State Climate and Energy Program—State Technical Forum
Unlocking Energy Efficiency in the U.S. Economy

November 19, 2009

Contents

Introduction

Julia Miller: …welcome you back. We take a break over the summer and the summer kind of extended into fall this year. Welcome back to the Tech Forum calls. I want to thank our speakers Priya Sreedharan and Phil Farese from the McKinsey and Company for helping us today. It's really fascinating material and there's a lot to get through, so I won't take too much time up front here. But I do appreciate the time they took to put together these presentations and to be with us today. Next month's call is going to be on bioenergy. We'll send out a save the date notice in the next week. Just so you all know, everyone's line is muted right now and we do that so we don't get some background noise or hold music or whatever. So when we do get to the point to open things up for Q&A, to unmute your line individually you need to hit #6, but in the meantime lines are muted. I know that Catherine Morris from the Keystone Center who is the moderator today will walk us both through that as well.

With that, I'm going to go ahead and introduce Priya. Priya is here at EPA. She works with us in the Climate Protection Partnerships Division. She's a science and technology policy fellow with the American Association for the Advancement of Science. In her fellowship here at EPA she's working on a variety of clean energy issues, including analyzing energy efficiency provisions in proposed climate legislation. She's also researching the policy implications of SmartGrid technologies. She has a doctorate in engineering from Berkeley and she comes with a lot of design and research experience in clean energy technology innovation. With that, Priya, I'll hand it over to you.

Priya Sreedharan: Great. Thank you, Julia. Catherine, am I controlling?

Catherine Morris: You're good. Yes, we'll hand the controls over to you.

Energy Efficiency Potential Studies

Slide 1: Energy Efficiency Potential Studies

Priya Sreedharan: Well, hopefully I'll be able to give you a little bit of background on what we call efficiency potential studies before Phil gives you the… actually Catherine, I don't think I picked the option where it shows the clean version, so let me know if…

Catherine Morris: That's ok.

Priya Sreedharan: Ok. So I'll give a little bit of background on efficiency potential studies.

Slide 2: McKinsey's "Unlocking Energy Efficiency in the U.S. Economy"

Priya Sreedharan: The McKinsey study has three basic components. I won't go into these in very much detail, except for the first one. That is the quantification of energy efficiency measures that are economical. McKinsey also looked into the barriers that prevent us from achieving energy efficiency as well as policy strategies.

Slide 3: Energy Efficiency Potential Studies

Priya Sreedharan: Again, I'll give a little bit of background about this first item, which is how we go about doing this quantification of efficiency. Basically, that's pretty much what an efficiency potential study is. And I'll give some background about the different types of potentials that are often quantified; a few highlights from some recent studies, national studies, including McKinsey; contrast some of the differences between the two key national studies; then hopefully put some of these results in context so you know how to interpret some of the numbers—efficiency savings that are estimated. Hopefully I'll be able to convince you by the end of this study that there are some very tangible ways in which the states can use these kinds of studies.

Slide 4: Definition of Potentials

Priya Sreedharan: So basically, the potential study is just an analysis of the potential savings that might either physically exist, that might be cost effective, or might be able to be achieved through programs and policies. They can look at the savings across different fields. Basically, you'll have savings of electricity as well as natural gas that are estimated. If you look at the Venn diagram on the right, it shows you a graphical illustration of the main types of potentials. There are three main categories. The first one is technical potential, which is the largest category, and you can think of that as sort of a theoretical maximum of how much efficiency is out there, and that is if you ignore the cost issues. Then a further subset of that physical potential is an economical potential, which is what we deem as being cost effective, specifically comparing the cost of energy to other supply resources. Then a further subset is what we call a maximum achievable potential, which is basically looking at what subset of that economic potential that is cost effective efficiency can be achieved through aggressive programs. There is a fourth category which is sometimes looked at that is sometimes referred to as a flat out achievable potential or program potential, which basically looks at which portion of the maximum achievable potential can be achieved just using very limited or specified funding levels.

Catherine Morris: Priya, I'm going to interrupt you just briefly. We're getting a lot of static from your headset. You may need to push it away from you just a little bit.

Priya Sreedharan: Ok, let me know if you have any more problems with that and I'll just pick up the phone. The last point I want to make about the potential studies is that they are really bottom up engineering estimates of efficiency. You can think of this as maybe a contrast to how perhaps an economist might look at energy efficiency savings.

Slide 5: Information on Potential Studies

Priya Sreedharan: Now that was a very quick sort of introduction and if you're interested in learning more about potential studies, I would recommend in particular the middle reference here which is the National Action Plan Energy Efficiency Guide for Conducting Energy Efficiency Potential Studies. It's excellent. If you're interested in a lot of more gory details on methodology, the California potential study done by Rufo and Coito is also excellent, and their link's there.

Slide 6: Recent Potential Studies

Priya Sreedharan: Moving on. There have been a number of studies done recently. However, as far as U.S. national level potential studies, there are two key studies that have occurred recently. That is the McKinsey study which we'll hear more about in just a few minutes and the potential study done by the Electric Power Research Institute. McKinsey quantified the economic potential across the U.S. for both electricity as well as natural gas. The EPRI study looked at a couple different potentials but specifically for electricity.

There are a number of different regional and state studies that have been conducted. We just list some examples there. You can also find a lot of other examples listed in the National Action Plan for Energy Efficiency Guide for Conducting Potential Studies.

I'd like to highlight the findings that are common across these studies. There are two key findings. One is that there is a vast amount of low cost energy resources available through energy efficiency. I list the numbers that were estimated by McKinsey and EPRI by the economic potential and what they mean is that 25 percent—as estimated by McKinsey—of 2020 electricity demand could be offset by cost effective energy efficiency. I also list the EPRI estimation, which was at about 11 percent. If you want to think of those in sort of a normalized savings number, which is often done in these sorts of studies, you can think of them as approximately 2 percent or 1 percent a year in savings. I highlight a couple of the numbers that come from state studies. The range that we see in state studies is that you can achieve about 10 to 30 percent of energy efficiency economically or about 1 to 4 percent. Now, the second point that I'd like to highlight is that even though there's all this cost effective efficiency, there are significant barriers that need to be addressed in order for us to access this vast resource.

Slide 6: Comparing EPRI to McKinsey 2020 Economic Potentials

Priya Sreedharan: Now on the surface it might seem that the EPRI and McKinsey studies are very different, if you look at just the basic numbers. However, McKinsey and EPRI went through extensive efforts to identify what accounts for the differences between their two studies, and that is shown in the graphic on this slide here. What they show is you can build up from the EPRI economic potential, which is at 473 terawatt-hours, and through these different segments you can reach the McKinsey economic potential.

Slide 7: Reconciling Differences Between EPRI and McKinsey Estimates

Priya Sreedharan: I'll go into a little bit of detail about these different segments that account for these differences. So, there are four sort of main categories, and I'll refer you to McKinsey's publication on these reconciliations, which is listed at the bottom if you really want to get more information on the subject.

The first category basically shows that McKinsey looked at additional end uses: market segments, different kinds of electrical devices, and in some cases a wider technology in some end uses, which result in those first three bars that you saw in this graph. [Presentation Returns to Slide 6.] Those account for about 490 terawatt-hours. I'll go back to the previous slide so you can see the ones I'm talking about and if I can figure out how to use the drawing tool … so these guys right here amount to about 490 terawatt-hours. [Presentation Returns to Slide 7]. Now that 490 is a pretty significant chunk between the difference of EPRI and McKinsey; it adds up to approximately 80 percent of the difference. There are a couple other categories that are very important as well.

