

Jumpstarting Combined Heat and Power Initiatives in the United States

—Transcript of a webinar offered by the Clean Energy Solutions Center on 11 November 2013—
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Webinar Panelists

Bruce Hedman	Institute for Industrial Productivity
Katrina Pielli	U.S. Department of Energy
Dwayne Bregger	Massachusetts Department of Energy Resources
Michael Worden	New York State Public Service Commission

This Transcript

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Sean Esterly

Global Energy Laboratory and welcome to today’s webinar hosted by the Clean Energy Solutions Center. We are very fortunate to have Dwayne Breger, Katrina Pielli, Michael Worden, and Bruce Hedman joining us. This outstanding group of panelists will be discussing the topic of “Jumpstarting Combined Heat and Power Initiatives in the United States.”

One important note of mention before we begin our presentation is that the Clean Energy Solutions Center does not endorse or recommend specific products or services. Information provided in this webinar is featured in the Solutions Center’s resource library as one of many best practices resources reviewed and selected by technical experts. Now, before we begin, I just want to go over some of the webinar features. You have two options for audio. You may either listen to your computer or over your telephone. If you choose to listen to your computer, please select “mic and speakers” option in the audio pane. By doing so, you’ll eliminate the possibility of any feedback and echo and if you select the telephone option, a box on the right side will display the telephone number and audio PINs that you can use to dial in and panelists, we just ask that you please mute your audio device while you’re not presenting and if anyone has technical difficulties with the webinar, you may contact the GoToWebinars Help Desk at 888-259-3826. Now, we encourage anyone from the audience to ask questions throughout the webinar. You may use so by submitting your questions in the “question pane” of the GoToWebinars panel. Now, if you have any difficulties viewing the materials at the webinar portal, we will be posting PDF copies of the presentation at cleanenergysolutions.org/training and you can follow along. So, the presentation should be posted shortly and then, within a week or two of the presentation, we will have an audio recording of the presentation posted to the Solutions Center training page.

Now, as for our agenda today, we have a great agenda that is focused on exploring how the federal and state governments are leading promotion efforts to increase the use of CHP in order to achieve their environmental goal. Now, before the speakers begin their presentations, I'm just going to provide a short informative overview of the Clean Energy Solutions Center and then, following the presentations, we'll have a question and answer session led by Bruce, and then, we'll wrap up with closing remarks and a brief survey.

Now, this slide provides a bit of background in terms of how the Solutions Center came to be. The Solutions Center is an initiative of the Clean Energy Ministerial and is supported through a partnership with UN Energy that was launched in April of 2011 and is primarily led by Australia, the US, and other CEM partner. Outcomes of this partnership include support of developing countries through enhancement of resources on policies relating to energy access, no-cost expert policy assistance, and peer-to-peer learning and training tool such as the webinar you're attending today. There are four primary goals of this Solutions Center. It serves as a clearinghouse of clean energy policy resources. It also serves to share policy best practices, data, and analysis tools specific to clean energy policies and programs. Third, the Solutions Center delivers dynamic services that enable expert assistance, learning, and peer-to-peer sharing of experiences. Then, lastly, the center fosters dialogue on emerging policy issues and innovation around the globe. Now, our primary audience is energy policy makers and analysts from governments and technical organizations in all countries, but we do also try to engage with the private sector, NGOs, and civil society.

Now, one of the more key features that the Solutions Center offers is the "Expert Policy Assistance." So, the "Ask an Expert" service is a valuable no-cost service offered through the Solutions Center with established broad team of over thirty experts from around the globe who are available to provide remote policy advice and analysis to all countries. For example, in the area of Smart Grids, we are very pleased to have Julia Renaud of industrial efficiencies serving as our expert. So, if you have a need for policy assistance on industrial efficiency or any other clean energy sector, we encourage you to use this useful service. Again, it's provided free of charge. So, if you are to request assistance, you may submit your request by registering through our "Ask an Expert" feature at cleanenergysolutions.org/expert. We also invite you to spread the word about this service to those in your network and organizations. So, in summary, we just encourage you to explore and take advantage of the Solution Center's resources and services including "Ask for Policy Assistance," subscribe to our newsletter, and participate in webinars like this.

Now, I'd like to provide some brief introduction for our great panelists today. First up, we will be hearing from Bruce Hedman with the Institute for Industrial Productivity and then, following Bruce, we'll hear from

Katrina Pielli, a Senior Policy Advisor to the US Department of Energy's Deputy Assistant Secretary for energy efficiency. Next up is Dwayne Breger, Director of the Renewable and Alternative Energy Division with the Massachusetts Department of Energy Resources and then, our final panelist today is Michael Worden, Chief of Electric Distribution Systems with the New York State Public Service Commission. So, with those brief introductions, please join me in welcoming Bruce Hedman to the webinar.

Bruce Hedman

Great. Thank you Sean. Hello everyone. My name is Bruce Hedman. I'm the technical director at the Institute for Industrial Productivity. I'd like to welcome you all to this third in a series of webinars on industrial energy efficiency that IIP is sponsoring with the Clean Energy Solutions Center. If we could go to the next slide, please.

Again, I'm very pleased to be here to present and also to moderate a panel that really is on the front lines of developing and implementing innovative policies to promote CHP as a clean energy and really as an energy efficiency resource in the United States. Each panelist has sort of a different view and plays a different role in promoting CHP looking at it from both federal and state and local perspective. So, I think it will be a very lively and informative panel discussion as we move forward. If we could move to the next slide, thank you.

My role, besides serving as a moderator, really is to kick off the discussion by setting the scene with some very brief background material on CHP in the US. We have a number of people on the line from outside the US so we just wanted to make sure that we set the stage with a little information on the current status and future potential for CHP in the United States and what some of the issues are with CHP development. If we could go to the next slide.

First, I'm going to start off very briefly with a quick introduction to IIP, the Institute for Industrial Productivity. IIP was started in 2010 as an independent nonprofit organization. Our role is to accelerate the uptake of energy efficiency practices in the industry. We are part of the climate works network and we identify—what we do, our mission is to identify and share best practices for industrial energy efficiency technologies and policies and we provide technical assistance to implement effective policies, technologies, efficiency measures, and financial approaches. We are based here in Washington, DC, but we have offices in Beijing, New Delhi with projects in those countries and also, an office in Paris where we interact with the European Union. Our focus, actually, is on industrial energy efficiency primarily in US, China, and India. These three countries represent almost fifty percent of total industrial energy consumption in the world. So, we're trying very—you know, most of our efforts are at promoting energy efficiency measures in those three countries. If we could go to the next slide, please.

Now, to the topic for today's panel, combined heat and power. What IIP feels is a very significant energy efficiency opportunity in many countries around the world. I suspect everyone on the call or webinar knows what combined heat and power, what used to be called co-generation is, but just in case, CHP is an integrated energy system that's located at the place of energy demand, the factory, or building. It's basically on-site generation where the heat normally lost in the production of power is recovered for use of the site for heating, for cooling, for dehumidification process needs. CHP really is more of a practice than a single technology. In fact, CHP can utilize a variety of fuels and technologies including biomass, landfill gas, process, waste streams, waste escape. The fuel depends on what you have available at the site. The technology depends on what kind of thermal demand you have and what kind of fuel you're using. So, it really is sort of, in our feeling, a collection of energy efficiency practices. Next slide, please.

