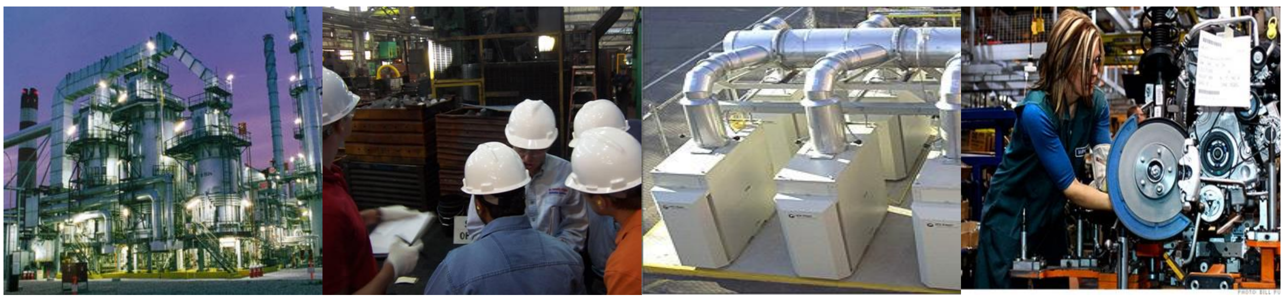
Northeast Energy Efficiency Partnerships



A Systems Approach to Economic Industrial Efficiency and Combined Heat and Power in the Northeast and Mid-Atlantic States

August 2013

A SYSTEMS APPROACH TO ECONOMIC INDUSTRIAL EFFICIENCY AND COMBINED HEAT AND POWER IN THE NORTHEAST AND MID-ATLANTIC STATES

Primary Author:

VERMONT ENERGY INVESTMENT CORPORATION

Introduction

This paper was prepared for Northeast Energy Efficiency Partnerships (NEEP) by the Vermont Energy Investment Corporation (VEIC). This report reflects the opinions and judgments of the NEEP staff and its consultant, and does not necessarily reflect the opinions and judgments of NEEP board members, NEEP Sponsors, or project participants and funders.

This reports builds upon information gleaned from the Northeast Mid-Atlantic Industrial Efficiency and CHP Regional Dialogue (Dialogue) co-hosted by the U.S. Department of Energy and NEEP in Baltimore, MD on March 13, 2013. It is intended to provide a summary of the opportunities, barriers/issues and actions needed and recommended high-value roles for NEEP and others to support the acceleration of industrial energy efficiency and combined heat and power (CHP) in the Northeast Mid-Atlantic region through the advancement of public policies and industrial efficiency programs, and deployment of high efficiency advanced manufacturing technologies and best practices.

NEEP was founded in 1996 as a non-profit whose mission is to serve the Northeast and Mid-Atlantic to accelerate energy efficiency in the building sector through public policy, program strategies and education. Our vision is that the region will fully embrace energy efficiency as a cornerstone of sustainable energy policy to help achieve a cleaner environment and a more reliable and affordable energy system.

VEIC is a mission-driven nonprofit organization, founded in 1986, dedicated to reducing the economic and environmental costs of energy consumption through cost-effective energy efficiency and renewable energy technologies. VEIC has consulted in 25 states, six Canadian Provinces and seven countries outside North America to design programs that reduce energy use through energy efficiency and renewable energy.

Executive Summary

This paper explores ways to increase the installation of Industrial Energy Efficiency (IEE) measures and Combined Heat and Power (CHP) in the Northeast and Mid-Atlantic States (Region) in response to President Obama's Executive Order on Accelerating Industrial Energy Efficiency (EO 12624) which is encouraging industrial investment in energy efficiency "to reduce energy use through more efficient manufacturing processes and facilities and the expanded use of combined heat and power (CHP)".[1] IEE and CHP installations have been active in the region and been largely driven by state driven goals around IEE and CHP as well as supporting state and federal policies.

IEE has increased greatly over the last decade, and there have been significant achievements in the Region to encourage this type of investment. Most states in the Region have Energy Efficiency Resource Standards (EERS) with ambitious goals, as well as energy efficiency programs that include industrial customers. Some have Clean Energy Portfolio Standards (CEPS) that include energy efficiency and/or CHP as part of the goal.

It is estimated that the industrial sector accounts for 30 percent of the all energy consumed in the United States.[2] Based on U.S. Energy Information Agency (EIA) data, in 2011, the Region consumed 327 million megawatt hours (MWh) of electrical energy and 1.354 trillion MBtus of gas energy in the industrial sector.[3] Through existing IEE programs in the Region, the electrical energy consumption was reduced by 1.5 percent and the gas energy consumption reduced 0.4 percent. So, while EE programs have been successful, this indicates that there is potential for additional savings in the sector.