Number two: McKinsey allows for accelerated deployment of efficiency technology prior to end of life. Now this is only when it makes economical sense to retire those units earlier. That accounts for an additional 180 terawatt-hours; that's about 30 percent of the difference. The third category describes how EPRI applied existing performance and economics while McKinsey is seeing some improvement over time. That gets you to about 10 percent. Now all these three categories together would actually have you exceed the McKinsey potential. Now in one case EPRI is actually a little more aggressive than McKinsey, and in some cases they use more aggressive assumptions and technology characteristics. Hopefully, that's not too detailed information, but I would definitely encourage you to refer to the source that's listed at the bottom.

Slide 8: Results in Context

Priya Sreedharan: Very briefly, I just want to put some of these numbers in context. We have all this energy efficiency that could be saved by the year 2020—what does that mean? Usually we can think about that in terms of how do we impact the growth of electricity demand and then what might be the greenhouse gas mitigation potential from the energy efficiency savings. Now this isn't the only way to think about potential studies; it is one aspect of the whole potential study story. What I list there in electricity demand growth. The first line is the reference case growth—that is, AEO predicts that electricity demand is going to grow by about 490 terawatt-hours between 2008 and 2020, roughly 8 percent a year. You can see how, if you adjust the reference case for the savings that are predicted for the different studies—that is the McKinsey economic potential and going down to EPRI's economic potential, then to EPRI's maximum achievable potential—you can see that you can cut into that demand quite significantly. Using the McKinsey potential, you can get to the level where you are eliminating that altogether and beating it as well, resulting in a negative average annual growth. EPRI economic potential pretty much flattens the demand growth. You can see the achievable potential takes a big chunk out of the estimated demand growth.

Climate change mitigation is a topic everyone is thinking about today. EPA or Waxman-Markey legislation that was passed by the Hill calls for a 960 million metric tons of CO_2 reductions in 2020. What I listed below is if you take the energy efficiency savings and then convert them using the simple emission conversion factor in CO_2 savings, what you can see here is what impact emission reduction savings can help us achieve that mitigation, and certainly just the electricity savings from McKinsey gets you pretty significantly to that 960 goal. The EPRI potential gets you about a third of the way there, and certainly even the achievable potentials are significant as well.

Slide 8: Uses of Energy Efficiency Potential Studies

Priya Sreedharan: So I'd just like to wrap up quickly. There are a number of ways that these studies can be helpful to the states in achieving different kinds of objectives. We list just a couple here. You can use the energy potential studies to establish energy savings statewide targets. You can also, as I showed on the previous graph, estimate what kind of CO_2 reductions you can get from energy efficiency. Then lastly, these studies might be helpful in determining how much money might be spent toward energy efficiency programs. So with that, I'd like to turn it back over to Catherine.

Catherine Morris: Thanks a lot Priya. I'm going to take a couple of clarifying questions but I'm going to answer some preemptively here. I know people are going to be interested in getting these presentation materials. We weren't able to get them up until today, but if you open up your chat line it gives you the URL to get to them. In short form, you can go to www.epatechforum.com and then follow the links for materials for 2009-10 season of Tech Forums and you'll be able to download all these presentations. We are recording this session. We've been recording the Tech Forum so you can have access and folks who weren't able to attend can view them on their own time. And we post them on the same site. So I just wanted to give you a heads up that you will be recorded. One other thing is we did have a mistake on our agenda or our original reminder for registering. We're trying to go till 3:30, so we have time to really dig into the McKinsey report today.

Why don't we take a few clarifying questions before I turn it over to Phil? You have a couple options. I encourage you if you want to type your questions in your control bar, you simply have to open up the question bar, type some questions in and they'll come to me and I'll be able to ask our speakers. If you have a question—our group is relatively manageable today—so if you have a question, you can unmute your line. You can hit #6 as Julia recommended and ask Priya directly. Do we have any clarifying questions from her presentation? No, ok. We will have a chance to come back at the end. I hope we'll have a bit more time at the end and Priya will stick with us.

Unlocking Energy Efficiency in the U.S. Economy

So, with that let me introduce Dr. Phil Farese. He is a physicist and co-author and project manager of the McKinsey study that we're talking about today: Unlocking Energy Efficiency in the U.S. Economy. He's been with McKinsey since 2005 and supports clients of McKinsey in the energy sector, particularly in understanding and overcoming the barriers to energy efficiency and developing strategies to help seize opportunities from renewable energy opportunities as well. I'm going to turn the presentation over to you Phil and you'll have a chance to really give us a lot more detail about the specifics in the study.

Slide 1: Unlocking Energy Efficiency in the U.S. Economy

Phil Farese: Great. Thank you very much Catherine and Julia and Priya as well. We're more than happy to take the time and talk about it. I look forward to any questions people may have at the end. Again, I'm going to take you briefly through our findings in the report before diving into the scoping and details. We wrote this in cooperation with a total of 12 organizations from government, the private sector, and from the public sector. Specifically, we had the Department of Energy and EPA who were co-sponsors—by co-sponsors, I should clarify, in addition to providing financial support for the project, they were also involved in helping us think through some of the issues, in editing and feedback on the document. A lot of times McKinsey held onto the pen, if you will, and is responsible for the content.

So in addition to EPA and DOE, we had a number of utilities including Austin Energy, DTE Energy, Exelon Corporation, EGE Corporation, Sempra Energy, and Southern Company. We also had some nonprofit help specifically in this category. In addition to the government, we also had Energy Foundation, the Natural Resources Defense Council, and the U.S. Building Council. We're very thankful for their help. This project in a sense began when the EPA approached us when we came out with our 2007 report on reducing greenhouse gas emissions, how much it would cost, which focused again on carbon dioxide and greenhouse gas reduction and said a lot of people claim that with all this energy efficiency stuff we work in kind of a negative cost for carbon. If it really is a negative cost it should be happening today, so why isn't that happening? That was the genesis of this project.

Slide 2: Mentions in the report to Washington

Phil Farese: As such we put forth this document in order to get the fact base out in front of a broader community. We have had some excellent press from it so far and excellent recognition, specifically we've had mentions in Washington where Senator Max Baucus mentioned it as well as the Environmental and Public Works Committee shortly after it came out. The report was mentioned by three witnesses—David Sandalow, John Wellinghoff, and Fred Krupp. You can see we've also had some recent bipartisan initiatives that reference it. It's not actually in the bill itself, but the expanding Building Energy Emissions Act of 2009 upon its release was referenced by the authors as relevant inspiration for some of the work in there. Finally, on the think tank side, both the Center for American Progress and Union of Scientists recognized the report as being important.

Slide 3: Mentions of the Report in the Press

Phil Farese: Additionally, more broadly in the press—the next page… we have mentions in the New York Times, the Wall Street Journal, and a lot of various climate press as well. We've been very satisfied with it and we've been very pleased and very surprised with the generous support we've received with very little objections or complaints.