CHP offers a number of benefits as a clean energy option and they really all center from its efficiency advantage and I'm sure most or everyone on the webinar has seen some schematics to this, but the benefits of CHP. CHP is more efficient than separate generation of electricity and heat and that efficiency comes not only from the use of heat normally wasted in power generation, but it's also by generating that power at the point of use and eliminating line losses and giving that power from the power plant to the user. This high efficiency normally translates into what we're operating costs, but it does require a capital investment. Higher efficiency reduces emissions of oil pollutants. CHP can also increase energy reliability and enhance power quality and on-site electric generation can reduce grid congestion and avoid distribution cost. So, there's a whole series of benefits. Alright. The next slide, please.

I just really want to know about those benefits. It's important to note that many of them affect not only the user, but the society as a whole. The user gets, yes, reduced energy cost and improved power reliability, but the environmental benefits of reduced energy use and lower emissions, not only of greenhouse gases, but criteria pollutants, and the other benefits for public safety that include keeping critical infrastructure up and operating at times of emergency. These are benefits that are really for the society. The user obviously gets some of that, but the society as a whole gets those benefits and not many of these societal benefits get monetized for the user to help offset the capital cost and increase maintenance cost that CHP typically involves. Next slide.

I put this slide in really to demonstrate that some of the societal benefits of CHP can be significant. In this slide, I'm comparing the energy and CO2 savings of a ten-megawatt natural gas fire at CHP system. You can see the assumptions below the table. Compared to a ten-megawatt utility scale PV solar system and a ten-megawatt utility scale wind generator, the savings are based on displacing all fossil generation average values in the US coming from the EPA eGRID database and you can see what the heat rate

and CO2 factor is and for natural and for CHP, also, the benefits come from displacing a natural gas on-site boiler. The difference in energy savings and CO2 savings of these three technologies or practices really comes from the annual capacity factor, the fact that CHP normally is base-loaded in an operation. It follows the needs of the user. So, it generates a lot more power during the year and also, CHP is also providing thermal energy and eliminates the need for an on-site boiler or for a fuel going into an on-site boiler. Again, looking at the energy savings and the CO2 savings, I put this up not to say that CHP is cleaner or better than the other two options because, quite frankly, if you compare it to a varying grid averages and things like that, the relative position will change. I want to point out that CHP, a fossil fire technology or fossil fire practice, has energy and CO2 savings on the same order of PV and wind and really other clean energy technologies that are out there that currently get a lot of support from governments around the world. Next slide, please.

To be clear, CHP is already an important energy resource for the United States. We have about 82.4 gigawatts of installed capacity at 4,200 industrial and commercial facilities. Eighty-seven percent of that capacity is in industrial applications in the US, but there's a growing amount of interest and capacity going into commercial and institutional applications, hospitals, universities, multi-family housing, nursing homes. Over seventy percent of this existing fleet is natural gas fire and you can see on this slide that it provides us significant existing capacity. It provides us significant amount of energy and CO2 savings already. Alright.

In the next slide, you know, the next question is 'Okay. You've eighty-two gigawatts of CHP currently installed, what's your potential for more?' This was a picture of the technical potential for additional CHP in the US and this is based on the work done by ICF International for DOE and EPA. The blue line—the blue portion of the bars represents existing CHP in electric capacity. The green is technical potential. In our stretch, it's technical. It's not screened for economic and that green represents about a hundred and thirty gigawatts of additional technical potential in the US, split between industrial and commercial institutions. Alright. You can see large potential and industrial applications even those with significant existing capacity and large potential in commercial and institutional applications that don't have a lot of existing CHP experience, which is an issue in the market place.

The next slide really tries to address the obvious question of 'Where are we on the path to developing a technical potential for additional CHP?' Well, quite frankly, the CHP market has been tough in the US for the past eight or so years. Volatile natural gas price in early 2000s changes to the whole sale power market around that time and financial uncertainty has sharply curtailed growth in CHP since about 2005, but the situation really seems to be changing and for three emerging reasons that are emerging drivers. First, we in the US are fortunate to have a game-changing outlook for natural gas supply and price here in North America. The current prices

in natural gas are very low. They're decoupled from world oil prices and we're looking at what we think gas prices in the four to six-dollar range for the foreseeable future. Along with that, the second emerging driver is the benefits of CHP really are starting to be recognized by federal and state policy makers and then, on top of that, there are significant opportunities being created by environmental drivers in the US and also, growing interest in how CHP systems can address grid resiliency power reliability in times of natural and manmade disasters and we'll hear about them in a little bit. The circled green bars all the way over on the right really are an indication that the market is changing. These are CHP systems announced under construction and expected to be in place by the end of 2016 and we're looking at right now over four thousand megawatts of those facilities. My final slide, if we could go to that.

You know, a great outlook for CHP, a lot of potential. There are still significant barriers in the market. There's financial uncertainty. There's a capital available. What's the long-term price track of electricity and the fuels you might use? There's technology uncertainty. Some of these markets are—there's not much familiarity with CHP in many of the new market segments. There's regulatory uncertainty about how CHP may be covered under greenhouse gas regulations, trading schemes, state level and that kind of thing and there's always utility uncertainty and uncertainty about utility attitudes. Where the CHP fit into their plans? CHP can be represented by laws of revenue to utilities. So, they've been generally neutral or sometimes, negative about CHP. So, how can that be turned around and impacted? That's really where federal and state policies come in helping alleviate some of these uncertainties, reducing the risks, and making the decision to move forward with CHP even a little bit more easier for the user.

At this point, if we could go to the first presentation of the panel, we'll get into some of those details of what federal governments in the US is doing and what some of the state governments are doing to promote CHP because of some of the benefits I talked about. First up, I'd like to introduce Katrina Pielli, Senior Policy Advisor in the office of Energy Efficiency and Renewable Energy at the US Department of Energy. I've had the pleasure working with Katrina for the past ten years while she's been a tireless voice for CHP within the federal government, first at the US Environmental Protection Agency and now at DOE. Katrina will give us an update on federal policies that have recently been initiated to promote CHP in the US. Alright. Katrina, I'm turning it over to you.

Katrina Pielli

Great. Thanks Bruce. I appreciate that kind introduction and thanks everyone for your time today on the webinar. We can move to the next slide, please.