The Region currently has 16 gigawatts (GW) of installed CHP capacity, which is approximately 20 percent of the total U.S. installed capacity. Recent state-level studies in the Region identified significant additional potential for CHP systems. There is approximately 37 GW of technical potential[4] in the Region, with approximately 27 GW identified in the industrial sector. The economic potential within the Region for the industrial sector ranges between 7 GW and 10 GW.

[1] The White House. August 30, 2101. Executive Order – Accelerating Investment in Industrial Efficiency. http://www.whitehouse.gov/the-press-office/2012/08/30/executive-order-accelerating-investment-industrial-energy-efficiency
[2] The White House. August 30, 2101. Executive Order – Accelerating Investment in Industrial Efficiency. http://www.whitehouse.gov/the-press-office/2012/08/30/executive-order-accelerating-investment-industrial-energy-efficiency
[3] http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_ng.html&sid=US and http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_es.html&sid=US
[4] CHP existing capacity includes all customer sectors and provided by the DOE reflecting an internal ICF database.

During the Northeast Mid-Atlantic Industrial Efficiency and CHP Regional Dialogue (Dialogue) co-hosted by the U.S. Department of Energy and NEEP in Baltimore, Md. on March 13, 2013, a number of market characteristics were inferred via feedback from the several hundred stakeholders in attendance. One of these conclusions was that CHP installations were most successful where the owner considered a system approach that combines IEE and CHP. Such an approach helps to ensure that the facility was truly managing overall energy use from both an electric and thermal perspective, as well as ensure that systems were designed for maximum cost effectiveness, supported critical processes and provided system resiliency for the facility.

While CHP has been included in some state EE programs as an EE resource, the success of a systems approach to IEE and CHP has not been explored on a Regional level. One objective of this paper was to continue an examination of a systems approach for IEE and CHP in order to identify opportunities to increase the amount of both IEE and CHP in the Region through action plans that can improve goal setting, supporting public policies and the enhancement of an implementation toolbox.

NEEP could be positioned to bring unique and substantial value to helping achieve the Regional vision outlined in this document. NEEP's role in "maximizing energy efficient solutions through regional partnerships" and the ability to "leverage knowledge, capability, learning and funding to increase the impacts of individual state efforts" can provide a means to assist stakeholders in the action plan defined herein so that identified policy gaps for IEE and CHP can be successfully addressed.

Such an approach would provide stakeholders a regional forum to share experiences, investigate best practices, and identify needed resources that enable industrial clients to understand and evaluate – both technically and financially – how a systems approach to IEE and CHP is beneficial to their facilities. This approach can also support management of energy goals, create system resiliency, increase economic viability of stakeholders and help them meet their own sustainability goals. This Regional system approach to IEE and CHP can be a core element in sustaining and driving economic growth in the Region by making the region an attractive place for industrial clients to compete and profit.

Table of Contents

Industrial Efficiency and Combined Heat and Power: A Systems Approach

Using a systems approach to Industrial Energy Efficiency (IEE) and Combined Heat and Power (CHP) can increase the overall electric and thermal usage in industrial facilities in a cost effective manner. In this context, the focus is on combining energy efficiency (EE) practices with CHP installations to perform the same or greater industrial tasks or functions while using less energy. For this report, we have employed a broad definition for the industrial market. This includes any type of organization that has a continuous and significant use of both electric and heat energy. This definition then includes facilities such as manufacturing facilities, universities, hospitals, and wastewater treatment plants.

The benefit of a systems approach to increasing the overall efficiency of industrial energy use as opposed to simply swapping out specific components or installing CHP as a single event, is the consideration of the interactive relationship between electric use and heat production. The end result is a more efficient, reliable and resilient facility.

Industrial Energy Efficiency

IEE has increased greatly over the last decade, and there have been significant achievements in the Northeast to encourage this type of investment. Most states in the Region have Energy Efficiency Resource Standards (EERS) with ambitious goals and energy efficiency programs that include industrial customers. According to NEEP's Regional Energy Efficiency Database (REED), in 2011, the annual electric energy savings reported for the C&I sector was over 2,160,000 MWh while the annual gas energy savings reported was over 1,876,000 MBtus. Energy consumption in the C&I sector in the Region, based on 2011 U.S. Energy Information Administration (EIA) data, was 327 million MWhrs for electricity and 1.354 trillion MBtus for gas. Since EIA provided data for industrial and commercial, the percent of C&I consumption in the Region for industrial electrical consumption is 32.7 percent of the C&I electrical total while the industrial gas consumption is 38.7 percent of the C&I gas total. If these same percentages are applied to the C&I energy savings from the REED database, the average industrial electricity energy savings in the Region is 706,320 MWhrs, or 1.5 percent of the electric consumption in states with EE programs and the average industrial gas energy savings is 726,013 MBtus or 0.4 percent of the gas consumption in states with EE programs.

