

# CHP: A Strategy to Meet Sustainable Community Planning Goals

Webcast Transcript

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## Introduction

Margaret Cook: I am going to now introduce our first speaker, Claudia Tighe. She is an economist with over 20 years in the energy industry working both on the supply-side and demand-side of the meter. As a consultant to federal, state and local governments, Claudia designed and evaluated numerous energy efficiency programs focused primarily in the residential and commercial sectors. She supported several DOE/EIA energy market surveys providing quality control support. Working with economic expert witnesses, Ms. Tighe supported written and oral testimony in the conduct of litigation related to electric utility antitrust, rate of return, and market analyses. Claudia also performed life cycle cost assessment of interconnecting renewable and traditional generating systems. She has a background in econometric modeling for the energy industry.

Prior to joining EPA this fall, Claudia was the Energy Analyst for Arlington County government in Arlington County, VA. For the county's climate change initiative Claudia was responsible for developing Building Energy Report Cards disclosing government building usage data; Strategic plans to engage the community in the climate change initiative including collaborative process for green workforce training program, pilot Home Performance with ENERGY STAR Program in Northern Virginia, and management of the Home Energy Audit Giveaway Program. As a Program Manager for EPA's CHP Partnership, Claudia is focusing on state and local, residential, commercial, and institutional markets.

### Slide 1: CHP: A Strategy for Sustainable Community Planning

Claudia Tighe: Thank you, Margaret and good afternoon everyone. Welcome to our discussion today focusing on how CHP technology can be a significant player in meeting the requirements of the American Recovery and Reinvestment Act of 2009 funds, frequently referred to as "stimulus money," and more broadly a player in strategic planning for energy efficiency and sustainable communities.

### Slide 2: Webinar Objectives

Claudia Tighe: This webinar will illustrate that CHP can be an effective, "shovel ready" option in energy efficient and sustainable strategic planning. In the past few months, state and local communities have had opportunities to receive American Recovery and Reinvestment Act of 2009, known as ARRA, monies through a variety of federal agencies. Our discussion today will focus on EPA's Climate Showcase Communities Grants and the DOE's Energy Efficiency and Conservation Block Grants, or EECBG, program grants. These two solicitations have directly supported the usage of CHP as a viable means to meet our need for proven energy efficiency technology, adaptable to numerous applications, with favorable investment paybacks. We'll give you an update of where these funding solicitations are in their process and where CHP fits in.

Just to give a little background for those in our audience who may not be familiar with CHP. Combined Heat and Power (CHP) is an on-site technology added to a generator, boiler or other engine to create both heat and electricity. The heat component, referred to as “thermal load,” can be used for space and/or water heating or to run chillers for space cooling. If a facility were to buy electricity off-site from a grid-based fossil fuel power plant and produce its thermal energy from an on-site boiler, the overall efficiency is about 49 percent. By utilizing the thermal energy otherwise wasted, as well as avoiding typical line losses during transmission and distribution, a CHP system can achieve system efficiencies up to 80 percent. These heightened efficiencies are what make CHP a viable player in this scenario. In addition to these efficiencies and their resultant environmental benefits, there are many economic, reliability and security factors that make CHP attractive.

Considering the diverse audience that we have today, I will begin with an overview of these two federal grant programs, their objectives, applicability, time frame, and current status. Next, Emma Zinsmeister of EPA’s State and Local Climate and Energy Program will brief us on two documents they have prepared: one on CHP’s role in community planning and the other on various federal agency funding opportunities available to state, local and tribal governments. Then we will hear from two localities, King County, WA and Stamford CT that are successfully incorporating CHP in their community plans.

Finally, we’ll talk about how the CHP Partnership is poised to provide the necessary information and assistance to entities to move forward.

## **ARRA Funding for CHP Projects**

### Slide 3: ARRA Building Sustainable Communities

Claudia Tighe: ARRA funds are meant to stimulate the economy with particular emphasis placed on modernizing our nation's energy infrastructure. It is seen as a mechanism to re-create vibrant, healthy, sustainable communities. Through funding opportunities and tax incentives, the focus is to support investment at the local, community level. The intent of these monies is to create sustainable market transformation by providing long-term energy solutions that are replicable, scalable and provide significant benefits.

The ARRA gives preference to activities that can be started quickly and completed expeditiously. Energy efficiency and conservation represents the priority to invest in the cheapest, cleanest and most reliable technology currently available that can be deployed immediately. CHP, also known as cogeneration, is a proven technology that can play a significant role towards achieving these criteria.

EPA, through its Climate Showcase Community Models, and DOE via its EECSBG energy efficiency strategies are supporting ARRA goals. The emphasis on models and strategies highlights the importance that this funding is meant to be a pathway towards energy market transformation, not just a "quick fix". These grants are provided directly to communities for them to implement sustainable community strategies to: reduce fossil fuel emissions, reduce total energy usage, increase energy efficiency in buildings and transportation (although, our focus here is on Buildings), and , improve environmental, economic, public health, and community benefits

### Slide 4: EPA's Climate Showcase Communities

Claudia Tighe: The objective of EPA's Climate Showcase Communities is to assist local and tribal governments to develop plans, conduct demonstrations, and implement projects that create models of cost-effective and persistent GHG emissions reduction strategies. The primary focus is to fund projects that achieve replicable, on-going reductions in energy and emissions. The overall goal is to share best practices with the public by funding projects that will serve as living laboratories of innovation and education. To this end, each award recipient will be profiled on-line with quarterly updates in order to serve as "living case studies." These grants are applicable to local governments, federally recognized Indian tribal governments, and inter-tribal consortiums.

### Slide 5: EPA's Climate Showcase Communities: Eligible Activities

Claudia Tighe: The solicitation listed 10 eligible activities within the Scope of Work, including: Energy efficiency, clean energy supply, transportation, land use and waste

management. Of these primary activities, CHP is directly eligible to meet the solicitation goals energy efficiency, clean energy supply and waste management.

#### Slide 6: EPA's Climate Showcase Communities (continued)

Claudia Tighe: EPA issued its solicitation last spring. The deadline for applications was July 22, 2009. EPA received 444 applications as a result of this solicitation. This resulted in a massive review process, whereby three reviewers assessed each proposal against a 100 point scoring system. About 15 applications specifically included a CHP component in their grant proposals, illustrating that applicants are seeing the value in CHP to meet their overall planning goals.

Twenty-five projects have been selected. The awardees will be announced in January. Recognizing the interest in these grants and the opportunity that they present to EPA to build further capacity showing best practices in the "field", EPA has been approved an additional \$10 million for another round of grant proposals next year. It is anticipated that this will be announced sometime in the spring. So please, stay tuned for further information on the website: [www.epa.gov/cleanenergy](http://www.epa.gov/cleanenergy).

#### Slide 7: DOE EECBG Program Grants

Claudia Tighe: DOE supports the ARRA's goals of sustainable communities by encouraging investment in the cheapest, cleanest and most reliable energy technologies available that can be deployed immediately. These reliable and commercially available technologies center around energy efficiency and conservation. EECBG assistance is delivered through formula and competitive grants to U.S. cities, counties, states, territories, and tribes as a means to empower local communities to strategically plan investments to meet long-term goals for energy independence and climate change leadership.

Up to \$2.7 billion in DOE formula grants were provided to cities and counties based on population, Indian Tribes, and States. Each state is required to sub grant as least 60 percent of its funding share to those cities and /or counties that were ineligible for direct formula grants from DOE. Up to \$454 million in competitive grants are available now. The competitive grants are seeking innovative state, local government and tribal investments to demonstrate fundamental and permanent market transformation whereby energy efficiency and renewables are the first choice option.