So, let's just illustrate some of the primary scenes that we are observing across the US and actually, very similar two things that Bruce just mentioned. We really continued to view federal and state policy as a

critical piece to advancing CHP. It really creates the framework in which end-users and others will make the decision to actually invest in CHP. Bruce did talk about the low-cost of natural gas, which continues to drive an increased interest from folks that are interested in CHP worsening and up-taking that certainly. The energy savings, the associated benefits, really, that lead you right into the jobs hooked, which is really important for the states and others and also, as we look at manufacturing, reshoring, and sort of the renaissance of how we describe it, it's a great opportunity to really link economic development to CHP. Certainly, there's also an increased link there when we talk about shale gas extraction in various parts of the country and then, there is this new, I think, resurging interest about community planning, district energy, and microgrids that use CHP as an anchor. This is important as we look at increased reliability and resiliency. Also, a number of cities looking at local energy. Also, the microgrid component is an opportunity to look at the role of CHP in forming intermittent renewable resources as well and then, again, resiliency and reliability. Next slide, please.

So, as we look at those scenes and other current issues that we're looking at across the energy sector, we really are sort of highlight some of the changes that are happening outside of CHP when we talk about the extracted closure of about around forty-nine gigawatts of coal capacity in our power sector through 2020. Also, looking at, again, the low-cost natural gas and last month, in October, it was the first time since February of 1995 that the US oil production actually topped our oil import. So, we are facing a very different energy future than we have in recent years. There are low wholesale electricity prices, which can create a tough market for CHP, but again, when you pair that with lower natural gas prices, that doesn't prove the picture. When we talk about resiliency and reliability, there are recent severe storms and extreme weather that we have experienced here in the US that have led to a number of folks really taking a second look or a fresh look about CHP and as well as in the district energy or district heating and cooling system or a microgrid. As Bruce said, we did have a gigawatt nearly that was installed last year. This was the largest single year since 2005 and we do expect that to continue to grow as we look forward and again, I'm harking back to the trends that we just described. So, next slide, please.

The federal government really does continue to recognize the important role that CHP can play in our energy future and one way—I think a very high level that was illustrated is this executive order. Next slide.

This executive order was something that the president issued last year and has really been a bell that had been rung that brings people together. It's really an all hands-on deck to really focus on achieving the multiple benefits that CHP can provide. It is part of the president's approach to all energy strategies and it does focus on removing the barriers and accelerating investments in a way that benefits all stakeholders. Next slide.

This executive order has really resulted in sort of an increased focus from the federal government, but also, an increased focus across the country from the state and others. What it did for us is it set a national goal of achieving forty gigawatts of new CHP of the next decade and that's about fifty percent of more than we have today. It directs DOE and EPA and other federal agencies to continue to work with the states, with the utilities, with the industrials, and other important entities to again adopt best practice policies, look investment models, consider the government can help through technical assistance, education, and market transformation. Next slide.

The forty gigawatts would result in about a quad of energy savings. It would reduce CO2 emissions by a hundred and fifteen million metric tons and provide forty to eighty billion dollars in the capital investment in the manufacturing and other sectors, which again harking back to the job angle here. Next slide.

One of the most important ways that the department has really ramped up or engagement in CHP is the continued focus at the regional level through our regional technical assistance partnership or CHP TAPs. These are regional experts that provide the three services you see on this slide, market assessment, education and outreach, and technical assistance, and all of these are designed to help prime the pump and provide unbiased technical fuel neutral and summation and to help people understand the benefits the CHP can provide to them. Next slide.

That was a quick snapshot at the federal level. We will circle back to that, but at the state level—next slide—an important way that DOE and EPA are engaging around the state and local policy is through something we call the “SEE Action Network,” which is state and local energy efficiency action network. This is a group of over two hundred leaders that are focused on overcoming the barriers to energy efficiency and achieving all cost-effective energy efficiency. The graphic you see on the right here are the different working groups that have been formed to overcome these barriers and produce solutions to achieve greater energy efficiency. Next slide.

Through the industrial energy efficiency and CHP working group, this group did put out an important report that looks at successful implementation of state CHP policies and it covers the policies you see here on the slide, which focus largely on the utility sector and opportunities there to encourage CHP as an energy resource looking at the roles CHP can play in state energy targets and goals and then, as I mentioned, it sort of just focused on resiliency and reliability, how CHP can play with critical infrastructure as well as looking at the role of our electric and gas utilities. The next step here, again harking back to the executive order, is focused on running a series of state workshops with commissions to focus on these policies and how do we continue to work with them around best practice policies and investment models. Next slide.

There's an important regulation that the environmental protection agency issued in December focused on industrial boilers and one of the ways that DOE participated—next slide—was to really recognize that there's an opportunity as some of these facilities who currently burn coal or oil might be looking at upgrading to come under compliance for the CPA regulation that if they switch to natural gas, their compliance halfway may be more attractive to them and many of these same manufacturers, if they put the natural gas, how to appropriate thermal loads and other characteristics to make CHP a viable opportunity. So, the help really makes sure that we didn't lose this opportunity where these folks may invest in just straight-up natural gas. We thought 'Let's undertake an outreach effort, technical assistance effort, to help make sure that they're aware that natural gas CHP could not only help them achieve compliance with the EPA regulation. It could also help their plant become more energy efficient and it could also provide them with a positive economic return over time.' So, what you see here are the preliminary findings from this technical assistance effort that we've been running for about a year now and we've contacted over five hundred and thirty-five companies and what's important here is that we've got over eighty of these plants that we're providing technical assistance to help them consider CHP. We think that this is just one more feather in our cap as we continue to really provide the market transformation effort and solid technical assistance. We will continue to track this technical assistance and we'll be putting out a short document in the New Year. Next slide.

So, one of the ways—next slide, please—that the congress is actually showing leadership is they did pass, again around December, a legislation that directed DOE to actually undertake a new report and a study. Next slide, please, slide fifteen. Thank you. This directed the DOE to, within two years, do a study looking at the legal regulatory and economic barriers to greater industrial energy efficiency as well as developing policy recommendations around how we increase deployment of industrial energy efficiency as well as DOE making a proposed regulatory guidance to states and federal agencies and what you see here at the bottom of the slide is that the congress defined industrial energy efficiency to include CHP and this is important as we think about again the executive order, which defined the industrial energy efficiency to include CHP. Next slide.

So, what the congress told us to do is look out key barriers and you'll see a synergy between these key barriers and for example that SEE Action report. It also directed us to look at successful examples not only from the US, but also from private sectors as well as international successful examples. It really highlights this as things that should be given greater attention across the US as well as undertaking an economic scenario. What would happen from an economic benefit standpoint if there was a matching grant program? Then, finally, the way that DOE is moving forward with implementing this report to congress is through convening a stakeholder group that's providing input to us and we are on track to meet

the congressional deadline to deliver this report to the congress and the study in December 2014. This is just one more way again that state and federal policies really are creating an important framework by which investment in CHP is taking place. Next slide.

Again, in DOE, we do a lot of technical assistance as I mentioned, but we also focus on providing important strategic funding opportunities. Next slide.

One way to highlight this is through some competitive award that we offer to state energy offices and here, we're getting ready to announce these awards very soon, which was a competitive opportunity for the state to raise their hands and propose a way that they wanted to assist across their state with again developing programs and strategies to increase the investment of CHP and industrial energy efficiency that could look at different policy opportunity, regulatory, or market barrier. Next slide.