While this may not be an exact representation of the savings as reported through a state EEPS program, it indicates that significant additional potential exists to achieve energy savings within the industrial sector through energy efficiency. Details for each state are presented in Table 1 for electrical energy and in Table 2 for gas energy.

Table 1. Northeast and Mid-Atlantic 2011 Gas Energy Use

2011 Gas Energy Use, Mbtu						
	2011 Gas Savings		2011 Gas Consumption[5]			
	C&I Gross Savings @ Meter[6]	% Savings	Commercial	Industrial	C&I	% Industrial of C&I Total
Connecticut	144,785	0.20%	46,100,000	26,200,000	72,300,000	36.2%
Delaware	NA	NA	10,800,000	20,300,000	31,100,000	65.3%
Maine	4,548	0.01%	6,900,000	27,800,000	34,700,000	80.1%
Maryland	-	NA	-	-	-	
Massachusetts	605,620	0.47%	83,400,000	46,100,000	129,500,000	35.6%
New Hampshire	59,907	0.38%	9,200,000	6,600,000	15,800,000	41.8%
New Jersey	NA	NA	196,800,000	51,100,000	247,900,000	20.6%
New York	885,858	0.23%	298,900,000	78,700,000	377,600,000	20.8%
Pennsylvania	NA	NA	147,000,000	257,000,000	404,000,000	63.6%
Rhode Island	91,075	0.48%	11,100,000	7,600,000	18,700,000	40.6%
Vermont	84,955	1.58%	2,500,000	2,800,000	5,300,000	52.8%
Washington D.C.	NA	NA	17,200,000	-	17,200,000	0.0%
TOTAL	1,876,748		829,900,000	524,200,000	1,354,100,000	38.7%

[5] http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_ng.html&sid=US
[6] http://www.neep-reed.org/Focus.aspx

Table 2. Northeast and Mid-Atlantic 2011 Electric Energy Use

2011 Electric Energy Use, MWh						
	2011 Electric Savings		2011 Electric Consumption[7]			
	C&I Gross Savings @ Meter[8]	% Savings	Commercial	Industrial	C&I	% Industrial of C&I Total
Connecticut	127,140	0.75%	13,087,000	3,668,000	16,755,000	21.9%
Delaware	NA	NA	4,260,000	2,591,000	6,851,000	37.8%
Maine	44,628	0.63%	4,018,000	3,016,000	7,034,000	42.9%
Maryland	214,810	2.59%	3,075,000	5,007,000	8,082,000	62.0%
Massachusetts	537,497	1.53%	17,707,000	16,974,000	34,681,000	48.9%
New Hampshire	34,513	0.54%	4,478,000	1,936,000	6,414,000	30.2%
New Jersey	NA	NA	39,118,000	8,033,000	47,151,000	17.0%
New York	1,091,025	1.20%	76,406,000	13,420,000	89,826,000	14.9%
Pennsylvania	NA	NA	43,336,000	49,585,000	92,921,000	53.4%
Rhode Island	63,053	1.36%	3,660,000	916,000	4,576,000	20.0%
Vermont	50,481	1.45%	2,009,000	1,417,000	3,426,000	41.4%
Washington D.C.	NA	NA	8,966,000	216,000	9,182,000	2.4%
TOTAL	1,948,337		220,120,000	106,779,000	326,899,000	32.7%

While IEE programs have achieved energy savings, the low percentage is indicative of how difficult it can be engage industrial clients.   There is a difference between energy efficiency goals and programs that include industrial customers, and efficiency programs that specifically address the needs and special perspective of industrial customers.
For example, traditional programs that provide incentives for efficient lighting, HVAC, and refrigeration systems are usually designed for commercial customers, but are open to industrial customers. In addition, efficiency programs do not usually take a systems approach to the industrial clients that consider not only the building services systems but the manufacturing process or specialized services offered by the industrial client (such as clean rooms, operating rooms, etc.).

[7] http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_es.html&sid=US
[8] http://www.neep-reed.org/Focus.aspx

There are also issues of scale, where industrial equipment is simply larger and tends to run for more hours than commercial equipment. Some programs address specific industrial systems, such as boilers, steam traps and compressed air, and the implementation of such measures can lead to further collaboration between an industrial customer and an efficiency program, but even these measures often represent just the tip of the iceberg within a facility.