#### Slide 8: DOE EECBG Program: Formula

Claudia Tighe: Formula grants are provided to make strategic investments to meet long-term energy independence and climate change goals. Applicants could either utilize grants to develop their projects directly for the total available amount; or they could utilize a portion of their award to devise a community-wide strategy to meet EECBG program objectives. Grants could be utilized on internal government operations and/or community efforts.

Formula grant proposals were due to DOE in summer 2009. For those entities who are utilizing part of their EECBG money to develop their community-wide strategy phase, this could be a great opportunity to assess the feasibility of including CHP. Over 2,000 entities were eligible to receive this funding. To date, DOE has awarded more than 1,400 block grants, totaling over \$1.6 billion. This has been a monumental undertaking by the DOE. To see an updated listing of Grantees by entity, state, amount obligated and allocation totals, please see: [www.eecbg.energy.gov](http://www.eecbg.energy.gov).

#### Slide 9: Eligible Activities

Claudia Tighe: This illustration from DOE shows the 13 eligible activities under the EECBG Program. It highlights how DOE sees these activities fitting together in a community setting. As we look at the various activities, CHP applicability, as “highlighted” with an “asterisk” for illustration purposes, are in: Energy Distribution Technologies, Energy Efficiency Retrofits, and Reductions of Methane and GHG.

Because CHP can be a net generator of electric and heat, it can be viewed as a supply side option as well, so it could also fall with the eligibility activity of Renewable Energy Technologies on Government Buildings.

From a Policy and/or Planning Perspective, CHP has applicability to: Development of EE and Conservation Strategies and EE and Conservation Programs for Buildings and Facilities.

#### Slide 10: DOE EECBG Program: Competitive

Claudia Tighe: DOE’s EECBG competitive grants seek applicants willing to go beyond traditional public awareness campaigns and demonstration projects and other “one time” strategies. These grants will be provided to innovative state, local and tribal entities to demonstrate fundamental and permanent market transformation whereby energy efficiency and renewables are the first choice option. There are two topic areas for the Competitive Grants. Topic 1 is the Retrofit Ramp-Up Program. Under this topic, DOE is intending to reach “game changing” ideas focusing on a large number of buildings within a targeted area. The area does not have to be contiguous, and may be urban, suburban and/or rural. CHP, certainly in a district energy application, could meet these stipulations, as well as in an individual building applications either stand-alone or with shared heat and/or electric output in shared facilities.

The goal is to encourage programs of significant size to demonstrate economies of scale and/or critical mass in the deployment of energy efficiency and conservation building retrofits. Economies of scale can be reached via delivery channels, market segments or other means to attain wide-spread benefit beyond geographic focus. It is also intended that these be high visibility opportunities in order to communicate successes to a wide audience. Awardees are expected to create a comprehensive framework for building retrofits that includes financing, marketing, education, delivery, monitoring, and

verification measurement that can serve as a template for other communities. Recipients are expected to achieve a 5 to 1 ratio of leveraging for this funding opportunity.

Slide 11: DOE EECBG Program: Competitive (continued)

Claudia Tighe: Topic 2 for the EECBG Competitive Grants is General Innovation Fund. Topic 2 focuses on cities, counties and recognized Indian Tribes that were not eligible to receive the population-based formula grants. The General Innovation Fund is intended to help local community efforts to expand energy efficiency and reduce energy usage in commercial, residential, transportation, manufacturing, or industrial sectors. The eligible activities are the same as those for the EECBG formula grants. The long-term goal is for these funds to illustrate the financial viability of energy efficiency for future public/private financing opportunities thereby setting the stage for market transformation in the private energy efficiency lending market.

Funding Opportunity Announcement (FOA) for both topics 1 and 2 were issued October 19, 2009. Applications will be accepted until December 14, 2009. More information see “Solution Center” website [www.eecbg.energy.gov/solutioncenter](http://www.eecbg.energy.gov/solutioncenter).

## Overview of Presentations

Claudia Tighe: To get a better understanding of the specific role that CHP can play in sustainable community planning, Emma Zinsmeister is here from EPA's State and Local Climate and Energy Program. She will share with us the work her program has been doing with local and state governments in the CHP area. In particular she will talk about the guidance document they prepared to help communities identify CHP opportunities. This document provides technical information about CHP systems, the benefits of installing CHP, where they are most suitable in terms of reaping these benefits, etc.

Also, the State and Local Climate and Energy Program has developed a guide to renewable and energy efficiency opportunities for local and tribal governments with the ARRA monies. This document provides information on ARRA grant opportunities available to state and local communities from all the various federal agencies. It has a wealth of information including descriptions, eligibility, funding allocations, and program administration. Emma will provide much more detail on these two comprehensive reference guides.

### Slide 13: Case Studies

Claudia Tighe: For case study presenters today, we have chosen two communities that exemplify localities that have incorporated CHP in their sustainable planning process. These are localities with two different approaches to community sustainable planning implementation, both in the way they define their "community" and in their implementation approaches. Geographically, they also capture the planning processes on both the east and west coasts with divergent energy economics, utility requirements, and infrastructure.

### Slide 14: EPA's CHP Partnership Advocacy Role

Claudia Tighe: Finally, I wanted to share with you the continuing role that EPA's CHP Partnership will play in advocating for CHP in community planning. In addition to providing education and information on CHP, such as this webinar series, the Partnership also hosts a group of direct project assistance tools, such as: CHP Emissions Calculator, which compares anticipated GHG emissions from a CHP system to that of a "displaced" system that uses separate heat and power; Technical assistance for candidate sites including spark spread analyses, level 1 feasibility studies, 3rd party review of feasibility and design studies; An Up-to-date database of state and federal financial incentives; Technical White Papers and clean energy resource documents; and Analyses of strategic end use markets.

### Slide 15: EPA's CHP Program Going Forward

Claudia Tighe: Additionally, we will continue to keep you up to date on CHP Awardees via our website. We'll continue to pursue and analyze markets of particular strategic



value to CHP in the community planning setting, such as District Energy and Waste Water Treatment Plants, particularly in the context of biomass CHP. And in order to mirror the marketplace, we will continue to explore new opportunities such as those in the multifamily sector and more broadly in the commercial sector.

Slide 16: More Information?

Claudia Tighe: For more information about EPA's CHP Partnership, its benefits and how to become a partner, please visit us at [www.epa.gov/chp](http://www.epa.gov/chp) or contact me directly. Thank you very much. I will now turn this over to Emma to talk about that state and local program.

## **EPA's State and Local Climate and Energy Program and CHP**

Emma Zinsmeister: Thank you very much, Claudia. As Claudia mentioned I am from the State and Local Climate Energy Program and since our program today is focusing on communities I am going to share a little bit about what our program has to offer local governments as well as the role that local governments can play in utilizing CHP and energy efficiency and greenhouse gas reductions.

Slide 17: U.S. EPA State and Local Climate and Energy Program Resources for Combined Heat and Power Projects

Emma Zinsmeister: So, next slide please.