We have a current funding opportunity that is on the street right now. Letters of intent are due December 10 and this is focused on the Federal government leading by example. So, again focusing on Federal facilities that are government owned, different opportunities here to increase the use of CHP and renewable energy and this FOA is called AFFECT and it dedicates \$5 million to helping Federal agencies develop this projects. There's a link here at the bottom that you can get more information on but the good news is that as part of achieving this goal we are using all of our technical assistance resources that I mentioned previously to help make sure that that folks who are interested in putting in a letter of intent how to write the information. Next slide.

Then from a new innovative RND standpoint our loan programs office has a current solicitation that they have early information out about. This will be \$8 billion dollars in loan guarantee authority that focus on advanced fossil energy technologies and they've identified CHP and waste heat recovery as qualifying project under the Energy Efficiency Improvement category. These are projects that would reduce greenhouse gas emissions and that would employ significantly improved technologies. This is something again that's worth coming but there's notice of information out now where you can learn more and again that's \$8 billion dollars. Next slide.

So, one important way again that sort of Federal and state are working together. These are just a few of the exciting development that the state level where we see real leadership. In Maryland, two of the investor-owned utilities are running very impressive CHP incentive program. They one for example has been oversubscribed had to go back to the State Utility Commission and request additional funding because they had such a great response to this incentive program for new CHP in the state. In Illinois, the state energy office included CHP in their 3-year program filing. Again, this could be an opportunity for Illinois state government to

lead by example and this would be public sector incentive where they could be approved and what were still leading on that determination. In Minnesota, this is a great opportunity that sort of combines again district energy, microgrid, and CHP. This would allow the waste heat recover to be used as a way to really contribute towards the utilities energy efficiency goals to their conservation goals. In Texas, there's a couple of interesting bills here that would really allow CHP to have a greater opportunity in an industrial park for example. So, selling electricity and thermal to multiple customers that are near each other without really having to go through a lot of the hoops that exist now and then finally again back to this idea of resiliency critical infrastructure, at Texas still requires the State Energy Office to issue guidelines about how a state entity who is a critical infrastructure would have to consider CHP when they did a significant renovation or construction project. Next slide.

That theme of resiliency, again just to sort of continue to walk this thread through, is something we're seeing increase interest in not only from state legislatures like in Texas but for mayors, different state planners, and governors energy offices certainly. What we are seeing is that there's a resurgence to learning about this successful microgrid or district energy opportunities in the state that exist now at US campuses, universities, military bases and when we think about how to grow this as an opportunity in the US there is a focus on regulatory reform and I'm looking at opportunity for the utility, the electric utility, the gas utility that actually see that as an attractive opportunity. I did want to give a shout out here at the bottom you see too the International and District Energy Association who is doing a lot of work in the space and continues to really be a great advocate for this work. Next slide.

At the Federal lever again responding to a lot of this ground flow. The hurricane Sandy that hit the eastern US there was a Federal task force that was convened to really try to do a number of things and one of the things they did was to issue a rebuilding strategy and over the summer they highlighted two recommendations that specifically focus on how CHP and district energy can really help ensure that when we rebuild we do it in way that is the most resilient. I list these two here: one that focuses on critical infrastructure again and one on the electric grid policies and standards. Next slide.

In building on that DOE in partnership with the Environmental Protection Agency and HUD which is Housing and Urban Development issued a guide very recently that focuses on how you actually design and use CHP for reliability and resiliency in buildings and this is designed firstly in local policy makers and decision makers who are going to be involved in the rebuilding process. It talks about providing practical information or how you actually configure a CHP system to operate independently from the grid. What does that mean? It talks about the link between district energy and CHP. Next slide.

Here is just a quick snapshot again of some of the things that you can learn about in this guide where you can download it and want to take a second look at that. Next slide.

The background if you're interested in learning more about how some of the specific CHP systems actually operated during some of these severe weather events and blackouts since 2003 you can learn about that in this report here which it details case studies, specifically about how these systems were able to ride through the storms, some of their design characteristic. So, next slide.

This is just where you can learn more both on the executive order on our SEE Action working group as well as our DOE/CHP program and I'd be happy to provide you with additional information if you wanted to get in touch with me over e-mail. So, with that I'd like to turn it over to Dwayne from Massachusetts who will take over the webinar from here. Dwayne.

Dwayne Breger

Great. Thank you Katrina, and thank you to the organizers for inviting Massachusetts to be part of this webinar. It's my pleasure to introduce the listeners to some of the policies we have in Massachusetts that are really designed to promote and accelerate the insulations and adaption of CHP. I say that with also keeping in mind that we've had modest success, which I'll get to towards the end. It was pointed out earlier there are clear barriers still with regard to information, knowledge, and stimulating interest in CHP that we're still trying to break down but we have fairly an interesting policies to share with you in Massachusetts and then towards the end I'll also get into a couple other specific initiatives where we're working on energy resiliency, energy security where CHP plays an important role. So, next slide please.

Here's an overview of the policies we have in Massachusetts with regard to CHP and essentially they fall into a two categories. I think people recognize it. CHP is an interesting technology and that as policy frameworks go, it often involves either in energy efficiency programs or renewable or alternative energy programs and in Massachusetts we actually have a two separate but additive programs; one in our Energy Efficiency Programs and one in our Alternative Energy Programs both of which support Combined Heating Power. So, it's an overview. First is our Energy Efficiency Program, which go by the umbrella name of MASS SAVE, which is a Utility Energy Efficiency Programs. I had some background there as a result of the Green Communities Act in Massachusetts in 2008. Utility companies were essentially mandated to fund all cost effective energy efficiency activities. These are supported through System Benefit Charge on Massachusetts ratepayers as well as funds that we receive through the Regional Greenhouse Gas Initiative auction of carbon allowances. Importantly though in the 2008 Act, it allows for a de-coupling essentially so that the utility companies are held harmless essentially on energy efficiency measures to the extent that they reduce their electricity sales. They do recover the cost of lost revenue

through de-coupling. So, since that time obviously utility companies have actually taken an interest in CHP and are working with us in trying to promote a CHP technology. In this energy efficiency programs, Combined Heating Power also in the 2008 Act importantly CHP was included for the first time as an energy efficiency measure so that brought in a CHP opportunities for utilities to work with as part of their requirements to provide energy efficiency services. Essentially those in a MASS SAVE program, Combined Heating Power project need to pass a benefit cost test which I'll get into in a moment to be able to receive funds through the energy efficiency funds and that program provides enough fronts, a rebate or grant for Combined Heating Power projects. Separate from and different from that is the performance-based incentive, which is through our Alternative Energy Portfolio Standard. This APS program operates exactly the same and in conjunction with more typical Renewable Energy Portfolio Standard (RPS) programs. It creates an obligation on all the retail electric suppliers in Massachusetts to acquire a certain number of Alternative Energy Certificates from qualified generators. The Minimum Standard for the APS program is 3% in the current year and increases up to 5% by 2020. Importantly in RPS programs, in APS programs is the Alternative Compliance Payment rate, which gives you a sense of the ceiling price of the certificates, and give a sense of the incentive value of the program. In the case of the APS program, the ACP rate, it started \$20. It's been going up with inflations, so it's a \$21, since some change in 2013. So, certainly is a lower incentive value within our class one RPS program but nonetheless it's a performance-based incentive and we'll get to that in a moment in terms to how that calculation is made but essentially what it translates to is sufficient revenue for CHP projects. They are qualified to maintain an operation maintenance sort of cover the operation maintenance cost associated with CHP projects. So, it's a significant and important revenue stream that is helping the CHP projects move forward. In the Alternative Portfolio Standard there are a series of our list of technologies which are eligible up with the program but what's important is that essentially all and I'm talking 99+% of the qualified generation and the certificates that are contributed or supplied to the APS program does in fact come from CHP projects and these are typically for the most part natural gas driven and CHP projects but we do also have a couple of biomass and anaerobic digester, a CHP project as well. So, the next slide please.