Understandably, industrial clients often do not want to make changes to their processes and are hesitant to utilize prescriptive energy efficiency programs. Potential barriers and issues include:

- Changes to one part of the process may have unintended consequences elsewhere.
- The process may be continuous, running round the clock, and therefore it is difficult to shut anything down to make changes.
- A process may be specialized or proprietary, and the energy efficiency program staff may not necessarily have the knowledge or expertise to suggest changes.
- Plant personnel are often more concerned with the operation and production than the energy usage.
- The budget cycle for the allocation of money for a project is typically long, and the requirements for a payback may be very short.
- Energy either is not visible, is seen as a fixed cost, or is seen as unimportant when compared to other costs.

Successful IEE programs address these and other barriers in order to earn the trust of the industrial customers, present energy efficiency as investment opportunities to the financial officer, and overcome technical concerns through case studies or pilot projects. The best industrial programs also provide networking opportunities for customers to compare lessons learned and to promote successful projects in person.

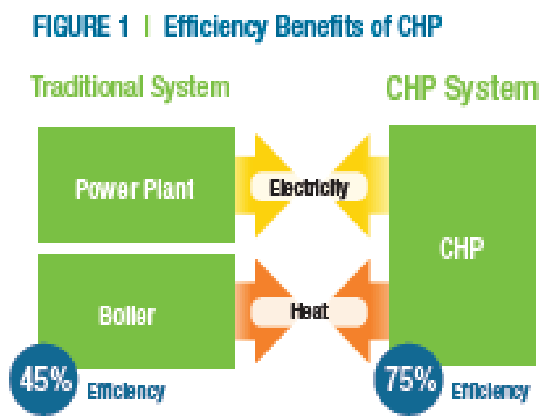
Once there is a level of trust between the program implementers and the customer, there is an opportunity to further the systems approach to IEE and look at how specific energy uses within the facility interact. For example, instead of just looking to upgrade an air compressor, a systems approach would look at the end uses of compressed air, the distribution system, and the sources and treatment of compressed air. Looking at how compressed air fits into the energy usage at the site and assessing the potential for heat recovery takes a broader view, and starts to overlap into the area of the boiler system. While this systems approach is complicated, it potentially yields the greatest benefits.
In summary, making additional gains in industrial energy efficiency will require a concerted effort that leverages existing resources and develops close partnerships with industrial clients. Promoting investment will also require the combined approach of a number of resources that develop partnerships with industrial clients to encourage investment in energy

efficiency. As further illustrated by the Executive Order, to encourage investment in industrial efficiency:

> "The Departments of Energy, Commerce, and Agriculture, and the Environmental Protection Agency, in coordination with the National Economic Council, the Domestic Policy Council, the Council on Environmental Quality, and the Office of Science and Technology Policy, shall coordinate policies to encourage investment in industrial efficiency in order to reduce costs for industrial users, improve U.S. competitiveness, create jobs, and reduce harmful air pollution. In doing so, they shall engage States, industrial companies, utility companies, and other stakeholders to accelerate this investment."[9]

Combined Heat and Power

Just like IEE, Combined Heat and Power (CHP) installations have increased greatly over the last decade, and there have been significant achievements in the Region to encourage this type of investment. Many states have incorporated CHP systems into an Energy Efficiency Resource Standard (EERS), since CHP can displace a significant amount of grid electric use. Other state policies have included CHP as an eligible resource for the state's Renewable Portfolio Standard (RPS) or Alternative Energy Portfolio Standard (APS). The practice varies from state to state and can include all CHP installations or be limited to CHP that utilizes waste heat, or renewable fuel sources, or that are driven by fuel cells.



Source: U.S. DOE and EPA, August 2012. Combined Heat and Power: A Clean Energy Solution

As of the end of 2011, CHP systems comprised about 7 percent of the total electric capacity of the United States. Approximately 25 GW exist in the Industrial Sector, 2 GW in the commercial sector, and 43 GW in the electric power generation sector.[10] President Obama's Executive Order on Accelerating Industrial Energy Efficiency (EO 12624) encourages industrial investment in energy efficiency "to reduce energy use through more efficient manufacturing processes and facilities and the expanded use of combined heat and power (CHP)".[11] In addition, the order sets a national goal of 40 GW of new, cost-effective, combined heat and

---

[9] [9]The White House. August 30, 2101. Executive Order – Accelerating Investment in Industrial Efficiency. http://www.whitehouse.gov/the-press-office/2012/08/30/executive-order-accelerating-investment-industrial-energy-efficiency

[10] Energy Information Administration, http://www.eia.gov/todayinenergy/detail.cfm?id=8250

[11] The White House. August 30, 2101. Executive Order – Accelerating Investment in Industrial Efficiency. http://www.whitehouse.gov/the-press-office/2012/08/30/executive-order-accelerating-investment-industrial-energy-efficiency

power (CHP) by 2020[12]. States in the Northeast and Mid-Atlantic region are well positioned to lead the nation in CHP development in the industrial sector. Not only have industrial energy efficiency programs expanded in recent years, but there is a growing recognition by state policymakers that CHP systems will play a significant role in achieving energy, environmental, and economic goals in a cost-effective manner. As stated in the Executive order, this investment will "reduce costs for industrial users, improve U.S. competitiveness, create jobs, and reduce harmful air pollution".[13]

Favorable natural gas prices and state policies have helped increase investment in IEE and CHP in the Region in recent years, though significant capacity remains to be captured. IEE and CHP are important components to not only meeting state energy efficiency mandates but to address state energy resiliency, reliability, affordability and environmental goals. CHP can also greatly increase the efficiency of electrical generation.