Slide 4: Project Background

Phil: As I mentioned, this is really to address the puzzle of energy efficiency. This is a stylized version of the curve that we did release in 2007. The left side that is circled is the part that's energy efficiency. The y-axis here is the cost of delivery of carbon dioxide mitigation at some amount and the x-axis shows the amount that's available given that approach. We embarked on this project not only to analyze the potential—to say what is really there—but to analyze the barriers inhibiting the energy efficiency and identify solutions that can overcome those barriers.

Slide 5: Project Scope

Phil Farese: To tell you a little bit about the project scope, it is reasonably vast but also contained to the extent that we could. Specifically, we analyzed stationary uses of energy efficiency where we looked across residential, commercial, and industrial sectors, and we did include combined heat and power applications. We examined 675 end uses, and we did this sort of measure by measure with a very granular database. We took the inputs from the Energy Information Agency's annual report—the Energy Annual Outlook—and the inputs in their modeling system—the National Energy Modeling System—to understand what the energy inputs are today, what the existing stock is, and how that stock is going to turn over. Then we basically considered the entire DOE's report on end uses and the various technologies you could employ in the various end uses represented in that list.

Additionally, we did a deep dive into home improvement. Things like basement insulation, windows, adding insulation in ceiling or duct, and insulating your ducts, etc. It's important that we focused on productivity. This truly is energy efficiency. We're not talking about conservation here, such as putting on a sweater and turning down the heat in the winter and wearing a t-shirt and turning it off in the summer. So it is not conservation, and from a formal economist standpoint we did our best to basically require no changes in lifestyle or behavior so you're in a sense getting the same utility out of less energy. As such, there are some things people would have liked to have seen in the report, such as increased use of ceiling fans or adding fans or low flow faucets. We did not include those because they do require to some extent a change in your behavior.

Additionally, as Priya had mentioned, this is an economic analysis. Specifically, we did an analysis that focused on the net present value (NPV), such that we are essentially trying to minimize the cost that America pays for its energy bill. That cost includes all applications of energy efficiency based on the incremental capital of those investments, the operations/maintenance, and the lifetime energy cost. We did exclude program costs because this is agnostic to how you deliver it. And we did not include the indirect benefits, such as improved health, you get from improved indoor air quality and other benefits which are not as well documented or directly linked to other particular measures. And finally, as I'm mentioning a net present value calculation, we selected 7 percent factor, and I'll get back to that in a moment.

Finally, very important, as I already alluded to, is we did a potential analysis to see basically what is the size of the prize. And more importantly in our mind, we looked at what are the barriers to capturing that, and finally what are the potential solutions out there to do it. We did not attempt to do a realistically achievable or high, medium, and low set to see how much can be achieved. Sufficient to say that getting the prize that is out there would be a massive effort and yet well worth the effort if you look at the economics.

Slide 6: Central Conclusion of Our Work

Phil Farese: The report is about 160 pages long. And we do—for most people of course don't have the time to read that—have a 22 page executive summary. This is actually the executive summary of that executive summary. It has four parts. The first: energy efficiency offers a vast, low cost energy resource for the U.S. economy, but only if the nation can craft a comprehensive, innovative approach to unlock it. The reason for that is that significant and persistent barriers will need to be addressed at multiple levels to stimulate demand for energy efficiency and manage delivery cost for millions of buildings and literally billions of devices. I should add, also industry processes and any use of energy.

If executed at scale, a holistic approach that would address all of this, it would yield gross energy savings worth more than $1.2 trillion. That's well above the 520 needed from the up-front investment of energy efficiency measures to get that $1.2 trillion. That does not include program cost.

Finally, such a program is estimated to reduce end use energy consumption in 2020 by 9.1 quadrillion Btus. That's roughly 23 percent of projected demand, potentially adding up to 1.1 gigatons of greenhouse gases annually. Again, to draw back on previous numbers, this includes not just the electricity, but all of the energy consumption including natural gas and oil consumption. As you can see, that exceeds the Waxman-Markey numbers that were mentioned earlier in the presentation. What I'd like to do now for the next few minutes is walk you through some of the more interesting aspects or characteristics of the potential and then move into most of the remaining time—about half hour—on the barriers and then finally talk a little bit about the solutions at the national scale in the policy arena, as my understanding is that would be attractive to this audience.

Slide 7: Significant Energy Efficiency Potential Exists in the U.S. Economy

Phil Farese: So the first thing I would say is that this is a vast resource. We were able to analyze about 81 percent of the stationary uses of energy. We required public sources in a very granular way to understand the analysis, and about 80 percent is understood that way. That's the 36.9 quadrillion Btus you see on the left in the first chart. That is expected to grow to 39.9 quadrillion Btus. But, if instead we were to again minimize our energy bill including the upward capitals that we would invest, you could not only offset all expected growth but turn the growth curve negative so that in 2020 that 36.9 quadrillion Btus would reduce by 23 percent and give us only 30.8 quadrillion Btus. On the right side you see a commensurate decrease in the amount of carbon where our 3.9 gigatons rather than growing to 4.3 could actually decrease to 3.2.

Slide 8: Energy Efficiency Potential Across Fuel Types

Phil Farese: Additionally these opportunities cut across all fuels. This chart shows a couple different measures of the size of potential and the use energy as is measured by the consumer, so at the meter. Primary energy is a measure many may be familiar with. It is the measure of that energy when it is first accounted for in the system. So this is basically the energy including any conversion losses such as turning coal into electricity as well as distribution and transmission losses that you get for the electrical and also the gas pipe system. And finally we do have the carbon emissions here as well.

It's important to note the vastness of these numbers, as Priya also alluded. The 1080 terawatt-hours is actually more than Russia consumes in a year. So, we actually waste as much energy in the U.S. as Russia consumes. Simultaneously, we also waste 2.9 cubic feet of natural gas, which is more than Canada consumes in a year, and as you know it's pretty cold up there, so they need their gas for warmth. The oil here has an opportunity to reduce consumption by 250 barrels of oil equivalent. That is actually more than all the biofuels that are produced in a year currently.

Slide 9: Potential Remains Attractive Even Under Significant Changes in Assumptions

Phil Farese: This truly is a vast resource. As I've said, America really is the Saudi Arabia of energy efficiency. In addition to being this common across all the fuels, it's also a very durable resource. A number of people have put forth the barriers that they think might explain the entire opportunity, such as the discount rate people may demand. So we did actually test the sensitivity to this. We looked at what happens if we decrease the discount factor to 4 percent, which is sort of a minimum for society—you'll see a minimum increase there. If, however, you consider discount factor's maybe 20 percent, as you might get on a credit card or other secured financing for a residential homeowner or a commercial business, or even 40 percent, which translates to roughly to a three year payback, what many behavioral economists have found is sort of a human sense of behaving in decision making. Though in this latter case the energy efficiency is about 50 percent as well as large as what we found in our base case. That still is a vast amount of energy efficiency, more than enough to offset future growth. It is not a silver bullet to say we just need to sweeten the economics and provide the up-front funding and make sure this stuff pays back fast enough. It truly is a barrier that we'll get to very shortly.

