder feedback yielded a mix of support and opposition surrounding a reinstatement of equipment tradeoffs within the IECC.

In addition, other organizations have submitted proposals targeting whole-building energy savings and performance-based alternative compliance paths. Some of these proposals target the use of the Residential Energy Services Network (RESNET) Home Energy Rating System (HERS). Proposals have also been submitted based on modified versions of the former equipment tradeoff mechanism. The International Code Council recently published a monograph containing all submitted code change proposals for the 2015 IECC (http://www.iccsafe.org/cs/codes/Pages/12-14-Proposed-Group-B.aspx). All of these proposals are considered for adoption into the 2015 IECC. The DOE-submitted proposals for the 2015 IECC, including related analyses and public comments received, are available at https://www.energycodes.gov/development/residential/2015IECC.

QUESTION FROM REPRESENTATIVE WELCH

Q1. Dr. Hogan, in the President's "Plan for a Strong Middle Class and a Strong Economy", the President calls for a doubling of U.S. energy productivity by 2030 (similar to the Alliance to Save Energy's Commission on National Energy Efficiency Policy). Dr. Hogan, could you please discuss how the Administration proposes to achieve this goal?

A1. The Department is prepared to support the achievement of the President's goal to double U.S. energy productivity by 2030. Since energy is essential for every aspect of our economy, including conventional and alternative sources of energy for transportation, homes, and businesses, improving energy productivity has the potential to make our economy stronger and more competitive.

Recent reports[1] have demonstrated that using only currently available technologies, the potential for energy use reduction could be sufficient to achieve the goal. Emerging technologies in the buildings, advanced manufacturing, and transportation sectors have the potential to raise savings beyond the improvement needed to double energy productivity. Many DOE activities strive to take advantage of these opportunities and contribute to the Administration's energy productivity goal. Energy efficiency technology research and development, appliance and vehicle standards, and information sharing activities that inform consumers all form a part of the strategy to transform the Nation's energy system, reduce waste, and improve economic productivity.

An important step the Administration has taken to achieve the President's goal of doubling U.S. energy productivity by 2030 was the issuance last year of the Corporate Average Fuel

[1] For example, "Real Prospects for Energy Efficiency in the United States," National Academy of Science, 2009, http://www.nap.edu/catalog.php?record_id=12621.

Economy (CAFE) standards for light duty vehicles. DOE worked with the Department of Transportation and EPA in promulgating these standards that will double the average fuel economy of new light duty vehicles by 2025. The first fuel efficiency standards for medium- and heavy duty vehicles, issued in 2011 by DOT and EPA in consultation with DOE, will improve energy productivity for larger vehicles and save an estimated 530 million barrels of oil over the lifetime of the vehicles covered.

Doubling U.S. energy productivity by 2030 will require concerted action and investment by households, businesses, and governments at many levels over the next two decades, but it is an achievable goal that carries with it the promise of extensive benefits, leading to a stronger, more efficient economy.