Many states in the Region have policy mandates that give priority to EE as a resource. Massachusetts, Connecticut, Maine, Rhode Island and Vermont all have requirements for all cost-effective efficiency solutions. New York and Maryland have implemented efficiency portfolio standards. These policies challenge efficiency programs to achieve aggressive energy savings goals with increasing budgets and goals each year.

The need and priority for energy efficiency as a resource is expected to continue given the high cost of energy, the difficulty of siting new generation, gas pipeline constraints, state climate change and environmental quality plans and commitments. For example, ISO New England's recent ten-year forecasts of energy demand show that energy efficiency policies and programs fully offset growth in energy while the regional economy continues to grow. By combining IEE measures with CHP in a system approach, the total energy consumption, of all fuels for a facility can become more cost effective.

CHP Potential

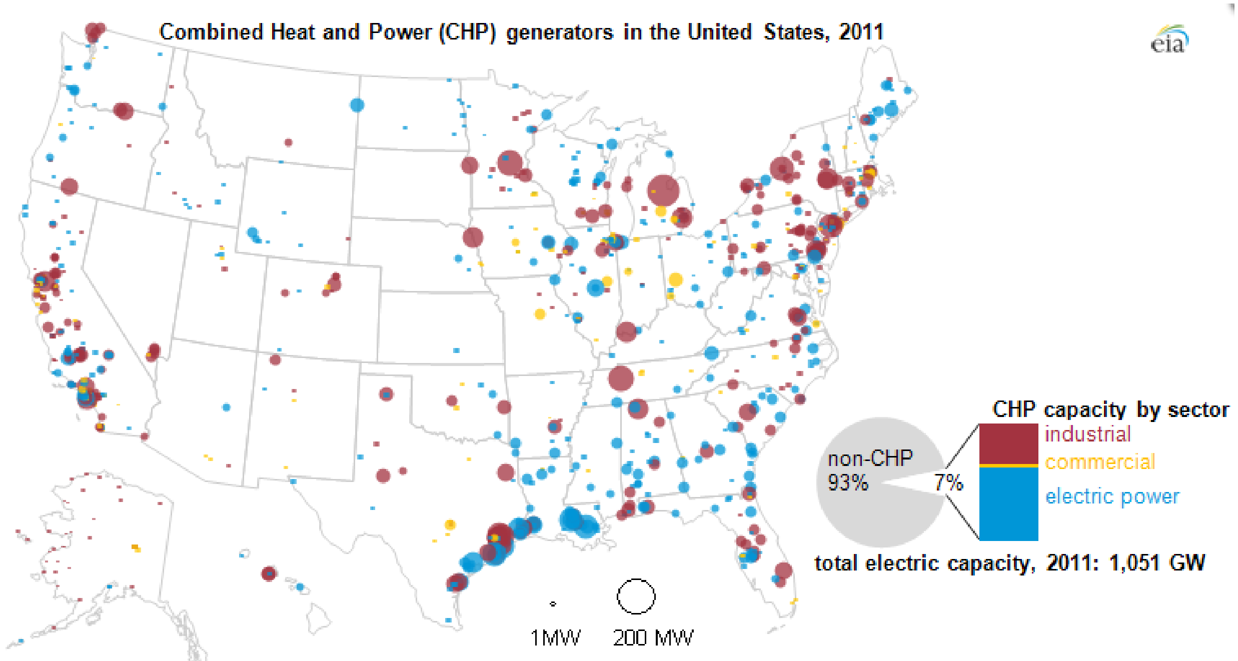
CHP can be an efficient way to meet thermal and electric energy needs with one efficient on-site solution. For the purpose of this report, Industrial CHP is defined as a combined heat and power system that serves a 24 hour per day, continuous process use. Facilities that qualify under this definition are manufacturing facilities (with continuous thermal demand processes), hospitals, healthcare facilities, college or university campuses, water treatment plants, and refrigerated warehouses.