Another myth we debunked is that carbon prices will vastly decrease the amount of energy efficiency. Turns out if you look at the technology available today it's almost a barbell shaped curve where you have a lot of opportunity to deploy technology that exist today, but we have not done so. There is not a lot on the margin, but a lot in the future that needs to be made more economical. If you will sweeten the economics by adding a carbon price—even as high as $50—you don't actually tremendously increase the size of energy efficiency, you see it goes here from 9.1 to as high as 10.3 Btus. That's not to say that carbon price may not serve as a price signal or as awareness to again change people's behavior, but it does not necessarily increase the size of the potential that we're going after.

Slide 10: Energy Efficiency Offers the Most Affordable Means of Delivering Energy

Phil Farese: The final thing I'd like to mention is that this is a ubiquitous opportunity. This chart lays out 50 measures that we aggregated 9.1 quadrillion Btus into to make it somewhat tangible. This is the traditional way people have analyzed how to do it, and I don't expect people to read the small font on this page necessarily. But, suffice it to say that across residential, commercial, and industrial sectors, there is ample opportunity in many ways to go after this. In fact, this is actually one of the problems—that this is very hard to get your head around and to prioritize "How do I do this?" Should I go after right around 6,000 on the x-axis, the retrocommissioning opportunity in commercial buildings and understand how to improve commercial buildings, or should I focus on energy management that you see around the 3,000 trillion Btus on the x-axis as an opportunity?

Slide 11: Clusters of Opportunities Emerge

Phil Farese: So, one contribution that one of our co-sponsors said was probably the greatest contribution to the science of studying energy efficiency was to cluster these into actionable units that someone can go after, be it a policy maker or developing a business model. We actually see 14 on this page, 13 of which are shown on this page; the 14th is combined heat and power. But what we found is when we broke the consumption of country into 21,000 roughly microsegments of opportunity, we aggregated them up into these end uses formally, but then we also considered what is the commonality of the barriers here in the demographics, the energy consumption powers, etc. We had these 14 clusters emerge.

So for example, to take on the top right here in residential, lighting opportunities tend to face the same set of barriers and similarly we're likely to have the same solution. They are different than the bottom left, different than the energy support systems you might find in industrial systems, where you're talking about the building systems, steam systems, motors, etc., where a different set of barriers exist and a different set of solutions is available. Actually, the body of the report—the 160 page document I mentioned—goes through in gory detail: what are the actual barriers to these clusters and what are the solutions that people have tried over time to address the answers to these questions. Since even with the generous amount of time I've been given today, we don't have time to go through all 16 clusters here, but I wanted to just lay out the barriers that we face at two levels.

Slide 12: The Fundamental Nature of Energy Efficiency Creates Challenges

Phil Farese: We're going to switch out to the barrier conversation. The first level of barriers that we call a system level is really based on the fundamental areas of energy efficiency. We group these, as many have done over the past 20-30 years who have done research in this area, into four broad, fundamental attributes. The first is that energy efficiency requires outlay, but it is fundamentally an investment. Full capture would require $150 billion dollars per year or $500 billion present value, plus any program costs. Again, investment is more than paid for over time but we as humans tend to not like to make that bet necessarily. Additionally, the opportunity is extremely fragmented, as I mentioned. We're talking about touching more than a 150 million locations, so it's counting all the houses, industrial establishments, and commercial establishments, and literally billions of devices and industry processes, etc. You can imagine walking through your home and seeing all the glowing LED lights and hearing all the things that are sitting motors and what not. Each one of those things are likely wasting energy and could be made more efficient.

Another problem energy efficiency faces is it has low mind share. Traditionally, efficiency is rarely the focus of any one in the economy specifically. ESCOs and a few other people who may fall into this category. There aren't many people who wake up and think about "How am I going to go out and save energy today?" Finally, energy efficiency is difficult to measure. Evaluating, measuring, and verifying savings is more difficult than measuring consumption. It's not impossible or an insurmountable challenge. Whereas measuring consumption you just put a meter on a house or on a bus bar coming out of a plant and know how much you produced. To understand energy efficiency you need to not only do that but understand what your consumption would have been had you not changed that and then attribute those changes to energy efficiency versus other changes such as consumption pattern changes, economic output, or environmental changes.

Slide 13: Additional Opportunity-Specific Barriers Inhibit Output

Phil Farese: Next, I'd like to focus on the opportunity-specific barriers that exist. These are what we really got into with those 16 clusters. We see barriers out of three categories: structural, behavioral, and availability. I'll walk through these each in turn. The structural barriers are those that prevent the actual opportunity from being available to the decision maker deploying an energy efficiency measure. There are four of these as we've structured them. Agency: this is the traditional split incentives between two parties, such as the owner of a building and the tenant who may pay electricity or fuel bills. Often that's touted as the main problem of energy efficiency. It turns out it's high in some area, such as food service buildings where well over 50 percent (in the vicinity of 75 percent) do face an agency problem. You can think of a restaurant owner, they don't own the building they're just renting it. Turns out if you look at the whole 9.1 trillion Btus, under 10 percent is actually impacted by the agency barrier.

Other barriers such as ownership transfer may be more ubiquitous than some of the clusters. For example, to focus on that one, if you were to look at the low income home section (what we categorize at 30,000 a year) they would make an investment and actually leave typically before that investment is paid off. In fact that impacts about 55 percent of that opportunity. There are other structural barriers such as transaction barriers, or the unquantifiable cost of doing the research, sacrificing your spare time to know what to do, tracking down the contractor, preparing your home for upgrade for example, etc. Finally, pricing distortions where the cost that many pay for their fuel is not aligned to the actual cost of delivering it. You can think of major industrial players who may have well negotiated rates or other social organizations that actually get a cut similarly.

Even when you're able to clear those structural barriers, we come next to the behavioral barriers. So, these are the types of things that prevent people from making the decision to save energy. They are also diverse and very hard to quantify in these cases. The couple I would draw your attention to is the lack of awareness; it is the most ubiquitous barrier affecting almost all the clusters. It is just the fact that product efficiency and consumption behavior are not known. If we were in the room together, I like to call on people to raise their hand if they know what their energy bill was last month, and not surprising not many people know what that is. That's only the first level of challenge you face in this category. Next you have to say "How many of you know how much energy you could save if you were to change your behavior?" Again, very few hands stay up. Finally, you need to get through the last hurdle and say what you need to do and how do you go about doing the energy reductions measures you could take to reduce energy? It is very hard to walk through that series of hurdles and come out with an actual plan that you can do. It is very difficult to be aware of all those steps.

A lot of these other than the elevated hurdle rate are actually being studied by economists today. Apparently, a rationality from a formal economic standpoint is born out of that kind of research, such as the fact that humans tend to prefer a sure thing even if the expected return is riskier than a higher bet than getting a sure thing. For example, if I was to give you a dollar for a 60 percent chance of winning two dollars and a 40 percent chance of getting nothing, a lot of people are going to gravitate towards taking that one dollar and going home, rather than taking the bet on the two, even though the expected value is higher. I did mention the elevated hurdle rate earlier, so I'll go into that in more detail now. It's very difficult to know what is the right hurdle rate; what is the right risk adjustment here to an individual investor. Should it be 20 percent, should it be 40 percent? It is important to observe though that today in our energy system by calling on the utilities we're having people pay 7 to 10 percent on the investment when someone makes the investment to delivery energy for you. We notice it is treating a different option of saving energy differently by requiring a higher discount rate on those opportunities.