Slide 18: Communities Matter

Emma Zinsmeister: So as you all are probably well aware, local governments are experiencing a lot of attention at the federal level right now and it is a very unique time. The stimulus package has put forward a lot of money for projects at the local level and it is a tremendous opportunity for you to take these funds and really build comprehensive programs that can promote energy efficiency and climate protection well beyond the economic recovery period and help you to see benefits beyond economic stimulation and job creation. The EPA Administrator Lisa Jackson has also made communities a very high priority at the Agency and we are working on many fronts to help champion local interests at the federal level and support your efforts on the ground. And to that effect we have a lot of tools and resources within my program and across EPA to help engage, engage you in what is going on, and help local governments take advantage of the opportunities available and help guide you in how you may want to be spending your stimulus funds to get the most out of the spotlight that is now on communities. Next slide please.

Slide 19: Local Climate and Energy Program

Emma Zinsmeister: So, just to start off with a little bit about our program, the Local Climate and Energy Program is an informational and peer exchange network. We work on advancing climate protection through greenhouse reductions and energy efficiency improvements in local governments and their surrounding communities. And we focus mostly on promoting cost-effective best practices and we emphasize energy efficiency first and then renewables. So once you've maximized energy efficiency in your buildings and operations, then would be the time to install renewable energy supply technologies. And we see ourselves as a gateway to EPA and other resources that are of interest to local governments. So we help to connect interested local communities to the relevant EPA technical experts so that you can get involved in a variety of voluntary programs, so you can get the information that you need to build successful programs that will reap multiple benefits for your communities.

So we have a lot of tools and resources and guidance materials available on our website for you to access, and we focus very strongly on peer to peer exchange, knowing that you get the most by learning from your peers and so our resources are designed with that in mind. And you'll see through my presentation that there are a lot of web links so that you can access the documents that I will be talking about. And so when you get the chance to download the presentation, I recommend that you take a look at all of the links that are available and you can access these resources for additional information. Next slide, please.

#### Slide 20: Local Climate and Energy Program Goals

Emma Zinsmeister: So our goals are to help assist communities in reducing their greenhouse gas emissions while achieving their other sustainability goals, and as I mentioned, we work with other partners across the Agency here, as well as across the federal government to help you get plugged in to the information that you need. And ultimately we are working to help you understand and integrate multiple benefits of climate protection and energy efficiency into your planning and design programs. By reducing your energy use you can reduce your costs and your emissions which helps to improve things like environmental quality, air quality, which has public health ramifications, and other implications, you can help, to many benefits, across your communities through these program and by taking a multiple benefits approach it helps to align climate and energy programs with your priorities which can help you get buy-in at the local level and to gain support for these types of programs. Next slide please.

#### Slide 21: Webcasts and Training

Emma Zinsmeister: So one of our resources that we offer are webcasts and training programs. As you can see today we are partnering with the CHP Partnership program to help bring you this information today. We also have a separate webcast series and there is a link here to that. And the best way for you to stay in touch with what we have to offer is to sign up for our listserv and on the last slide of my presentation there is a link to where you can sign up for that. We send out announcement on our training opportunities, others that may be of interest to you through other programs that I have listed here on this slide, as well as policy updates and relevant program information that you may be interested in. Next slide please.

#### Slide 22: Local Climate and Energy Strategy Guides

Emma Zinsmeister: As Claudia mentioned, another one of our key resources are our Local Climate and Energy Strategies Guides, one of which is focused on Combined Heat and Power. This is a series of guidance documents that covers multiple strategies, from energy efficiency, renewable energy, transportation, solid waste and materials management and urban planning and design. And within each of these categories we have guides that talk about specific ways that you at the local level can implement projects and programs to implement your climate and energy goals. And each of them covers the same basic information, including any technical information on the overall

strategy, the benefits that you can see from implementing these types of programs, key participants at the local level who should be involved, how you can implement these programs and initiate them, other costs and funding considerations; and, of course, the guides contain lots of case studies of other local governments that have successfully implemented these programs and each guide has two longer profiles at the end that go into more detail about some of the most comprehensive and robust programs that we are seeing that the local level. And ultimately these guides are a series of interrelated strategies and we really stress that in order for you to have the most robust and successful program that you look at these not just as individual steps but as part of an overall strategy for climate and energy. And we try through these documents to make connections to other relevant projects and programs that you may want to be implementing.

And you can see on this slide the different types of projects that we are covering. Right now we have eight guides on the web in draft form and we are going to be finalizing those early 2010 as well as publishing some new ones. There are a variety of topics that have been released thus far and Combined Heat and Power is one of them. Next slide please.

#### Slide 23: Featured Local Climate and Energy Guide – Combined Heat and Power

Emma Zinsmeister: And so just to provide a little bit more detail on what we are talking about in our Combined Heat and Power Guide, here's a bit of a snapshot on the next two slides about what is included. We really view heat and power as a key strategy in your communities and by using Combined Heat and Power to lower the amount of energy you need for your heat and thermal needs you can also reduce your greenhouse gas emissions and if you do use biomass or renewable energy sources, it can be a very effective renewable supply measure. And we see an opportunity in the local planning processes for you to integrate Combined Heat and Power into your climate strategies in both, and by utilizing the local planning process you can get buy-in for these programs from your local state officials, other participants that are involved in these types of programs, connect Combined Heat and Power to other goals that you may have and your priorities and initiatives. And utilizing local planning processes can also help you identify and remove barriers so that you can hopefully implement them.

Here is a list of what we see as the multiple benefits that local governments and communities can achieve through implementing Combined Heat and Power. Of course reducing energy use and costs, reducing greenhouse gas emissions and other environmental impacts. There's also increasing economic benefits through job creation and market development, and also a lot of financial benefits as well to implementing these projects. And ultimately, of course, by implementing these projects at the local government, you are demonstrating leadership on climate and energy issues and can hopefully encourage the private sector to follow suit as well. Next slide please.

#### Slide 24: Featured Local Climate and Energy Guide- Combined Heat and Power

Emma Zinsmeister: So, additionally the guide includes a lot of links to other tools and resources, including a couple of tools, one of which Claudia already mentioned, the EPA CHP Emissions Calculator, screening tools, that can help to see whether or not these types of projects are something that would be feasible for projects that you may have in mind. And another tool that we highlight that may be of interest is from the Department of Housing and Urban Development. And you can see whether or not there are opportunities to install CHP projects in affordable housing. And we go through a number of applications where CHP may be used at the local level and talk about different local governments that have implemented projects in these ways and they include wastewater treatment facilities, landfill gas energy projects, K-12 schools, multi-family housing, and district energy systems. Next slide please.

Slide 25: Featured Local Climate and Energy Guide- Combined Heat and Power

Emma Zinsmeister: And at the end of the document we have two case studies that go into more detail about specific programs that have been implemented. We talk about a program in Chicago, Illinois as well as a program in St. Paul, Minnesota. You can see some of the details on this slide of those programs, which were very successful in helping to increase the amount of energy generated through Combined Heat and Power as well as helping to reduce reliance on fossil fuels and reduce greenhouse gas emissions. So I encourage you to check out the document to learn more about what these communities have done as well as others. Next slide please.

Slide 27: EPA ARRA Resources for Energy Efficiency and Renewable Energy Projects

Emma Zinsmeister: And also Claudia mentioned that we have put out a number of resources to help governments figure out the best opportunities for utilizing their stimulus monies for climate and energy types of programs. And you can see here I have listed a number of documents that we have put together. One in particular that she did mention was our guide to renewable energy and energy efficiency opportunities for local and tribal governments which is highlighted in red here on the slide. And I will go into more detail, but these resources are available at the website listed on the slide and you can look at them for more details, and they cover various types of projects related to climate and energy. Next slide.