So I want to go into just a few slides and detail on these two programs. First, for the MASS SAVE Energy Efficiency Program, again this was enacted or enabled in the Green Communities Act in 2008. It does provide a rebate incentive structure, so for small systems it's essentially a rebate of \$750/kW. For larger systems, the rebate is up to \$750/kW but the actual amount that's awarded to a project depends on the Benefit/Cost Ratio that's established up with the project as well as available funds from that utility company that's available in that time period to support the Combined Heating Power projects and also importantly the rebate is

limited for the larger projects to no more than 50% of the installed cost. The Benefit/Cost Ratio is important and is done with a fair amount of engineering detail that is work, that's a combination of the utility companies, engineers working with the project developers to reach a consensus on very careful, essentially hourly modeling of the CHP system to provide a benefit/cost analysis that is looking not so much at the benefit/cost of the project itself to the host customer but the benefits and cost to the project to the social society in general meaning particularly the utility and distribution grid. This is done as I mention on a case-by-case basis with a fairly sophisticated engineering analysis. Certainly only high efficiency CHP units typically those that are thermally driven are likely to demonstrate the necessary Benefit/Cost Ratio greater than 1 in order to be eligible for the Energy Efficiency funding. If I can have the next slide please.

In terms of the recent outcomes and truthfully the last year that we have to report as 2011 on this but typically for projects that have been awarded MASS SAVE incentives and grants this typically have a Benefit/Cost Ratio certainly above 1 and in between 1 and 2 but also importantly is at least in 2011 CHP units—I should mention the utility companies have different energy efficiency targets in terms of savings for different sectors. So, the commercial/industrial sector where most of this CHP applications apply. CHP has become a relatively important contribution to these utility companies in meeting their Energy Efficiency Targets. In 2011, CHP itself represented 30% of the targeted savings for the utility companies and furthermore it was demonstrated that the \$/kWh savings provided by the CHP systems were amongst the lowest of the MASS SAVE measures. More information on the MASS SAVE Program is available at that link provided. If I can have the next slide please.

So, transferring over to the Alternative Energy Portfolio Standard, which again is a separate but additive incentive program that is a Combined Heating Power Project, can get a MASS SAVE rebate as well as see qualification and get incentive to the Alternative Energy Portfolio Standard. Again, this was established in the Green Communities Act in 2008 and DOER provides the regulation for the APS Program in the citation given there. Amongst the eligible technology I did mention there are a number of other technologies these include flywheels, gasification, paper-derived fuels, and various other things but what's important here again is that CHP has really been the dominant supply that has come in to the Alternative Portfolio Program. I will say that the program as a whole still remains under subscribed. That is we have a shortage of Alternative Energy Certificates being generated, so there is a fair amount of reliance on Alternative Compliance Payments. So there is a lot more headroom and actually a need on our end to really encourage more CHP to fill in the available compliance obligation in the Alternative Portfolio Standard. If I can have the next slide please.

This provides an important slide which I won't go through in detail but really I think provides what we put together in Massachusetts in terms of being an innovative policy approach in terms of how to award performance incentive value to a Combined Heating Power Projects and we did not want to—we really were after what is the essence of the attribute associated with Alternative Energy Certificates that are provided under the Alternative Portfolio Standard and in the case of CHP it's not so much that the electricity that are generates from the MW capacity of the generation unit but it's really what actually Bruce was getting at earlier in his slides, it's really the efficiency gains that are provided and therefore the greenhouse gas emissions, another pollutant emissions, and energy reduction in fossil fuel dependency and so forth that were after in terms of what is the value added provided by Combined Heating Power Projects. So, what we've done in Massachusetts is provide or award Alternative Energy Certificates through this formula which is at the bottom of this slide but essentially is derived by looking at serving an electric load and a thermal load in the case of the diagram at the top without CHP and then supplying the same electric load and the same thermal load with CHP and essentially looking at the energy savings that is the difference between the overall energy input from those two different options. So, if you subtract the fuel input from meeting those loads without CHP and subtract from that the primary energy input from the serving the same loads with CHP that difference is essentially the number of MWh of energy savings and that is what's awarded in Alternative Energy Certificates. So, it requires a fairly sophisticated calculation and a projection of what given the performance of the CHP system over the course of the year my office with the project developer we help them work through what the expectation would be with regard to how many certificated one would expect to generate in the course of the year. Obviously, then there's metering requirements and the actual number of certificates that's awarded in the course of the year or actually on a quarterly basis. It depends on the actual performance. If I can have the next slide please.

So, to help in that process we do have guidelines for Combined Heating Power Systems for the Alternative Portfolio Standard. This provides a guideline with regard to what the metering requirements are essentially for the fuel input, for the electric output, and for the thermal output which is more of the trickier part of it but I will say that within our guidelines we do have metering requirements which are relaxed for smaller systems that really can't afford some of the metering requirements with the accuracy that we require for larger systems. What's also important in the regulations for the eligibility of CHP for the alternative portfolio standards that we do very much support what we refer to as incremental CHP that is incentives for an existing all electric power plants or all electric facility that decides to add useful thermal load to their output that just takes some of the thermal energy that was otherwise dumped to the environment and use that as useful thermal energy, we do provide incentive through the program for that as well as the case of a thermal-only facility or units that

adds electric generation through that pressure steam turbo or something like that and adds electric generation. They can get eligibility and incentive value for that incremental energy savings. With regard to eligibility we do require that the CHP Projects do serve thermal loads in Massachusetts, so geographically that's limited to Massachusetts systems that are real close to the boarder at least. What I mentioned before we do certainly allow CHP units to qualify for both programs: the Alternative Portfolio Program, which provides a performance-based incentive over time, as well as the rebate program associated with MASS SAVE. We provide here in the link a link to the guideline for CHP eligibly for the Alternative Portfolio Standard. If I could have the next slide please.