Finally even if you get through those two first barriers of having those savings available to you and having to choose to make those savings, the final question is can you really get at the savings. We call it availability here. A lot of times the equipment is just not available to you. It might be bundled. As one of our sponsors once said, I might want to buy the most efficient dishwasher but in order to do that I need to buy one that plays classical music at midnight and that bumps up the cost of what I'm willing to pay. Also speaking about payment, capital constraints are very significant. For a typical homeowner you might in fact be talking about a third of their discretionary income for a year required to make this investment, and that's a massive sacrifice to make. Yet we see capital constraints not only in the residential sector but in the commercial and industrial sector where you might think that business leaders are able to make more rational decisions. Often times, this barrier persists and there not able to do so. Products are often not available either because the change is not there or they're not produced in sufficient volume. And finally, even if you get through all that, we find that a lot of installation is not done properly. A lot of heating, air, and ventilation systems are not actually running at their optimum efficiency point. They're not installed correctly and not maintained properly. So installing and using these, another good example is a lot of times our energy saving settings on our television and computers are overrode or not even set initially because people just don't even think about it. These installation and use barriers can destroy even when you've got through the other barriers.

Slide 14: Addressing Barriers in Non-Low Income Homes

Phil Farese: The next real contribution that the report brought to the field was to say we all can agree on these barriers, a lot of people have thought of them before to catalog them, but there hasn't been a lot of work done before to say what barriers are inhibiting what opportunities. So what we've done for each of those clusters—in this case I'm giving you an example for non-low income homes—we took those clusters and through a lot of interviews, a lot of researching literature, we were able to say what barriers exist for that cluster and how do they manifest. We'll go through all these in detail but as you can imagine you get agencies issues here. You have landlord / tenant issues, but that is a very small part inhibiting the non-low income home cluster. You face transaction barriers where you have to research and procure your home for improvement. You need to worry about is it going to pay back before I leave, etc. Similarly, we did a number of interviews and catalogued a number of available sources to see what strategies exist.

We found four categories of strategies here. Information flow: making people aware of not only their consumption but also the opportunities through education, voluntary standards and labeling or through voluntary price signals. There's another whole category of solutions around capital outlay where we saw financing vehicles, such as on bill financing, tax financing, energy efficient mortgages. There are a variety of vehicles exist there to eliminate the need for upfront investment, but gives them the capital and then recover that through interest payment. In some cases, which you're very well aware, utilities are provided with grants to divide that upfront cost.

The final two categories, mandatory codes and standards, have proven very successful over time. Finally, the need for third-party installation, which can take two forms. Either education about the workforce and increasing the size and education of the workforce who actually do this work, and in some cases, such as with the weatherization systems program, actually showing up and have someone volunteer to come to your house and fully deploy these technologies themselves. The final ingredient to this is to take a given solution strategy such as home labeling and assessment and say, "Okay, which of these barriers does it overcome?" What we see is very rarely is there a single approach that covers all the barriers. Home labeling and assessment is a very powerful tool, but as you can see even in non-low income homes where there are 10 barriers it only overcomes seven. You still have the challenge of elevated hurdle rates; you still have the capital constraints where even if you could justify that hurdle rate; you may not be able to get the money; finally are you really going to be able to get the products and get them installed properly? It's hard to get the products out there; there just aren't enough contractors.

What we believe is going to be necessary is a comprehensive approach. If you look at all of the potential approaches you have in the non-low income homes, you can put together sort of sets here that would overcome all of the barriers. We have a few, if you take the time to look through this that are combinations that would overcome all of them. You can see mandatory codes and standards hits all 10 of them, and then in and of itself is therefore overcome. Alternatively, you could consider home labeling assessments with things such as developing a certified contractor market, innovative financing or taxes, or other incentives, and any combination of those would be able to overcome all the barriers as well.

We at McKinsey aren't making specific policy recommendations. That's actually a stance our firm continues to take. We will not make policy recommendations, but we believe we've developed a powerful tool to help policy makers understand what's necessary to craft intelligent policies to overcome barriers and really start driving change in the market for energy efficiency. Similarly, we believe that business leaders can take this tool and use it to develop new business models to enter these markets and to successfully capture more than they've traditionally able to do.

Slide 15: Solution Strategies, with Varying Degrees of Experience, Are Needed to Unlock Barriers

Phil Farese: Finally, just to take one last aspect on how we came about the solutions. As we went through them we realized they fell into three categories. There were those that were proven, and here we mean proven at a national scale. There are those that are piloted. This is drawing on some of our work with our clients where we would often, for example, if you were working with an industrial paper manufacturer who had many plants around the world, you would take one plant and pilot the changes you would do within that plant. If you're thinking about a country, a pilot would be on the scale of something you would do in a city, say a million inhabitants. So we see some solutions being tried at that level, at a pilot level. Finally, those that are just recently emerging. This page without going into the details lists a few of those as you can see ENERGY STAR and EPA is actually active in all of these areas.

Slide 16: Important Observations

Phil Farese: So, I'd like to switch now to talking about five important observations that we had coming out of the work. These are in a sense what we think could be used to build an overall strategy for policy makers or for business leaders about how do you really transform the way that the nation uses energy to develop a comprehensive approach to overcome all these barriers.

Slide 17: U.S. Mid-Range GHG Abatement Curve 2030

Phil Farese: the first is that we need to recognize energy efficiency as an important energy resource while the nation is currently developing new energy sources as well. This is a flashback to 2007; this is our mid-range greenhouse gas abatement curve. We've highlighted here the overlap where again we've run deep into the NPV of energy efficiency uses in this report. As you can see these are the beneficial negative costs measures we can deploy to get to the type of carbon mitigation that a lot of legislation is talking about. In the long term, you're going to need to go farther than that. You're going to need to get to not just the left side of the curve as we call it but the right side as well where we're looking at new lower carbon forms of generation, where you're looking at proper land use, etc. I'll refer you back to that that 2007 report for more details here.

In addition to needing to think beyond energy efficiency into a broader range of options, concurrently developing other generation. Even though, as I mentioned, the overall consumption of the U.S. could be reduced through these energy efficiency measures, that's not to say that it could be reduced everywhere. We already know that new forms of load will emerge that are not included in the VIA's report, such as electric vehicles potentially or data centers could grow more rapidly than expected. So that's something to make sure you have the reliability to sort those new loads and also there are different areas of the country that are going to be growing faster than others. Obviously, people know that there's a general migration from the North and Midwest to the South. All kind of going south for the winter so to speak. And that means that that area will actually be growing more and as a result will not be able to turn down their growth curve and will need to continue thinking about generation options.

Slide 18: Important Observations

Phil Farese: Additionally, we see the need to launch an integrated portfolio of not just proven but also piloted and emerging approaches.

Slide 19: Portfolio Representing Cost, Experience, and Potential Clusters Possible with Specified Solution Strategies

Phil Farese: We put forth a classic portfolios initiative approach, where for each of the 14 clusters we can see them put out on this game board here. Where the x-axis is the cost of the saved energy in dollars per Btu, the y-axis is the experience of the approach (proven, piloted, or emerging), and the size of the bubble represents the size of the opportunity. To keep it simple for now, this is the residential opportunity. What you can imagine wanting to do here is take opportunities, such as existing non-low income homes and by considering not just the emerging opportunities. As we get experience with them that's going to move down and become a more proven resource. Similarly, if we think about new technologies being deployed or new business models, we would like to see the cost come down. So, ideally, you'd like to navigate all of these bubbles to be down here in the bottom left hand corner where they are proven and more affordable.