Slide 28: Guide to Renewable Energy and Energy Efficiency Opportunities for Local and Tribal Governments

Emma Zinsmeister: So our *Guide on Renewable Energy and Energy Efficiency Opportunities for Local and Tribal Governments* is a short white paper that goes through the different funding opportunities and highlights ways that they can be used by local and tribal governments to achieve energy efficiency and greenhouse gas reductions. And we cover funding resources for clean energy applications in five key areas, three of which are ones in which CHP projects may be eligible. And those are Local government operations, including water treatment plants as an example, affordable housing and green

schools. We also do cover transportation and alternative fuels and green job training as well. Next slide please.

#### Slide 29: Guide to Renewable Energy and Energy Efficiency Opportunities for Local and Tribal Governments

Emma Zinsmeister: And under each of these funding opportunities we provide the information that is listed here. The description of the program, the eligibility requirements, how much funding is being allocated through ARRA for these programs, the program administration and where you can go for more information. And I encourage you to go check out the document online, the web links for any particular programs you may be interested in, and check out those. Opportunities for where you may be eligible and where you may have an opportunity to apply and maybe get some funding for CHP programs in your communities. Next slide please.

#### Slide 30: Climate Showcase Communities Grants

Emma Zinsmeister: And Claudia did a great job of sort of summarizing Climate Showcase Communities Grant program. As she did mention, we did get approved for a second round of funding, so in the Spring of this year we will be having another solicitation, the timeline is yet to be determined on that. But we expect that we will probably get a lot of applicants again, there was a lot of enthusiasm first round and we are looking forward to having a great round of grantees. We have twenty-five grantees that will be announced in January and we will be building a program to highlight their experiences in a peer to peer exchange format through the web and we will also be offering training opportunities, there will be webcasts, and conferences associated with this program to help share what is being learned by these demonstration projects and to bring that knowledge to other communities across the country. Next slide please.

#### Slide 31: Climate Showcase Communities: Connections with ARRA Funding

Emma Zinsmeister: We really see this grant program as a complement to the ARRA funding, for a number of reasons. The Climate Showcase Communities program has a bit of a broader focus looking at demonstration projects with also a narrower focus on specifically greenhouse gas emissions reductions that is a complement to some of the “shovel ready” efforts through ARRA and you can see here a little bit more information about the comparison. But ultimately, the Climate Showcase grant program is aimed at achieving greenhouse gas reductions that can be repeated by other communities across the country and hopefully will serve as models that can be implemented widely. Next slide.

#### Slide 32: State Bioenergy Primer

Emma Zinsmeister: And one last resource that is not specifically targeted at local communities but can be useful at the local level is a document that we put out primarily for states on bioenergy and although this is sort of from a policy perspective, targeting

state policy makers, there is a lot of useful information for local communities in this. And it covers in detail different bioenergy technologies, biofuels, biopower, bioproducts. It goes through a description of those technologies and you can see in this slide here a breakdown of the table of contents of what is in there. But we talk about how to determine whether or not bioenergy may be suitable for your area and things that you should be considering if you are considering implementing them. And so this is a great complement to Combined Heat and Power if you want to be using renewable fuel sources for your CHP projects. So, with that, I just wanted to say thank you for having me on the webcast here. The last slide just shows our contact information.

#### Slide 33: Local Climate and Energy Contacts

Emma Zinsmeister: My colleague Andrea Denny is actually here with us today, I apologize for not introducing her before. But you can see our website here where you can get all of the documents I mentioned, and also, I encourage you to join our listserv. Thank you.

## **Stamford Connecticut Case Study**

Claudia Tighe: Thank you, Emma, I think we are going to take a break from the EPA resources and perspectives and then go to our case studies. The first one we have is with Michael Freimuth of Connecticut. He is the director of the Office of Economic Development in Stamford, Connecticut as well as the Office of Intergovernmental Affairs. He has worked in planning and economic development for many years and has written numerous articles on urban development affairs. So, with that, I think he will start his presentation.

Michael Freimuth: Okay, can you hear me? Okay, a little background first on Stamford. We are one of five cities in Connecticut above 100,000 in population. . .

Margaret Cook: Michael? This is Margaret again, we're actually not seeing your slides yet, so before you continue, could you make sure that you accept the controls and show your screen.

Michael Freimuth: I thought I had (laughter). Hold on.

Margaret Cook: It's right where your play button is. Alright, we have got it now.

Michael Freimuth: So many buttons on this machine.

Slide 34: Progress Report on CHP Development in Stamford

Michael Freimuth: Alright, back to where I was.

Slide 35: Stamford: The City that Works

Michael Freimuth: The city is one of five cities in the state with a population above 100,000. Roughly 25 miles north of New York City and it has become the state of Connecticut's commercial and financial center over the last few years. The shot on the right is the largest trading floor in the world at UPS headquarters here in Stamford.

Slide 36: Sustainable Stamford

Michael Freimuth: Over the last few years there has been a mayoral initiative known as Sustainable Stamford. This has been an attempt on the local level to focus in on clean energy, green vehicle fleet efficiency, solid waste and recycling goals, procurement activities. As part of this, the city has been one of the early members of ICLEI and has been a founding member of another organization known as Climate Communities which is obviously tracking the cap and trade legislation as part of global warming. We are a rail oriented city, we have three transit areas and each of them are zoned with appropriate land use patterns to enforce transit based development and we are actively pursuing several projects in that area. And we have been one of the first cities to enforce the



LEED code through the zoning process. It has been recently adopted at the state level within the building code process, but we were a little ahead of the curve on that locally.

#### Slide 37: Energy as an Economic Development Matter

Michael Freimuth: Stamford, or practically speaking, Connecticut, is the highest cost energy area in the continental United States. In fact, I think we may have jumped in front of Hawaii when you put all fifty states in the pot. We are one of four national problem areas for reliability, brownouts have become common. We have had some energy disruptions, and frankly the capacity of the grid as it has been built to handle the growth in the local area has been a high level of anxiety for much of the business community and consequently the local economic development apparatus.

We are really focused in on five elements. Capacity really got us focused here. Reliability, because of some of the brownouts; costs, while it is a high cost area it is not the number one issue before our business community; quality, to some extent, and more recently a focus in on green technologies and LEED standards.

#### Slide 38: Connecticut Power Issues

Michael Freimuth: For most of our guess, our demand continues to grow, and as of a snapshot today, we are still probably 700 megawatts short of what we need to meet today's demand, even with an economy that is somewhat flat lined from the growth curve it was on a couple of years ago. It is next to impossible to get power plants built in the state of Connecticut, in part because of air emission standards, in part because of NIMBY. We have gone through a recent effort to build new transmission lines to carry power from further north down to southwest Connecticut, but there are a lot of political carcasses laying around on that one. And, without too much elaboration, there is a great loss of efficiency in the power that is transported from upstate Maine to down state Connecticut.

Notwithstanding this, Connecticut Light and Power, our local utility, has recently launched a series of major investments, now totaling \$80 million just for the city of Stamford, to rebuild the electrical grid to meet the demand. About 50 percent of the state demand is coming out of southwest Connecticut, and we see continuing shortages in our future.

#### Slide 39: EID Legislative Process

Michael Freimuth: Looking at this from a municipal perspective, we have been approached by several large developers and a couple of large international banks who are looking at the city seriously, but asked us some questions that somewhat surprised us. And those questions had to do with electrical power and reliability and our willingness to take a series of alternative and backup systems to meet what they saw as a shortage in this area. That's not an area that the city has ever focused on, or for that matter, ever concentrated on, when it came down to its economic strategy. In some ways it was an

awakening to a problem that we kind of knew was out there, but it really came home to us that our future job growth, our future tax based growth was tied to our ability to move power, not only economically, but also reliably and on the capacity demands we needed.