As I mentioned before, we have certainly seen an uptake in the installation of Combined Heating Power in Massachusetts but yet admittedly the progress is slow and steady. At the beginning, of the launching of the Alternative Portfolio Standard as well as the Green Communities Act and ability for Energy Efficiency Funds to be spent on CHP we did see and uptake in 2008. These are actually a number of projects, larger academic institutions, some of our university campuses, public and private that were in the earlier adopters and early installers of CHP and some significant-sized CHP Projects. Since that time we've seen and I also state, you know Massachusetts does not have a large industrial base as many other states do so our CHP while we have had some success and certainly some of are larger industry much of our focus is on academic campus type of sites and as well as commercial installations working very closely with housing and particularly public housing to look at sort of more packaged scale CHP units. So, we've been working hard on this. Again the uptake has been modest and we are recognizing some of the challenges we have particularly with regard to easy access the financing particularly for smaller projects not necessarily the large industrial projects but for smaller sort of packaged CHP units as well as really just more information and technical knowledge gap of the commercial housing sort of applications that really are not that directly attuned to opportunities that CHP offer. If I could have the next slide please and my final slide.

We are in this came up in Katrina's presentation as well. We certainly do our working and recognize and are starting to work a fair amount. I do believe were some is behind on what you'll hear coming up from New York and some of the other states but the issue of energy resiliency, energy security is definitely very much in front of our office at this point and a substantial interest of the governor as well. There are three areas that are particularly of interest and are helping to drive this interest and work forward. The first is through our Department of Public Utilities. There has been a recent convening of a working group and with a Steering Committee working on grid modernization. Asking a lot of questions and beginning to layout which the DPU will soon issue a notice a docket basically to put together a plan moving forward on modernizing the grid included in that but obviously that incomes there's a lot of other issues as

well but certainly included in that is specific opportunities and work on CHP/district energy, microgrids, etc. The second I will say from direction from the governor and from our secretary, we are very much looking at a significant initiative moving forward that we will be announcing in the near future with regard to energy resiliency for critical infrastructures particularly looking at working with our cities and towns to develop opportunities and funding for energy resiliency and critical infrastructures. This is really being driven by our Climate Adaptation initiatives that are under our Global Warming Solutions Act and the Clean Energy and Climate Plan, which is really directed to secretariat to look at and to begin to provide activities on Climate Adaptation. The last thing I'll mention is that we have launched a Massachusetts Military Base Energy Program where we are working with our 6 Department of Defense military bases in Massachusetts where we are working really and recognize that we both between the commonwealth of Massachusetts and the Department of Defense we have very similar objective and goal with regard to energy security, renewable energy goals as well as greenhouse gas reduction goals and this was a great opportunity to work with our military bases to assess Clean Energy opportunities and Energy Security, Reliability, Resiliency, and at the same time reducing greenhouse gas emissions and supporting renewable technology. So, that's an ongoing activity that will take place and continue for the next 6 to 9 months.

So, with that again appreciate the opportunity to provide this information on Massachusetts and let me at this point turn the program over to Mike Worden from the New York State Department of Public Service. Thank you. Mike.

Michael Worden

Well thanks Dwayne. I too would like to thank the organizers for inviting New York to participate in this session. I hope the participants on the online are finding it useful and informative. Next slide.

Just to give you an overview, I'm going to talk briefly about some of the CHP background and funding opportunity for New York State and then I'm going to talk about the impact of Sandy on New York State, followed by discussion of resiliency. You'll hear me as I talk today, I'm going to talk about CHP but you'll hear me use the terms DG, microgrids, somewhat interchangeably because the focus of my presentation is on resiliency and the efforts we have underway to improve it. Next slide please.

The CHP funding opportunities we have in New York State are run by Nysesda. Probably many of you have heard of them. As part of the programs that we have underway right now, there are six criteria that we look at for CHP applications. And you'll note the first two are resiliency and reliability. The ability to one, when the grid is down is one of the elements that has to be in there for CHP projects to move forward in New York State. Obviously energy efficiency, environmental impact, and

energy security and cost savings are all important as well. Next slide please.

We currently have two funding opportunities. They're broken down by size as you can see on this slide but the total is \$100 million dollars from 2011 to 2015. The reason for this is that we see CHP as an important part of ensuring reliability and resiliency of the grid. So, we're trying to add more funding. This is significantly increased over what had been there in previous years. Next slide.

I didn't wanna go through all these slides but if anybody is interested, there is a link to the slides that I just put up there from a previous webinar and also a link to Nysesda. Next slide please.

This is kind of what a grid, microgrid, looks like circa 1888 in New York City. Yup. Keep in mind that obviously we moved away from these kinds of small grids for a couple of reasons, two of which were reliability and resiliency. So, in order to have more reliability with interconnected and I'm sure you were or were all aware of the interconnected nature of the grid, the big grid, and by and large that's a very reliable grid but now we're seeing that there are some benefits to having some of these smaller grids that can have more flexibility than this large microgrid could have. Next slide.

I just wanna go through a few slides from Sandy and you know, Sandy was really a game changer for New York State. Irene, Hurricane Irene, happened in 2011. We thought that was a very severe event and then along came Sandy and made Hurricane Irene seem like it wasn't that significant event. Obviously both of them were significant but Sandy presented some difficulties that we hadn't seen in previous storm events. This is a picture done on Rockaway Beach and you can get a sense of the destruction that was there. Next slide please.

This one is really telling. This is next to a Con Edison substation area in Manhattan. It gives you a good sense of the amount of water that was faced down there during this time. Again, totally unprecedented. There'd been a lot of efforts made to add resiliency to protect these substations from these kinds of events in the future but the one thing, you know, we're pointing out is that the utility can maybe protect their stuff but it's important that customers protect their stuff as well. Next slide please.

Again, just another shot to reinforce what I mentioned on that previous slide. Next slide please.

This is a picture of Red Hook back in October 2012. So, the purpose of showing these slides is that it's important that you identify your critical load and it's important that you protect it. Obviously there were cases in the Long Island in New York City area where there was back up generation and it couldn't operate because maybe the controls were in the

basement or the fuel source was in basement so it's important that you recognize all the obstacles that are in place in order to make your system more resiliency. It's also important to have a contingency plan in the event something does go wrong. We find a lot of times that some of the operators of various DG systems do not have a good contingency plan and that's a critical element to have. Next slide please.

So, I wanna put a little bit of a footprint on Sandy and you can see over on the right hand side there how long customers were without servers. So, we're seeing NYSEG ten days, ORU, 11 days and while all of you don't necessarily recognize who these companies are, it affected virtually all of New York and, the most severe areas were out for two, two and a half weeks. So, if you gonna have a CHP system and it's gonna be resilient, it needs to be able to function under these things. We need to be able to get fuel and have a fuel source. Obviously your equipment needs to be able to operate when the grid is down. Those are things you need to consider as part of your development for a DGCHP type system. Next slide please.

This final slide here picture shows the flood footprint from Sandy. What I would point out is that there is an area up in middle New York State area called [Indiscernible][1:06:08] and also experienced similar flooding type damage. While this is the footprint for the flooding, the footprint obviously for Sandy and for Irene was much bigger. It took all of Long Island, all of the New York City metropolitan area up into the central part of New York State. So, the footprints of these storms that we've been seeing recently are huge and are really changing' how we're looking at the need to do resiliency, not only from the utilities but as customers look, to look to have distributed generation systems. They need to be cognizant of these things. Next slide.