We would expect that as you look at the entire portfolio that would again be a very transformative approach with some thing that we hope the nation can drive through over time. Finally, you can use this tool to think about "If I am a policy maker, how do I want to think about writing policies?" "If I'm a business person, what do I want to enter?" You can see here that some of the more proven things—you need to start capturing those—and some of the emerging things. You need to think of some of the more innovative approaches and how can you earn innovation in those areas.

Slide 20: To Deliver the $1.2 Trillion in Savings Will Require $520 billion in Upfront Investments

Phil Farese: Another important opportunity is we need to provide the upfront funding for this. If you look across the residential, commercial and industrial for combined heat and power, you're talking about an upfront investment of about $520 billion in present value. That's about four to five times the current spending on energy efficiency; many would estimate a range of 10-15 billion a year right now. That is not going from zero to 100 so to speak. It is, however, a four times increase, which is pretty significant. Even very attractive devices of the last century such as television, radio, and cell phones took a decade or more to go over that kind of expansion in terms of their penetration. Also on this chart, we call out the fact that you would expect some program cost if you were to drive the policy approach that could range from 10-30 percent. It's very difficult to know what those will be since most of those have not been done at a national scale so far. It's hard to predict one another. Suffice to say that that 10-30 percent range is conservative but also pretty broad.

Slide 23: Aligning Multiple Stakeholders is an Important Enabler for Unlocking Efficiency Potential

Phil Farese: We see the need to forge greater alignments between stakeholders. As we look at the regulators, manufacturers, utilities that provide the equipment and the customers, traditionally there's not been a great alignment here. There are four things that we think need to happen to increase that alignment. The first in the top left here is that we need to achieve regulatory alignment on cost recovery. Here you need to keep electricity reliability high; you need to keep rates affordable; and you need to keep energy reliability strong. You don't want to sacrifice reliability, but none the less utilities need to move forward on current cost recovery of their investments. So the top right hand corner, traditionally for the past few decades, we have fought about rates when we talk about energy. And energy efficiency breaks with that traditional paradigm, where if you were to have anyone—not just a utility—drive energy efficiency, you would see the bills of people who partake in this energy efficiency come down as the rates go up. Those rates will increase from where they are today regardless if a utility is doing this or someone else is doing it. That is just because you're in many cases distributing a fixed cost of transmission distribution and, in many cases in this country, generation across a smaller set of megawatt hours.

I would pause here to say that, as I know that I'm speaking to a regulatory audience, this is going to vary tremendously across all the service territories. So, before you were to really understand the impact, you need to carefully consider all of the intricacies of your particular service territory and the different states and utilities, both public and investor-owned across the country.

The bottom left highlights the leadership for each category of efficiency potential. There are some natural partners here where, such as appliance standards are naturally done at a federal level, as they have been done for decades. Similarly, building codes are done in the same way and if you think about driving some of the more new things such as building retrofits, there is not yet a natural owner. We actually believe that utilities are well positioned, as we call it in the report, to drive a lot of this because of some advantages they have at their starting place, such as their understanding of demand and supply, their relationship with their customers, and their access to attractive funding to do so.

And, finally, we believe it is very important to assure appropriate measurement and verification. And, by appropriate here we mean it has to be enough to make sure that the savings are really being done and what's being claimed is truthful and accurate. And, it will help design programs as well as ensuring recovery and rewarding the appropriate parties. But also we want to make sure that that does not go too far where such a high bar is set on measurement and verification that it would disrupt the flow of energy efficiency as even short delays can cost the country millions or billions of dollars given the entire size of this opportunity.

Slide 24: Important Observations

Phil Farese: Our final observation, which was again almost a corollary to the report, is that we see the need to foster the development of next generation energy efficient technologies. We did state in our formal analysis "with currently available at commercial scale" opportunities, so we did not really look at technology development. But, suffice to say, as we look back over time, we see that investing in R&D is a very cost effective way to bring new technologies to market, which can be brought to scale and save energy costs after a fashion.

Slide 25: Central Conclusion of Our Work

Phil Farese: So, in conclusion, I'd like to remind you of the central conclusion of our work. That is that energy efficiency offers a vast and low-cost energy resource, but that these significant and persistent barriers need to be addressed. They are, however, very much worth addressing, as the size of this prize is tremendous. We're talking again about in present value terms $1.2 trillion in benefits for only $520 billion in costs. If you think about this as an investment, it's upwards of 20 to 30 percent, though it varies tremendously by the particular measure you pursue. Finally, this would save the nation 9.1 quadrillion Btus of energy—that's 23 percent of what we would be projected to consume in 2020. And, as an auxiliary benefit even when you think about it, as we are focused on the economics more so than on the carbon savings, you nonetheless get a whole 1.1 gigatons of greenhouse gas abatement.

Slide 26: Contact Information

Phil Farese: With that, I'd like to thank you for the opportunity to speak today. I've put up the contact information where you can download the report and also our email addresses. These are the authors of the report, and our email address format there is FirstName_LastName@McKinsey.com. We'd be happy to talk about any of the states or any of the regulators with how we can help take advantage of the findings of the report and the tools that we've created to help you understand these in the future. Thank you.

Catherine Morris: Thanks a lot, Phil. Phil told us in advance that this presentation was really designed for 60 minutes, but he did a great job of squeezing it into 45, so we have enough time left for you to ask specific questions. And, I'll let you know that if you do go to download the presentations, we did put an executive summary of the McKinsey report there as well, so you can download that.

Questions and Answers

Catherine Morris: We've got a couple of questions that came in online, and I want to encourage people to continue to use the question box on their control bar and send me questions, and I'll make sure they get answered. And, please, if you have questions for Priya as well, I'll make sure she gets them. And you can also unmute your line using #6 if you want to ask a question.

So, I'm going to kick it off, Phil, with a question that came in about the program cost. You mentioned early in your presentation that the McKinsey report does not really include program costs as part of the cost-effectiveness analysis. And one of our participants noted that some of the states really are starting from ground zero—they have very little in the way of energy efficiency programs, and the start up costs and the time required is pretty significant. And you mentioned, I think a little later, that it could be up to 10 to 30 percent in program delivery costs. In looking back at the study, do you think that would make a significant impact on your results?

Phil Farese: There's certainly a caveat for that. I will just flip back to that one page we have in here. [Shows Slide 20: To Deliver the $1.2 Trillion in Savings Will Require $520 billion in Upfront Investments.] Again, surprisingly, if you are talking about 10 to 30 percent, even at the high end of that you'd be increasing your $520 billion present value to something like $670 billion. Still, the total benefit is vastly beyond that, right? Again, you are almost to a cost-to-benefit ratio of two-to-one.

I point you to Exhibit 40 in our report, the main report, where we actually did attempt to look at forecasting different program types—so codes and standards, labeling of different types, direct paying of incentives, and then the third-party deployment such as the weatherization assistance program—and we put in a wide range for each of those. Again, I caution here, as you mentioned, a lot of the states—and I would say, the entire industry—is trying to figure out how to do these things effectively. California is a natural leader here, as is Vermont. And typically those utility commissions and even the utilities there—as they are non-competitive across the states—are pretty forthcoming with what they've learned and the best approaches.