And looking around, we got involved with a concept known as the Energy Improvement District. We're working with the United States Conference of Mayors. And in part, one of their consultants, Paredo Energy. The Energy Improvement Districts essentially allows an area to create a microgrid around an energy platform to fuel one or more buildings. This was authorized in our state legislature in a special act in June 2007. At the local level, in late 2007, we had to adopt an ordinance which literally drew the boundaries of such a district and in early 2008, roughly a year and a half ago, we went through the political process of putting a board, a map of the district, and making the energy improvement district functional.

#### Slide 40: Purpose of EID

Michael Freimuth: The idea of EID is to encourage new, green energy systems to meet real estate or business needs. Essentially it is a private mechanism. We, in effect, enable it through public actions. Property owners form a board, agree amongst themselves to buy power from the new system, and utilize a simple contractual agreement known as a Power Purchase Agreement. This allows for decentralizing of power, it allows for using the grid as backup as opposed to primary, it reduces vulnerability to the grid's disruptions and it helps us reduce overall demand.

It has been in the last couple of years that we have realized that this offers us some opportunities to pursue some new technologies, to pursue our goals in Sustainable Stamford, and to dabble in some new production that is occurring in Connecticut, most notably, fuel cell technology. It is important to note that this is not a 'muni', it is not a municipal power company, it is not set up that way and it often gets confused. It is truly a private initiative under a public rubric to create basically distributed generation or district based energy systems.

#### Slide 41: Government Center Project Overview

Michael Freimuth: To launch this, we had a lot of Doubting Thomases as to whether it could be done, either legally, technically, according to regulations, financially. So, hearing that anxiety, we decided to tackle it in a demonstration mode by taking Government Center, which is our city hall, into a program of fuel cell based technology using Combined Heat and Power which allows us to show how an EID can work. Government Center was a private commercial center that was developed some years ago and purchased by the city, so it has the characteristics of many office buildings, the commercial buildings in the downtown area. We've opted to go with a fuel cell based technology since it is built in the state of Connecticut at UTC and we really wanted to make our building independent of the grid, so that, for a variety of reasons, not the least of them being emergency operations, homeland security, storm management, just taking it to a demonstration level, we wanted to make the building independent of the grid, to

show that it could work, to have it up and running should there be power outages, to have it up and running for the next generation of technologies so that local developers, real estate holders and local businesses can come over and kick the tires, test the system out, ask the questions, and challenge it.

We initiated this with a contract with Pareto Energy out of Washington, D.C. and they are going to join me in a couple slides from now to go over a bit more technically what it is we have done. The idea is to show an actual system, operationally, running here, with some cost projections, the most critical interconnection, the technical hurdle, to know that when our system is up, it is not feeding back into the system, as a safety precaution to line workers and others. The concept, after we launched the city hall demonstration, is to hook up to adjoining properties. Immediately behind the government complex there are a series of housing complexes owned by the public housing authority which we would like to wire in. Ultimately, we want to jump to proverbial public right of way, we want to go across the street and move power to other properties. We are talking to a variety of other property owners which could share power, have different demand cycles, with a hotel, a commercial complex, a university compound, that all have different peaks, and so the power system can be optimized, and we hope that is where we are headed in the near term.

#### Slide 42: Government Center Technology

Michael Freimuth: And so the program at the Government Center is roughly a \$7 million dollar program, I won't go through all of the details that you see there, but on the left hand side is a list of what it takes to put it together. The biggest nut in the pile here is a fuel cell, running roughly \$2 million and then there is another million dollars worth of technological and mechanical plumbing and IT work. On the right hand side is how we put together our funding source. We are using the Department of Energy block grants for a component of this, we are using a series of tax credits available through the state of Connecticut, and we are looking at the federal investment tax credit. We are hoping that we are one of those secret cities that might show up in January for some Climate Showcase monies, but fundamentally about half of this project will be funded through traditional financing through Pareto Energy. That requires the city to put together a purchase agreement that was just initialed in October, and that allows the city to purchase power back from Pareto Energy, the owners of the new system, over a period of twenty years. That power will be no more than the grid rate. Should it exceed the grid rate we have a right to opt out, should it drop below the grid rate, we have a cost sharing formula with Pareto.

#### Slide 43: Government Center Technology

Michael Freimuth: Government Center is a single fuel cell at this point, fueled by natural gas. We have a series of reciprocating engines that will supplement it at peak times. Our equipment is laid out there for you; we are going for the GE backup motors with UTC power cell. Our schedule is to complete our financing plan, which is currently before our

of our boards for review, getting to the design the build early next year and operational late 2010.

#### Slide 44: Government Center Goals

Michael Freimuth: Our goals, simply as I said before, to show it as a demonstration model, to show we can create reliable power outside of the grid, to lower some costs, and address the carbon footprint issue.

#### Slide 45: Investments in Energy Efficiency Diagram

Michael Freimuth: At this point, I am going to turn over to Guy, of Pareto, who will take us through the following slides.

Margaret Cook: And if I can just introduce Guy's background a little bit before you proceed? Guy Warner is the founder and CEO of Pareto Energy, Ltd., a platinum partner of the U.S. Conference of Mayors that designs microgrid architecture and arranges microgrid project financing, operation and maintenance. Trained as a financial economist, Mr. Warner worked for seven years at the National Tax Service at Price Waterhouse before founding his own company. Since 1995, Mr. Warner has concentrated on developing new energy efficiency, renewable energy and on-site power projects. So, the floor is yours, thank you.

Guy Warner: Well, thank you very much and can you see the slides now?

Margaret Cook: Yes, working perfectly.

Guy Warner: We'll start with this first slide and what we are going to do now is look over the horizon a little bit on the Government Center Demonstration project to see the almost breathtaking opportunities to expand this microgrid in Stamford. I think that there are five points to consider when we talk about that: interconnection, affordability, fuel diversity, reliability and governance. Now, we mentioned the critical importance of interconnection, we are going to have a few slides on that coming up, to show you a bit of detail on how we overcame that, but I want to pause here to say that when you start relationships with your local utility company, and you can see in the slide to the right hand slide that there is a line into the grid that is utility power, that is our life line for reliability purposes should the microgrid go down, but if you are going to interconnect, you have to respect the utility's concerns about current that could proceed from the microgrid onto their grid, this particularly goes to the heart and soul of a utility company, which are their line workers. So, we overcame that, it took us a while, we made an invention that we are going to show you in a minute, but I wanted to point out that we started from a base of mutual respect with Light and Power and we were able to establish a very good working relationship by putting that up first. We will get into that a little bit more. Going to the second topic of affordability, a lot of you on the line who know about CHP or our friends at EPA know that in the northeast US, single building CHP is usually pretty affordable, you can get below grid rate if you pick the right kinds of properties, but

the really interesting thing about an EID microgrid, if you see some of the lines on the chart, is that in some particular buildings you are going to overshoot if you are trying to meet thermal load and you have too much electric or vice versa. To take an example, if you have a hospital that has a high thermal load, you are going to have way too much electricity left over and it is going to go to waste. In a micro-grid, the idea is, along those wires you see, the yellow being electricity, the blue being chilled water, and the reddish line being hot water or steam, you can see that trigeneration breakup, that you will be able to distribute this in the district and really get your efficiencies up by distributing those resources. So, in most studies of microgrids, theoretically at least, it looks like you can squeeze out twenty more percentage points, you can go from sixty to eighty percent, just to give you a rough idea.