Most of these facilities share a need for continuous power in order to either provide human life support or support critical manufacturing processes. While facilities of this nature have

[12] Ibid
[13] Ibid

traditionally relied on generator backup for power, recent storms in the Northeast have demonstrated that prolonged utility outages are possible, and that these outages can also impact the availability of fuel such as diesel, which is typically the backup generator source of fuel. CHP systems frequently use natural gas as the fuel source, and because it is normally piped underground, it is a more resilient source of energy than the electrical grid that has wires on poles and underground transformers or substations - all of which are vulnerable to high winds and/or flooding.

Figure 2. Installed CHP Systems in the US



As can be seen in Figure 2, the Northeast and the Mid-Atlantic states have appreciable installed CHP capacity. Various studies in the Region have identified additional technical and economic potential for additional CHP installations. The technical potential identifies the size of the market based on the ability of CHP technology to meet the thermal and electric energy needs of the facility. The economic potential reflects a screening of the technical potential for factors such as the ease of system retrofit, fuel availability and thermal load characteristics. This combination of factors as well as the customers' ability to access capital and interest in operating and maintaining a CHP system on site, can significantly reduce the stated technical potential.

In support of the Dialogue, the Department of Energy (DOE) provided a summary list of technical potential estimates from an internal ICF database across the Northeast and Mid-Atlantic states. This technical potential does not differentiate between commercial, institutional and industrial sectors. While there are no specific values for the industrial market sector as defined by this report, information available from other resources can be applied to the ICF technical potential values to provide a range of industrial potential for the Northeast and Mid-Atlantic States industrial market segment.

The SEE Action report "Guide to the Successful Implementation of State Combined Heat and Power Policies," released in March of 2013, estimated technical potential for industrials in the U.S. to be 65 GW and commercial/institutional (C/I) technical potential to be 65 GW for a total technical potential in the combined sector for 130 GW.[14] This represents a 50/50 split between the industrial and C/I sectors. In the C/I technical potential there is a portion that meets this report's definition of industrial, which includes universities and hospitals. A representative composition of the C/I market had to be established. In a technical potential study performed in January of 2000 by ONSITE SYCOM Energy Corporation for the DOE entitled "The Market and Technical Potential for Combined Heat and Power in the Commercial and Institutional Sector", the top 90 percent of the market is made up of eight categories. Those are universities (29 percent), district energy/utilities (13 percent), government facilities (10 percent), hospitals (8 percent), solid waste facilities (5 percent), offices (3.5 percent), and healthcare (3.3 percent)[15]. As a result 45.5 percent or 30 MW of the C/I market meets this report's definition of industrial. Therefore 95GW (65GW plus 30GW) of the 130GW, or 73 percent, would meet the definition of industrial CHP for this report. While this is a proxy, the goal is to determine if there is opportunity for increased CHP installations and to determine the size of the opportunity. The ICF technical potential was reduced to reflect this proxy value for the industrial market. These values are presented in Figure 3.

During the preparation for the Regional Dialogue in March, a number of reports were reviewed to try to determine the economic potential for the Region. Each applied various methodologies to determine the economic potential. A summary of the high and low values of economic potential showed that the economic potential can be as little as 5 percent of the technical potential or as great as 46 percent, with a mean of 26 percent. A 2009 McKinsey and Company study estimated that there was 50 GW of economic potential CHP in the industrial and large commercial and institution application in the US.[16] Assuming the 130 GW of technical potential, the economic potential would be 38 percent of the technical potential. To help establish the range of economic potential in the industrial sector in the Region, the

[14]SEE Action, US Department of Energy, US Environmental and Protection Agency. *Guide to the Successful Implementation of State Combined Heat and Power Policies.* March 2013. http://www1.eere.energy.gov/seeaction/pdfs/see_action_chp_policies_guide.pdf