So, for example, to pick on one of our sponsors… If you think about PG&E, they quickly found that—when they were doing a lighting program, once they figured it all out—moving from direct rebates on coupons for compact fluorescent light bulbs that they would have had to mail in or have electronically sent, etc. was very costly. Instead, they leveraged that up by going to Best Buy or Home Depot and setting it up through them and using some kind of electronic system there. It drove down the cost tremendously. And so there are a lot of things you can learn there and, I would say, the information is there. You could look at Form 861 filings, which are required filings by the utilities about their programs. I believe actually Chuck Goldman at Lawrence Berkley National Laboratories has done some work on some of this stuff as well and is a great resource that is available.

Catherine Morris: Any one else want to jump in before I move to online questions?

Pierre duVair: Hi, this is Pierre duVair with the California Energy Commission. Is it alright if I go? I've got a question regarding the CO_2 emission factor used for avoided electricity consumption. It's been a huge topic of discussion here at the California Energy Commission for a number of years now, and we have a group still working on potentially coming out with a methodology paper soon on the topic.

It's enormously complex. We've used a number of different emissions factors for CO_2 avoided for reduced electricity, and we've had a wide range from… We've had a Climate Action Team that used 690 pounds per megawatt-hour as sort of a system-wide marginal generation versus average generation that you can get reported from individual utilities—like PG&E for 2005 estimated that their annual average electricity had a footprint of about 616 pounds CO_2 per megawatt-hour. Oh, I'm sorry, PG&E's is 489. SMUD is 616. If you look at eGRID just for the California mix, the 2005 number was 724 pounds. And then if you look at LA Department of Power and Water, they are close to 1,200 to 1,300 pounds. And that's again just an average annual. Any particular energy efficiency program may be much more peak shaving, and what we hear from our electricity office is typically it's marginal generation that's backed down which, per the California grid and the WEC, is combined cycle natural gas.

So, in addition, any sort of savings is going to reduce any renewables requirement down the road, which is based on a percentage of total electricity demand, so you've got to account for reduced demand for renewables. You have huge swings in hydro, which has a dramatic impact on what the annual generation mix is out here in California. So, just a lot of questions around assigning that avoided GHGs to that particular avoided megawatt-hour.

Phil Farese: I completely agree that this is very much a case in which the devil is in the details. As the report was basically about the economics of the energy savings, we did not go deep into the analysis of that. We took a system average in the range of what you were saying. I forget it off the top of my head, but I think it's around .6, similar to the 690 you mentioned, so 600 or so.

Pierre duVair: Which is low for a national average, right, which is much more coal-based than we are here?

Phil Farese: We were based on the EIA, and if you look at the EIA's numbers, that is the average reduction, so we did not get into… You're exactly right, if you want to do this right, I would say not only do you have to think of time of use and what particular measures you're using, etc. You really need to think about what is the full life cycle carbon cost of things, which is something people aren't even thinking about right now. So, I completely agree that the carbon savings is notoriously difficult to calculate. Nonetheless, most of these things are completely motivated by their energy savings alone, which is a much surer ground to stand on.

Catherine Morris: Priya mentioned in her presentation that there is a lot of comparison between the state potential studies and the McKinsey and EPRI study as well. I'm wondering if you can talk to how these national potential reductions break down at a regional level. Did you look at that at all when you were doing your study?

Phil Farese: Yes. Actually, I didn't go into too much detail about the power of the tool we had done. I mentioned that we had 21,000 microsegments. So, again, begin restricted to publicly-available data, you basically use NEMS—the National Energy Modeling System—which is actually at the residential, commercial, and—in a sense—the division level, all nine. And for industrial at the regional level, so four. As a result, Exhibit 4 actually in our report lays this out at the census region level, so we did the South, the Midwest, the West, and the Northeast.

Interestingly enough, although the opportunity in Btus varies quite dramatically across them, with the Southwest having the largest absolute potential with 3,650 trillion Btus, they actually have the smallest percent savings of only 22 percent. The Northeast, which has the largest percent savings at 24 percent actually has the smallest absolute savings of 1,400 trillion Btus. So, we do have it at that level and, again, for those interested in getting into more detail, the model goes down all the way to 21,000 segments. So we could say, for example, for low-income homes in—I'll pick on California because you just spoke, no offense—in the Pacific region, those who are in homes built before 1940, here is their typical consumption and here are the measures that you could do to be effective in those homes.

Catherine Morris: Other questions? #6 to unmute your line. Well, one of the other questions that we had teed up on the agenda was: You've looked at a full range of solutions, and I'm wondering if you looked at the specific policies that states are already using or already have in place to see how effective they've been.

Phil Farese: We did not go as far as effectiveness. Again, we were focused on what's the size of the prize and what are the things that are available. But, I guess personally I would say the jury is still out on what the most effective policies are when you look at the actual savings and the costs, etc. That is something that the nation is still trying to figure out. The beauty of the federal system, if you will.

But, again, if are trying to make decisions as to what to support as commissioners or what others or utilities are thinking about, I would point to Form 861 filings and to check Goldman's work—two other things that are available on the topic. I guess the other thing that I would say that is important is this is a case where you almost have to do all of it. We really don't think there is going to be a silver bullet. This is a case of silver buckshot. So, there's a role that codes and standards will probably play. There is a role that the weatherization assistance program could well be expanded to.

Actually, that is a good one to pick on for a moment. So, if you were to look at what has the weatherization assistance program done to date. If I was to remember, actually, I believe I might have it in this report here. Let me see. Here it is [Shows slide of Low-income homes.] They have captured about 13 percent of what is the target of what we call the low-income home. Under ARRA and, as many of you may be aware the process is still getting started here, that is going to be expanded by seven percent over the next few years. And this is again one of the very successful projects, one of the more large projects that's been delivered over time, but it still has only captured—even after ARRA—only 20 percent and you've got 80 percent to go. And so, with numbers like that, there's still a lot of learning to do. And, frankly, again, you're going to have to comprehensively do this. You're going to need to do the weatherization program; you're probably going to need codes and standards; you're going to need innovative financing to buy down some of these things; you're going to need education and awareness, labeling, and etc.

Catherine Morris: Thanks. Other questions?

Phil Farese: We do have ample time, so don't be afraid.

Catherine Morris: I think when I tell people that we're recording the call, it kind of makes them more sheepish.

Pierre duVair: Hello, this is Pierre again. I'll jump in a second time with one for Priya. It's a question regarding the ARRA funding. We've got a group here in our office that's dealing with trying to set up the EM&V or the monitoring of the energy efficiency savings. But I'm curious whether the U.S. EPA is working with DOE on how to estimate the GHG benefits of some of the efficiency programs under ARRA.

Priya Sreedharan: Well, I'm not sure I'm the best person to answer that question, but as I understand, DOE really is sort of taking the lead on all of those efforts. We do have an informal conversation with our colleagues over there, but they're certainly taking the lead. Julia, do you have anything to add on this issue?

Julia Miller: Yeah, I'm not the best person to answer that either. I know we are talking to them about that, but as far as the specifics, I couldn't speak to that.

Pierre duVair: Do you think you're reviewing their proposed methodologies for how to estimate the GHGs?