Let's talk about fuel diversity for a second. A natural extension of the microgrid has to be to extend non-pipeline fuels by turning community waste streams into community fuel stocks. On the right hand side of the chart, we have shown a stylized water treatment facility, in fact, in Stamford, the water pollution control authority is far along in a project to which they are going to contribute power and thermal energy to the microgrid, that will be fueled by a combination of at least biosolids and wood waste and perhaps someday, as technologies emerge, by gasified solid wastes. Which is interesting because there are high chipping fees in a place like Stamford to deal with these waste streams, you can actually turn these into assets in any microgrid.

Let's talk about reliability and self-reliance for a second. Adding additional distributed generation units that are loosely coupled in the microgrid provides for a more robust and autonomous system without a single point of failure. And also the EID, does not really share the Smart Grid vision, with deference to our federal friends. You know, the view of the Smart Grid definitions so far that have been put out are that distributed generators will be combined into a grid dispatchable virtual utility where the distribution utility, like Connecticut Light and Power in this case, would provide almost all of the functions. To the contrary, our vision is a little bit different. We are looking for maximum grid independence, the EID vision is to rely on the grid for backup power only. And demand side management, as you can see on the left hand side of the chart here, there's investments energy efficiency figure prominently and that is the low hanging fruit. Demand response, load balancing, voltage control, dispatching, metering and billing, all of these functions traditionally accomplished in the grid will be accomplished in the microgrid. The microgrid is really, in and of itself, aside from having to depend somewhat on the grid, our lifeline to main grid, is in all other aspects functional like a real grid. Finally, we get to governance and this is my favorite topic.

You know the intellectual underpinning of EID is the management of the microgrid as a commons. This is revolutionary and we are developing ownership models with some utilities now that allow them to be a player in the commons as well. But generally, in the commons, what is known as a common pooled resource. The internet is an example of a common pooled resource governed that way. Elinor Ostrom an economist who recently won the Nobel Prize in economics for her empirical studies on what makes successful common pooled resources, has done a lot of work on that, and her findings are the

following: group areas are small areas and clearly defined; the microgrid is a quarter of a mile by a quarter of a mile at most. The second aspect of successful CPR, or a common pooled resource, is that rules govern the collect use of the infrastructure are well matched to local needs and conditions and you can see that in this chart. You know any particular building can modularly add what it wants. It can be as green, as affordable, as reliable as it wants to be. At the top of some of these buildings, if you squint a bit, you can see that almost any kind of module can be incorporated, reciprocal engines which are minimally compliant with the environment, all the way to fuels cells which are very expensive but which are highly green. The next aspect is that most individuals affected by the rules can participate in modifying the rules. So, as you can see in the box at the top right, this is an organization that might be chartered by the town, but it is really run by the participants. And the last aspect is that the rights of the community members to devise their own rules is respected by external authorities. We have had a lot of good luck with passing along Connecticut to enact the EIDs and I am proud to say that without a lot of work by us a number of states nationwide are getting on the EID bandwagon and passing and enabling laws. So we can see that the EID governed by its city and energy uses is a pretty robust thing, but let's go back to our starter, which is that you get nowhere unless you go to this interconnection question.

#### Slide 46: Interconnection Rules Limited Stamford EID Microgrid Development

Guy Warner: So, the reason we came to Stamford was the fact that the interconnection rules as they existed completely limited our ability to keep a microgrid system up when the grid went down. I mean, they basically said, no way are you adding one megawatt of load onto the grid, this was Connecticut Light and Power, due to the fact that you could damage our system, and more seriously, you could electrocute our workers. Existing standards that we looked at were all enforced, top down power flow, there's no two way power flow, there were very strict penetration limits on any given feeder coming into a building, it is almost impossible to get a high percentage of combined heat and power. And the interconnection standards that exist, UL1741, IEEE1547, do address safety and approval and testing processes, but they don't really solve that problem of our users wanting to. . .So, we invented something.

Slide 47: With GridLink, the EID microgrid can control itself independently or operate in conjunction with the utility's grid, connecting or disconnecting itself seamlessly as needed, without disrupting service

Guy Warner: It is called GridLink and we will do a little promo here I guess, but it turns out to be terribly important. It depends on power converters and what happens, as you can see in the site, is that power from any source, whether there is an independent power plant in town, where there is the grid from the substation or whether there is onsite power at particular buildings, this system can control itself independently and operate in conjunction with the utilities grid, connecting or disconnecting seamlessly, without disrupting service. So how does it do that?

## Slide 48: GridLink Overcomes the Need for Shutting Down the Microgrid During Grid Power Outages and Overcomes Costly and Sometime Futile Interconnection Applications

Guy Warner: Well, moving onto the next slide, we've compared some of the other alternatives, but if you come to the right hand side, what we're saying that is multiple sources, from the grid, from the microgrid, can be converted from AC to DC power with fast power converters and then converted back into a single clean AC signal on a common microgrid bus and you saw that bus before, it was the single yellow line. But this is particularly important because not only are you getting the interconnection and ultra high levels of reliability but you are able to rely seamlessly on both but also you are getting a high signal that high tech industry likes power quality wise. And what we've found is that the microgrid can switch or change and balance among power sources in microseconds. This is due to new power electronics so as that ability emerged in terms of power electronics we were able to make this invention. There's minimal interconnection procedure required, the proof is that Connecticut Light and Power has approved of this, and really they approved of it on the basis that the power converters appear to the grid as a load management device, the grid really never sees, it is not synchronous, it never sees the microgrid. We did feel that we needed to give a cursory notice to the utility that we were taking a large amount of load off of their grid. So, the other way that has been tried on this is induction, which means that you go down when the grid goes down, you can read down, this is kind of a leave behind slide. But the one that has been focused on and that is synchronous interconnection with fast switches and what we learned is that no matter how fast a switch can catch a fall current, no utility is going to tell their line workers that they depend on a switch, it is somewhat of a technical issue and it is also a psychological issue. It is a hard lesson we learned going down that road for a bit. And most of the federally funded smart grid researchers are still trying to push the fast switch and I think it is going to be a while longer before that takes off, some day maybe, but we had to solve the problem now so we have gone with this third column. And with that, I'm finished and I hope I didn't run over my time.

## Slide 49: Contact Information

Margaret Cook: Thank you, Guy, thanks very much. So, we had a couple questions come in for the Connecticut case study and I will let Guy and Michael decide between them who should answer what first. First question, does the EID legislation affect all communities in Connecticut?

Michael Freimuth: Yes, it is optional though. It is enabling legislation, any community can opt in by passing a local ordinance which will do a variety things, declare a specific area, and appoint a board made up from people within that area to manage it.

Guy Warner: This is Guy, there were 22 towns and cities in Connecticut out of I think fifty some odd that have expressed an interest so far, and I believe that ordinance have been passed in Bridgeport and Ansonia, at least, it not others.

Margaret Cook: Okay, thank you. What about carbon emissions from the systems that you mentioned in your presentation?

Guy Warner: Mike, you want me to take that you?

Michael Freimuth: You bet.