I just wanna touch briefly on some of the distributed generation models that we see. A backup generation maybe that you might see with a hospital, maybe it's a form of a distributed generation. They're taking care of themselves. They just have to worry about what's going' on with their one facility. What we see a lot of in New York and others I've heard or Katrina mentioned some of this kind of stuff as well, is what we call the campus model. We use the term campus 'cause it's easiest to describe when you think of a campus with seven, eight, nine buildings and they're all interconnected together. They have a generation on the source. This is a pretty common model that we see on a regular basis in New York State. And it's pretty well defined how you can do that.

What we're seeing a little more of now is two things. One is what's called "virtual net metering" and the other is a modified campus model that we have in New York City. In these two models, the buildings that they're on, the campus if you will or whatever, are not interconnected but they're all there in their own space and it's more of a paper transaction. The downside of the virtual net metering or the Con Edison Campus model is

that you don't have that interconnectivity and therefore you don't have the resiliency.

So, you know... the reason for pointing this one out is that when you're gonna do something like that you need to be cognizant of what it's gonna do to your resiliency and whether it's really what's best for you. After Sandy, the governor appointed several commissions to look at things that could be done to improve response and resiliency in New York State. One of them was what's called the 2100 Commission. They issued a report and one of the significant themes in there was the benefits of using distributed generation and/or microgrids to enhance resiliency. The reason it's important to point this out is that going forward the more that an entity can put into her package it just piece it up and makes it more sellable. Ultimately we're looking at things going forward to be bigger, more fully integrated into this utility system and to the customer system. Next slide please.

One of the questions is how do you fully integrate these things, you know. Ideally you would want the best of both worlds. You wanna be able to island the system, operate on your own, but you wanna be able to provide support to the grid if possible, and, you wanna get into ancillary services. We don't see a lot of that right now but we feel like that's a direction that it needs to move to improve the funding capabilities of these sources. Ultimately it's preferable for these to be fully integrated with the utility system because it benefits the grid and from our perspective, we're looking to benefit not only the grid but customers. We don't want customers to be out, you know, no matter how you look at it.

We're looking to have the system be more resilient and more reliable from an overall perspective. Recognizing that, it is important that we protect the integrity of the grid. Obviously we don't wanna to be stopped with customer's equipment that harms the grid and we don't wanna do stuff with the grid that harms the customer's equipment, so, you have to follow certain interconnection requirements. We have standardized interconnection requirements in New York State and these are things that you know in the past have been viewed as a barrier. I think we've made significant progress in trying to make them more efficient. So... Next slide please.

So, I just wanna throw out a couple of things for people to be thinking about. One thing we ultimately wanna do is to make DG cost-effective without incentives. You know, that's the ideal world. It's got to be self-sustaining over time. You know, right now gas prices are low but incentives are high. You know, I recognize wholesale prices are down but retail prices aren't down. So, we need to work on our means of identifying the benefits of DG. You know, it's hard to quantify the benefits on a societal basis and that's something that I think we really need to do if we're gonna push things further and make them more cost-effective. We do have a study underway in New York State to look at microgrids in

particular but CHP is a significant component of that, to look at them and one thing we're really analyzing is how to come up with a benefit-cost analysis that's useful and can be supported. So, a final question that I raise is, should certain costs be socialized, protecting critical services or does every project have to stand on its own?

Next slide.

So what's the future for DG? It's clearly not what we saw in the late 1800's version of power system but I think it's gonna be evolved into a hybrid of some distributed generation systems, microgrids if you will, and the traditional grid. I think it's gonna be an evolution that's gonna take time, and technology is gonna play a role into that evolution. Thank you very much for the opportunity to speak and I'd like to turn it back to Shaun for the Q and A.

Sean Yes and thank you very much to all the panelists for the great presentations. We did receive quite a few questions from the audience during the presentation and I will be turning over to Bruce who will be moderating and presenting those questions to the panel. So, Bruce, go ahead.

Bruce Great, Shaun. Thank you. Again, as Shaun said there are a number of questions that have come in. We got limited time. We'll try to address as many as we can directly but I do believe that we've committed to answer those questions by email that we don't get to today so... Give us a day or two to do that but if you have a question that's not answered, you should get an answer.

The first question, Katrina if it's okay with you, I'd like to direct to you. We had several comments and questions come in about the role of utilities. Utilities can make or break a CHP project, the interaction with utilities. There are many issues. There are standby rates. There's interconnection. There is access to the market for access power. What is the federal government doing to try to address some of these issues and is there progress on the horizon?

Katrina Thanks and thanks for that question. I certainly agree with you that the role of the utility in facilitating CHP is important. I sort of flashed up there the C-action guide and in that document in particular we do spend some time discussing all of the policies that Bruce just mentioned—standby rates, interconnection, and interconnection with export. And here, the focus is for helping utility regulators understand how to implement these policies in a way that would help them achieve the intent of the policy.

Our approach in working on these topics at the state level is certainly not to ever prescribe one solution. There are many different solutions and our job is to try to understand the best practices that are happening across the country, make sure that we are able to understand those, coalesce them,

and highlight them to others. One example in particular I mentioned is regional CHP technical assistance partnership. They are engaging at the regional level on some of these topics. For example in the Midwest we're working with a couple of states there as they consider changes to their standby rate. There are a few examples and we'd be happy to talk offline.

Bruce Okay. Thank you. Any comments from people down at the state level about utility interaction and how to make it more of a win-win situation?

Mike Gordon This is Mike Gordon. In New York State we largely divested of generation years ago and so the biggest thing we can do to imple... Well, and the other thing is we have revenue decoupling so the utilities don't have an incentive not to [Indiscernible][1:15:57] project but the interconnection has been a significant thing and we've made... done a lot of work to make that smoother. But I think one of the things we're talking about now is whether we need to change the paradigm in terms of what utilities could do in this whole microgrid arena and so I think that's gonna be an involving thing.

Dwayne Yeah and this Dwayne from Massachusetts. I would suggest Massachusetts in sort of a similar situation. We do have decoupling as I mentioned so utilities certainly are not held harmless with regard to the installations of CHP and to the extent that they have energy efficiency targets that they need to reach. We do find just more recently actually that some of our utilities at least are actually interested in working closely with us to see how we can work together to help implement more CHP to help them reach their targets.

Bruce Great. Thank you. Dwayne, the next question is for you actually so two-part. One I think is a pretty response and then sort of about your program and more I think thoughtful question about how this all fits together. But first one is, your programs, the portfolio and the energy efficiency, is that only for investor-owned utilities or is it municipal utilities and others as well?

Dwayne Sure. Okay so for the energy efficiency programs, those programs and the requirement of the utility companies to invest in energy efficiency and to use the system benefit charge which is collected and provided to the utility companies [Indiscernible][1:17:46] the government has oversight of how those monies were spent but the monies go to the utility companies, the investor-owned utility companies, and they're required to oversee the energy efficiency services that's often done through third parties in their utility territories.