Julia Miller: Again, I would just say that we are having sort of an informal dialogue. We have had some informal conversations, for example, related to the expenditures on Smart Grid technologies. But, again, it's sort of an informal relationship in that we work with them on different kinds of projects and they know that we're interested in the environmental perspectives, so from time to time they'll discuss that issue with us. I will also say, Pierre, that Kathleen Hogan, who was in charge of all of the efficiency programs here at EPA actually recently moved to DOE and she's working on these issues over there. So, she certainly knows what the resources are here and she certainly knows the work going on over there.

Pierre duVair: That sounds good. I mean, use of a national average obviously isn't really appropriate. The question is really how do you get more specific local or regional numbers for GHG benefits of efficiency.

Julia Miller: I can have someone follow up with you on that if you'd like.

Pierre duVair: That would be great because the person who sits right next to me is working on our monitoring and evaluation of the ARRA efficiency programs. That's all under development, so it's pretty timely.

Julia Miller: Okay. I'll ask someone to follow up with you.

Catherine Morris: Any other questions? I'm not getting any questions online, so please do jump in. Well, let me ask, Phil, if states are looking to try to transfer the information that McKinsey has uncovered, particularly in terms of potential and some of the policy recommendations. How can they best take advantage of your work at a state level?

Phil Farese: Excellent question. I would say there's a few things in here. Again, drawing on some of the core charts that I displayed, one thing as you're thinking about planning these programs: Are the programs likely to overcome all of the barriers that a particular opportunity faces? Naturally, to get these programs started, they don't actually need to overcome all of the barriers. There are going to be some early adopters as there are in any cases, but as you walk up that S-shaped adoption curve for energy efficiency, if you really want to get significant penetration, you're going to need to make sure you comprehensively address these barriers. That has, again, the challenge of designing the programs well. It also has the benefit of getting some time to feel it out if you will. Where you shouldn't be discouraged if you try a building labeling thing and you get quick uptake but then get stuck. The next step is: What do I need to supplement that with? Is it an on-bill financing program?

Again, to pick on some of the solutions that we love, some of the emerging ones, the Long Island Green Homes is very attractive. They actually in Long Island were able to carve out of their solid waste budget—I can't remember how much it was for… $10 million dollars, however many millions of dollars—which they then are using to ideally retrofit or eventually retrofit the entire community, if you will. They are going house to house using those funds to completely pay for the upfront investment to deliver energy efficiency. They then save through on-bill financing and the shared savings replenish that fund and move on to the next house. So, exactly the right approach. It also illustrates one of the challenges of solutions, which is scaling that up. With the fund size that they have—there are millions of dollars of upfront investment and there are about 60,000 residents, if I remember right—it's going to take them around 500 years to fix all of those homes. So, it really shows you the magnitude of the money and the size of the pot that you need even though it is economic and will pay back. You've got to get it started quickly and you've got to get it up to scale. So, that's one thing you can do is look at your programs and see if they are going to comprehensively go after the barriers.

Similarly, I would say, looking at the supply curve, you could understand is this a cost-effective thing? And people gravitate very quickly to some of the sexier more visible things such as window or wall insulation. Whereas, programs that are going to encourage or set as default the setting on the PC in your office so it turns off at 8 PM and turns on at 6 PM, well before anyone gets to work, are going to save a tremendous amount of energy in a very cost-effective way. So how do you prioritize against costs in that fashion? And, then, finally, I would say, if you look at Chapter 5, we talk about a bunch of the policy levers there. We kind of lay out a bunch of areas where they have all of the policy tools at your disposal, such as codes and standards, building labeling, etc., and we discussed where they've been used in the past and give a perspective on what opportunities still remain.

If I'm allowed to ask a question, I would say, what do people find are the greatest challenges that they face when trying to think about energy efficiency in their service territories?

Catherine Morris: Any reactions? #6 and you actually have to unmute your phone too. I've found that that's been a problem. People think that they are talking, but their phone is still muted. While you're thinking, do you have any advice for the states that are in the process? A lot of states have set targets of achieving all cost-effective efficiency or a certain percentage of load reduction. Do you have any advice about how they can translate that? You talked about some of the regional differences…any advice about how they can take the potential information from your study and use it specifically in their state at a state level?

Phil Farese: Certainly. So, let me give first an answer about process. So one of the few things that we've found in talking to various players in the field here is it's very important to get the definitions clear up front and stick to them, if you will. So, understanding what cost-effective means or how are you evaluating the energy saved, which… Frankly, we talked about how hard carbon was; even harder is trying to figure out the value of energy saved. Is the kilowatt-hours saved from a lightbulb worth as much as the kilowatt-hours saved from an air conditioner knowing the different individual load curves and when the energy is consumed by each of those devices? Knowing what the load stack is for your particular territory you're looking at can be challenging, so you need to have, again, clear rules about how that happens. I would say that you don't want perfect to be the enemy of good, so you need a workable solution that's not going to get too technical, but that is sufficiently accurate. And coming up with that definition and then agreeing on those definitions will allow much more robust and risk-free assurance in the decision making of how people prioritize these opportunities and go after them. Similarly, what you're going to hold people to.

If I think about our report, we are—and sometimes I feel unfortunately—a private entity, so we are not actually releasing the core data or the tool that we've created. Again, we are happy to talk with states about entering into our usual form of doing engagement with someone to understand what opportunities might be there in using that tool. But much of the data, again, is publicly available, and we actually expect that at a state level there may be even better data available. So, understanding how you could go about prioritizing your opportunities and understanding your barriers, I think if you look at the clusters we've developed, the only remaining step—which is sufficiency challenging—is to understand what would consumption look like in your territories now and what are the technologies you can employ to figure out what are the cost-effective measures. And then the question is who is the right actor, if you will, and what is the right assistance to get them to act to figure that out.

Catherine Morris: Thanks a lot, Phil. I'm going to give you the folks on the phone one more chance before we close out, if you have any remaining questions for either of our speakers

Phil Farese: If you do think of any others, you are welcome to call or email. Again, my contact information was shown up earlier and is also available, I believe, in the report.

Catherine Morris: Okay. Well, as Julia mentioned, our next topic is going to be on Bioenergy, and hopefully we will have a date soon.

Phil Farese: Thank you very much. That was great.

Julia Miller: I would actually, Catherine, I just want to mention really quickly… So, EPA and DOE have worked together on this National Action Plan for Energy Efficiency, and we do have several resources available related to barriers to energy efficiency and all sorts of guidebooks. We also have a Rapid Deployment for Energy Efficiency Toolkit that may help folks actually develop programs, and those are on our Web site. So, it's www.epa.gov/cleanenergy.

Catherine Morris: And maybe one other note. Over the summer some of you responded to a survey—not a survey, a questionnaire—that we asked you to give us some input on topics. And we just wanted you to know that McKinsey's report came up as one of the topics you most wanted to hear about and Bioenergy was almost the second in place, so we are trying to be very responsive to your particular interests. We'll continue to take any feedback on topics you want to hear on these Tech Forums from month to month. So, watch your email inbox for the date for our December Bioenergy Tech Forum. Thanks again for joining.

Julia Miller: Thanks, Priya. Thanks, Phil. Thanks, everyone.

Phil Farese: Thank you as well for the opportunity.

Julia Miller: Bye.