Guy Warner: I have my Chief Technology Officer, Shalom Flank with me and he will help me out, but I think it is 35 percent for the government center, roughly. And if we were to go to a biomass fed, or we were to go to that project I mentioned at the WPCA and I am looking at my chief technology officer to make sure I don't overreach, I think it really goes down to almost negligible. You know I feel compelled to say that I feel that local pollutants and EPA regulates those too, are very important and particularly NOx and I feel compelled to say in these cities where there are high asthma rates, the system also dramatically reduces NOx emissions.

Margaret Cook: Okay, and then the third and final question for this case study, what thermal loads are utilized to help reduce summer peak loads of the Stamford Government Center plant?

Guy Warner: I will let my Chief Technology Officer take that.

Shalom Flank: Hi, this is Shalom Flank. We are operating in a trigeneration mode so during the winter we are focusing on the space heating requirements and replacing heat that would otherwise come from a natural gas boiler, but during the summer we are using absorption chiller technology so that we are able to get maximum thermal utilization throughout all of the seasons. And the WPCA project in particular we are also looking at using some of the waste or organic waste recycled to enhance electricity production and increase system efficiency that way.



## King County Case Study

Margaret Cook: Okay, great. Well, we have a few more questions that have come in, but we're going to move on to the next speaker and if we have time at the end we will address those, or if not, we will answer them by email, so never fear. Our next speaker is David Van Holde from King County. He is the energy manager for the King County Department of Natural Resources and Parks. David is the Energy Manager for King County's Department of Natural Resources and Parks. Among other duties, David leads the county Energy Task Force to develop and implement coordinated energy policy and planning across this local government's departments in support of its aggressive energy conservation and climate change mitigation goals. He is currently a member of the USEPA/USDOE National Action Plan for Energy Efficiency (NAPEE) Leadership Team, setting national energy efficiency policies. He has previously worked with the E Source Distributed Energy Service research group based in Boulder Colorado. At E Source, David led an international research and development team focused on distributed generation technologies, markets and programs worldwide. His professional specialty is in distributed energy resources and we look forward to hearing his distributed energy case study in King County. David.

Slide 49: Building a Sustainable County: King County Washington's 20-year Commitment to Renewable Energy

David Van Holde: Hi folks, can you hear me?

Margaret Cook: Yes, we can hear you.

David Van Holde: Okay, very good, and you can see my slides I hope as well.

Margaret Cook: Yes, we can. We are all set to go.

David Van Holde: Great, so I am just going to give you a tour through our largely biomass, bioenergy system in here in King County and talk about how CHP fits into that picture. For those of you who may not be familiar with King County, Washington, we are the county surrounding Seattle, Washington, including Bellevue, Redman and a couple of other smaller cities. We are the home to Microsoft, Amazon, Starbucks, we were the home to Boeing for some time. Really a progressive political setting, but really our county is still stretched financially as are most counties and we are extremely motivated by our climate goals. I guess I am hoping that our strategies may offer some ideas to some of you since most of these are relatively mature, they are not in planning, they are implemented. At the end I will talk about some systems that we are currently putting together. What you are looking at on the first page is five digesters at one of our large treatment plants, we have two of them in the county.

Slide 50: Our Policy Frame: Key County Climate/Energy Goals

David Van Holde: So we are going to take a look at our frame. A number of years ago our county executive and our county council got together and really said the climate goal is crucial to us and we understand that the climate goal is tied tightly to the energy goal and to take some key elements out of those policy frames, we were directed to get 50 percent or greater of our non-transit energy use and power from renewables and 35 percent of transit energy system powers from renewables by 2020 and 2015 respectively. And ultimately 50 percent of transit energy is to come from renewables or efficiencies by 2020. And those are extremely aggressive goals as you can see. Our strategy is to minimize energy use through increasing energy efficiency and maximizing conversion of use of waste to energy, the major focus on this talk, and the purchase renewables as appropriate to fill the gaps. Can we achieve these marching orders? We think so, it is going to be a challenge, but we are fortunate to have some substantial renewable resources in our portfolio.

#### Slide 51: King County Goals for Climate and Energy

David Van Holde: So the first thing you do when you are an organization like us and I am going to wait for the slide to catch up a little bit here so you can see what I am looking at. One of the first things you want to do as a government is to put this all into some kind of a rubric and in particular to try and frame the climate goals and the energy goals together and then figure out the stepwise increments so that looking at 80 percent by 2050, which is what we all need to reach for, I would point out, you need to break that down and make it politically digestible on a stepwise basis year by year so that you know whether you are getting where you need to go or not.

#### Slide 52: Anchor it with a Baseline. . .(2007)

David Van Holde: And the very first concrete step you need to take when you are moving in this direction is to get a baseline. That is a nontrivial event for a government or institution. We have about 1,000 accounts in this baseline, but basically what we are doing is we are taking all of our energy uses, from bus's diesel, to steam from a district energy system, to gas, to the renewables that we generate onsite, largely from bioenergy. And we accounted for all of that use and production and created a baseline for 2007 from which we are measuring moving forward. So this is a very important step and I just wanted to point that out. It's the only way to remain honest, as far as we're concerned.

#### Slide 53: Make a Plan: High Level Strategies

David Van Holde: The next step really is to make a plan, and our high level strategy is really as follows. Efficiency and conservation first, you've heard that before but I will reinforce it. Any of you in the field, you will understand that it just makes sense financially and CHP fits into that larger picture of energy efficiency and conservation really, but you look at even the lower hanging fruit before that, HVAC, lighting, and so forth. The next step is clean fuels, clean energy, and finally, offsets. As always the challenge is in effective implementation and one of our early steps was to codify these steps into our legal policies, so to basically backstop ourselves with law. So we took this

energy plan and embedded it into our comprehensive plan, but when people came to us later and said why are you doing this, we can say, well, it is in the comprehensive plan and that required a strong consensus process and a substantial amount of political processing, but we have reached that stage where we have that in place.

#### Slide 54: Practical Strategies for Implementation

David Van Holde: What are the practical strategies for implementation, and how do you implement such a plan? It really takes a broad based team within our institution and county in order to do implementation like this. The way we have done it is by putting together a cross-county energy task force as directed by the executive and to backstop that with annual reports to the executive that keeps us accountable and demonstrates the progress that we are making or not making so that we can set ourselves up to be critiqued and corrected and then also to give the departments of the county some autonomy and freedom to act out the way that they need to, to coordinate with our energy task force. So that means we let the county divisions and departments decide how they want to reach these goals and in coordination with our task force.

#### Slide 55: Energy Plan Key Implementation Goals

David Van Holde: I am going to step into the focal area of this presentation now which is really all about biofuels and one of the key implementation goals which is to convert 100 percent of all reasonably usable waste products at landfills and wastewater treatment plants to energy by 2012. We are well on our way, largely because we have been doing it for quite some time. So from here on out, our presentation is going to largely focus on biomass and biogas fuels.

#### Slide 56: Passing the Sniff Test: Successful Commercial Biogas from Waste Products

David Van Holde: This again, the same picture, one of our wastewater treatment plant digester set.