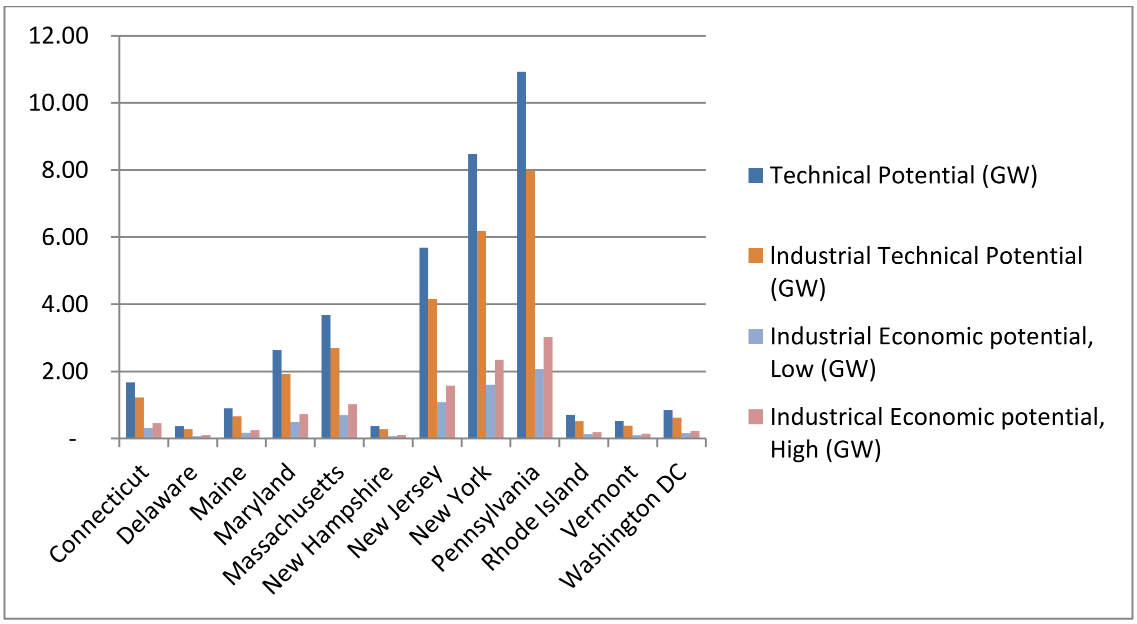
[15]US Department of Energy, Energy Information Administration. *The Market and Technical Potential for Combined Heat and Power in the Commercial/Institutional Sector.* January 2000. Page 5.

[16] SEE Action, US Department of Energy, US Environmental and Protection Agency. *Guide to the Successful Implementation of State Combined Heat and Power Policies.* March 2013. http://www1.eere.energy.gov/seeaction/pdfs/see_action_chp_policies_guide.pdf

calculated values reflect a low of 26 percent of technical potential and a high of 38 percent of technical potential. A summary of the potential is show in Figure 3.

There is approximately 37 GW of technical potential[17] in the region, with approximately 27 GW from the industrial sector. The economic potential within the region for the industrial sector ranges between 7 GW and 10 GW. President Obama's Executive Order 13624 sets a goal of 40 GW by the end of 2020. Therefore, the range of economic potential in the Region as shown in Figure 3 represents between 17 and 26 percent of the President's total goal.

Figure 3. Northeast and Mid-Atlantic states Technical and Economic Potential



Sources: ICF Internal CHP Potential Figures provided to DOE.

In summary, the Region currently has 16 GW of installed CHP capacity, which is approximately 20 percent of the total U.S. installed capacity. This figure includes 11 states and Washington, D.C. New York has the highest installed capacity of the group at 5.6 GW. Pennsylvania, New Jersey, and Massachusetts each have more than 1.5 GW of CHP installed. Recent state-level studies identified significant additional potential for CHP systems. However, because the methods used by states to quantify the technical and economic potential for CHP systems vary, the state data is generally not comparable across states. Despite this uncertainty, there is significant potential for additional CHP in the Northeast and Mid-Atlantic states, and that this region could play a leading role in realizing the President's goal.

[17] CHP existing capacity includes all customer sectors and provided by the DOE reflecting an internal ICF database.

IEE and CHP Policy Framework

A systems approach that combines IEE and CHP can drive more efficient energy use, and both IEE and CHP are included as part of several EEPS programs and/or energy efficiency programs. The success of CHP as an EE measure can in part be measured by the overall success of a states EEPS program or other energy efficiency program in the state. Successful implementation of IEE and CHP are driven by state policy frameworks that enable various stakeholders to install these technologies in a cost effective manner.

Figure 4. Policy Pyramid

These policy issues vary greatly from state to state and, as a result, when evaluating the state of IEE and CHP as part of a state's policy, a framework of the current policies has to be established so that an action plan can be developed to help move the sector forward. One such framework is the Policy Pyramid defined by the Institute of Industrial Productivity (IIP)[18]. IIP used this policy pyramid approach in developing their industrial efficiency policy database. The Policy Pyramid, as show in Figure 4, is composed of three levels: Effort-Defining Policies, Supporting Measures and the Implementation Toolbox. Effort defining policies are those that enable goal setting. Supporting Measures are those policies that create an environment where initiatives can move forward. The Implementation Toolbox is made up of those resources that can provide assistance to enable participants to install projects. A pyramid framework for IEE and CHP is presented in Figure 5. This includes state and federal policies that set IEE and CHP goals, supporting policies that enable stakeholders to implement IEE and CHP within the policy framework and finally tools that are available that offer stakeholders technical and financial assistance for evaluating and installing IEE and CHP.

Goals for IEE and CHP are set at many levels. These can include CEPS such as RPS and APS programs as well as economic development goals that include job creation by encouraging industrials to move to or remain in a state.