The municipal light districts, which I'm guessing is maybe about 20% of the electric load in Massachusetts, they do not have the same requirements but they can opt in to the energy efficiency programs or they can adopt their own but they're not regulated to do so. On the alternative portfolio standard, that obligation, the compliant obligation is on both the utility...

they regulate the utility companies for the basic service, which they provide to customers in their territory but then it also... The same compliant obligation is also on the competitive electric retail suppliers who serve load directly to customers, mainly industrial commercial customers, and both of those basic service and the competitive supplies are both about 50% of the electricity sales in Massachusetts.

What was the... Sorry. What was the... Was there a second part of that? Hello?

Bruce Uh-oh. There I am. Massachusetts has sort of embraced incorporating CHP both into its APS and its energy efficiency portfolio standard or program. Many other states sort of are concerned that putting CHP in an energy efficiency program or energy efficiency resource standard will sort of take resources away from more conventional energy efficiency programs. I mean what's your experience and thoughts on that concern?

Dwayne Sure. Yeah. Great. Um well, let me first say that Massachusetts has been very engaged in the energy efficiency activities ever since our restructuring in the late 1990 so we've had a long history of doing and working with utility companies to do energy efficiency work. The energy efficiency plans, three-year plans that the utility companies proposed and then get approved, are divided into targets that need to be made in the different sectors—residential, commercial/industrial, I believe low-income is a separate sector as well.

So, most of the CHP is in the commercial/industrial sector and I will stay with the relative success I should point out from my department that Massachusetts has been number one in energy efficiency according to the ACEEE rankings for the last three years so we've had tremendous success in implementing energy efficiency. I think one could say to the extent that especially in the commercial/industrial sector much of the low-hanging fruit in terms of energy lighting retrofits as well as improvements to pumping power and so forth. Variable speed pumps have, to a large extent, already been implemented. So, at least to meet those energy efficiency targets in the commercial/industrial sector, it's actually been harder and harder for the utility companies to find activities to meet those targets. So, I think to that extent we're not necessarily crowding out some of the other conventional energy efficiency measures. To a large extent those have already been implemented or there's less of them to be done that remain. To that extent, I think actually combined hidden power is sort of one of the technologies in this next level of opportunities that the utility companies are really looking towards.

Bruce Okay. Thank you. Michael, there have been a couple of questions coming in on a couple of things that you said. One was how do you get a CHP to become self-sustaining without growing the market, without subsidies or incentives, but also sort of parallel to that, you know, there is a great value

for grid resiliency but how can you monetize that sort of societal value for those projects that can support the grids, sort of two sides of that question?

Michael Yeah. There's what you call the ice model that's out there that was developed by one of the national labs and that's been used to identify some of the societal benefits and put a price tag on them. I would encourage anybody that's interested in looking at that to... If you just put in "ice model" in Google, I think it would pop up. You know, it's important for the grid stuff if... you know, I think over time we're gonna see more applications where it's not a standalone campus-type thing trying to deal with its own issue but rather looking and integrating it with some of the steps going on the grid. I think that's the way kind of a model we're moving towards. You know, we're looking at some various applications as we speak in New York to do kind of a community grid type of thing where it's more than, as I said, more than just a simple application but looking at a thing where you can basically add resiliency to the grid and through tools like this ice model you'll be able to price that out and make your project more attractive.

Bruce Okay. I guess pulling the same fret on societal benefits and things, do any of the other speakers have some thoughts on how to do that and I guess Dwayne, let me start with you. In your energy efficiency program there's a cost-benefit ratio that systems have to pass. Are there any specific societal benefits that are in that cost-benefit test?

Dwayne Yes there are in that analysis and let me preface by saying that I'm not the expert at my office here on that issue so there was a link on my presentation that I think folks can go to to get more information on that but I will say that in the benefit-cost analysis that's done primarily driven by the engineers at the utility companies, they do look at—and this is why they sort of go through essentially an hourly simulation of the project. They are looking very much at the impact of the project on shedding peak energy demands that serve social benefits and not just the potential demand charge reductions of the host customer of the CHP project. So they look at... They certainly look at those issues. I believe they also look at the impact of having that distributed generation on that distribution feeder line and how that can provide benefits and whether there's also benefit with regard to any upgrade that were anticipated on that distribution line. I would say the other... They also look at benefits with regard to emission benefits as well, air pollutants as well as greenhouse gas emissions.

Bruce Okay. Great. Thank you. Katrina... Go ahead.

Sean I just want to let you know. We have about two minutes left for questions so maybe one more or... Then we'll move on to the survey.

Katrina Sure. I'll be quick. I just wanted to flag that the department will have some research coming out early in 2014 looking at CHP and cost effectiveness

specifically looking at the five different typical cost paths that are used as utilities and states are looking at running rate [Indiscernible][1:26:28] program so stay tuned for more information on that coming out of DOE.

Bruce Katrina, there's also... there had been a couple of questions on the DOE report to Congress that you covered in your talk. It's gonna cover a lot of the hurdles and the barriers that we talked about today. Exactly how do you think... I mean what will Congress do with that I guess?

Katrina Yeah and that's a good question. Really we think that reports like these [Indiscernible][1:27:00] we report to Congress are useful of course for congressmen and their staff but obviously we hope that this will be picked up and used by others across the country really so state, advocates, end users, etc. So we hope to have an impactful result from this report that hopefully will ripple out far beyond Congress.

Bruce Shaun, I suspect we're near the end of our time. I do wanna point out that someone sent in that the ice model that Michael talked about can be found at www.icecalculator.com.

Sean Great. Thank you Bruce and thank you everyone else for the great question and answer session. I do just wanna remind all the attendees that maybe did not have their question addressed. I will be sending out all of the questions to the panelists so that they can provide their responses. Obviously give them some time to complete that but expect answers from them in the next couple of weeks. With that, I do just wanna thank everyone again.

We do have a brief survey, four questions for our audience. We just really encourage you to participate in the survey. It helps provide feedback to us and ways that we can improve for the future. Heather, if you'd like to go ahead and display the first question.

That question is, the Webinar content provided me with useful information and insight.

The next question: The Webinar's presenters were effective.

The third question: Overall the Webinar met my expectation.

The last question: Would you consider attending another IIP webinar?

Great. Thank you for participating in this survey and on behalf of the Clean Energy Solutions Center I just wanna thank all of the expert panelists and the attendees for participation in today's Webinar. We had a great audience and really appreciate your time for attending. I invite our attendees to check out the Solutions Center webpage over the next few weeks. We'll be posting the slides there, also an audio recording of the Webinar and then as I mentioned we will also be distributing any questions that went unanswered so that the panelist can respond to those.

We invite you to inform your colleagues and those in your networks about Solutions Center resources and services including the no-cost policy support. I hope everyone has a great rest of your day and we hope to see you again at future Clean Energy Solutions Center event. This concludes our webinar.

DRAFT