#### Slide 57: Well, how did we get here?

David Van Holde: So how did we get to the place where we are doing really a lot of renewables? The answer is that we have great resources. We have, and must dispose of biogas, and we have policies in order to take that on. We are a local government with a long history of environmental leadership so that is just part of our institutional framework and our institutional expectation. What is interesting is that the cost and risk associated with regulatory waste disposal is really a big motivator and this driver is really very significant. What I mean by that is that getting rid of the waste was our first motivation. We had gas both in our digester setting and also in our landfill setting and we needed to get rid of it, so we started to think of good, effective ways to do that. Against that, we also had an economic frame which was that we also wanted to recover value from those resources. And in the past, the long past, which I am going to talk a little bit about, in the 1980s, those alternative energy resources were valued at nominal market values, in other

words, we had to make that work. We worked with granting agencies such as the EPA to help get support for that process where it was appropriate and EPA has been a partner to us in a number of projects, which you will see, in partial support, in concert with the resource value that we extract from the renewables. In early time, that was a nominal value because there was no renewable resource attribute valuation, in the new world that we are living in, the resources are being valued as renewables and we are starting to move towards monetizing that and I will talk more about that later. But all through the history of this, this has really been perceived by us and our partners, such as Seattle and our other suburban cities, as a three way win because their utilities and their users are happy that even though they may not have had formal processes for recognizing the renewables, they did appreciate that these were renewable energy resources and the utilities like to brag about it, to be honest about it.

#### Slide 58: Gas Application Strategies

David Van Holde: So what's our gas application strategy? Typically wastewater gas was our first development and the concentrated source was driven by a desire to reduce biosolids, we were digesting first and foremost to reduce biosolids. But the application that we developed was first to run sewage pumps and that is because they were right there, they expend a lot of energy to pump sewage, and so we just apply the gas directly to that. I would note that we drive those things in a combined heat and power mode. In other words, they are large engines which also recover heat which is used for a process within the wastewater treatment.

Later landfill gas development went from flaring to application and again driven by the regulatory requirement to remove the gas from the landfill for environmental and safety reasons. And typically, as I mentioned before, we involved energy commodity sales when we could and utilities were not always interested in these commodities, but in general we were able to work out relationships through working out the right interconnection schemas or, and you will see a little bit more about that, the means to prepare the commodity for the utility to take it. Our perspective is that interconnection, or connection to a utility is not really a barrier as much as it is a technical feature and you have to work through the utility and respect them, as was noted in the earlier presentation. But typically, interconnection is a fairly straightforward matter, it gets more complicated with gas as I'll point out in a minute. Our primary motivation has been reliability, high system net efficiency and low emissions in that order really, and that is why we structured our system first in pumps, local applications, and then to increase efficiency and ultimately to also reach efficiency requirements. Again, the example of direct use in pumps is always "best use" to meet these objectives. CHP has not always been our first choice, although you will see that we have been applying it for many years because in the Northwest, in contrast to Connecticut, our electricity costs are very low so it is often difficult to compete, believe it or not, with the cost of hydropower even when the fuel is free.

#### Slide 59: Refining digester gas for sale on pipeline

David Van Holde: So the first application I want to show you quickly, and this one is going to take a minute to load because it has got a lot of graphic in it is our refinement of digester application as pipeline gas and this dates from the 1980s. And again, the product that was produced here, that is still being produced here, is a merchant gas which has no renewable attribute associated with it because, in effect, it is grandfathered out of that possibility. One of the things we are always looking at is best use, and we may reevaluate this application simply because we are increasingly recognizing that this application, with the value of either carbon offsets or renewable energy certificates, is so high compared to the commodity sale that it may make sense for us to utilize this gas in a different way in order to capitalize on the renewable energy resource credits.

#### Slide 60: South Plant Stats – A Valuable Resource

David Van Holde: This has been a very valuable resource to us, though, this is just a typical large wastewater plant, it has been operating since 1987 and it produces about a million and a quarter dollars a year. At the same time, like most plants, it produces a significant amount of parasitic load to operate, particularly in load compression, and the cost of that is somewhere around half of that million and a quarter goes right back into operating. You can see our biogas recovery and use has been 89 percent has been recovered of which 57 percent was scrubbed in the manner shown in the last slide and sold to Puget Sound Energy. 16 percent used to produce heat and 16 percent used to run our on-site CHP plant at our solid waste plant, which I will show you in a minute.

#### Slide 61: South Plant's Gas Sales Keys to Success

David Van Holde: What have been the keys to success? One of them is a lot of biogas, and large treatment plants do have that, small treatment plants don't, but there's a steady supply of biogas at any treatment plant and it is truly a renewable resource. It is going to be there as long as you are digesting sewage. A ready supply of water has been really important in this application because our scrubbing methodology has to do with pouring water on compressed gas to dissolve out the carbon dioxide. Equipment reliability is typically really important, but a very important aspect is proximity to a major PSE gas pipeline because you cannot inject gas on a distribution gas pipeline for reasons I won't describe here. The molecules basically have to get lost in a transmission line before a gas company will ever allow this for legal reasons. Commodity prices are also very important. Typically in the northwest, gas has commanded a better commodity price than electricity.

#### Slide 62: Added Modern Combined-Cycle CHP

David Van Holde: At the same time, we did install a combined site, a modern combined cycle CHP site in our South Plant and the reason we did that is that in 2001 we ran smack dab into the energy crisis in the west and as a result of that we decided we wanted to be able to arbitrage price and we installed a couple of three some megawatt solar CY's and a two MW steam turbine in a combined cycle application. At present this is largely being used for demand response in order to ratchet a demand rate that we have. It may be used

more in the future in order to exploit on renewable resource credits. That is a matter that is still up to decision.

Margaret Cook: Okay, David. Just to interrupt, it is about five minutes till the end, so we are going to take a couple questions and just let people observe the rest of the presentation online if that is alright. So, the questions are for you, I will go through quickly. Are you eliminating all combustible or digestible material from your landfill waste stream?

David Van Holde: I am not quite sure that I understand that question, so umm....

Margaret Cook: Okay, well what we can say then is that we will come back to it when we answer the questions online. How large is the district energy grid in Seattle or in neighboring cities?

David Van Holde: We don't have a district energy grid, we are all operating, these are all connected to the local utilities, so these all operate in parallel to the local utilities.

Margaret Cook: Okay, final one. What portion of your housing stock is on a district heating system?

David Van Holde: There is not, there is a district heating system for the downtown and for some hospitals and some large facilities, but there is not housing district heating system.

Slide 63: 1 MW Digester Gas Fuel Cell Pilot

Margaret Cook: Okay, thank you for your presentation. We missed the opportunity for Claudia to field any questions, so I am just going to circle back. We had a lot of questions relating to how CHP operators can connect with state and local grantees. So I will push that to her and let her answer that.

Claudia Tighe: Absolutely, this is exactly what we were hoping to achieve to get everyone looking at these opportunities and ways to collaborate. So, for that states and local governments to find CHP developers and manufacturers, we suggest that you go to our CHP partnership website, which is [www.epa.gov/chp](http://www.epa.gov/chp). There you will find a listing, if you go to the left hand side of the website, under the navigational options and click "Our partners" there is a whole list there of different developers and manufacturers. And for CHP developers and manufacturers, you can go to the [EECBG.energy.gov](http://EECBG.energy.gov) for the DOE grants for information and there you will find a listing of locals who have received ARRA money and because all of these monies need to be very transparent, typically each of the local government websites will have information on what they are doing with their money and with regards to the EPA grants, they will be announced in January, so at that point you will be able to see who has received that money.

Margaret Cook: Great, thank you Claudia. I just wanted to say thank you to all of the speakers, EPA, Connecticut and King County. We really appreciate you making yourselves available. You can see the presentations on the CHP Partnership website and for any questions that we were not able to answer in this time frame, we will follow up afterwards either by email or by posting online. So we hope to address all of your concerns with this webinar and we hope this sustainable communities opportunity has been helpful to you. Thanks very much!