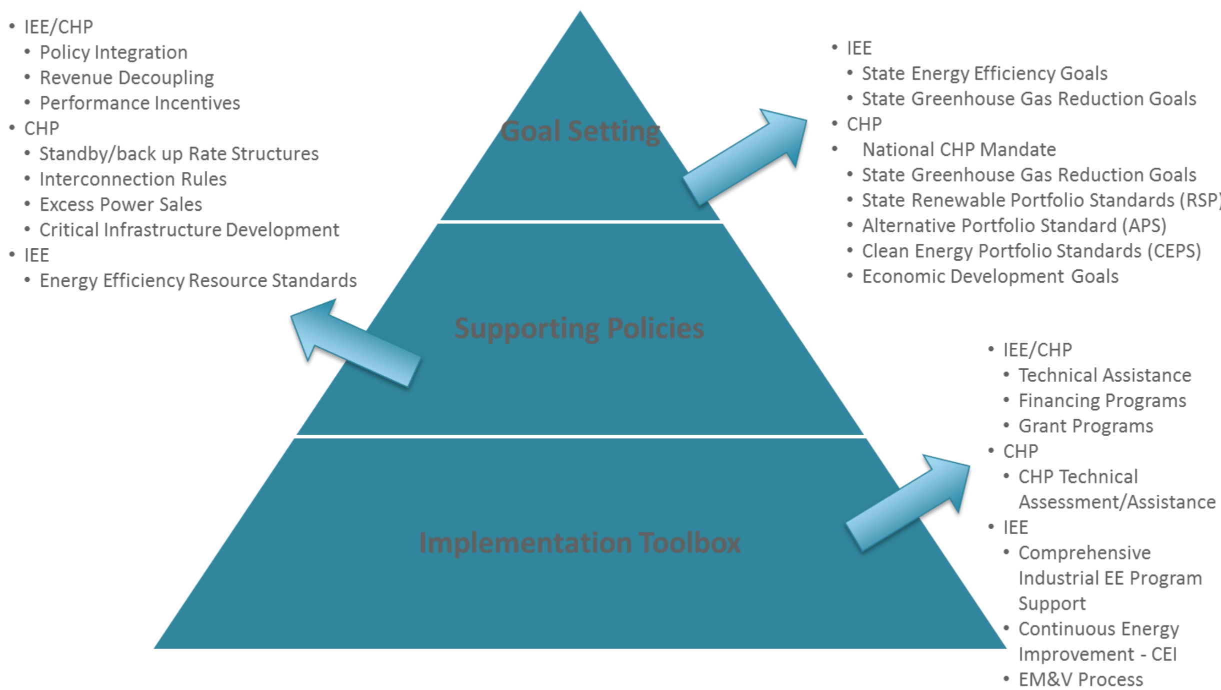
[18] http://iepd.iipnetwork.org/content/policy-pyramid

Supporting policies create an environment where goals can be realized by either creating opportunity or removing barriers. These can include the following policies:

- define how CHP, IEE and clean energy policies are integrated,
- what incentive structures are available,
- the policy of decoupling utility revenue resulting from energy sales from energy usage decreases resulting in CHP and IEE installations,
- the ability to provide and have grid connectivity through the application of standby rates and backup charges,
- the ability to connect to the grid through interconnection rules, and
- the ability to sell excess power (net metering).

These drivers are discussed in the following pages.

Figure 5. IEE and CHP Regional Policy Pyramid



Finally the implementation toolbox makes available resources to the various stakeholders to move IEE and CHP forward which can include both technical and financial assistance in evaluating the whole system within a facility to determine the best technical options for IEE and CHP.

Drivers for IEE and CHP Installations

The drivers for installing IEE and CHP can be further defined and evaluated in the policy framework defined Figure 5. The combination of goals, supporting policies and implementation tools has to be robust enough to encourage broad investment in IEE and CHP in the Region. The goals have to be well defined and the combination of supporting policies and implementation tools has to help reduce or remove barriers for installation of IEE and CHP.

Goal Setting Drivers

There are a number of goals that have set and can continue to set the expectations and desires for IEE and CHP. These include:

- State Energy Efficiency Goals
- National CHP Mandate
- State Greenhouse Gas Reduction Goals
- State Renewable Portfolio Standards (RSP)
- Alternative Energy Portfolio Standard (APS)
- Clean Energy Portfolio Standards (CEPS)
- Economic Development Goals

A state's goals around Clean Energy Portfolio Standards (CEPS), such Renewable Portfolio Standard (RPS) and Alternative Energy Portfolio Standards (APS) can drive CHP, either as an EE resource or as stand-alone installation, as a way to meet the states goals. This goal can encourage CHP and may or may not have to be accompanied by incentives. In a systems approach to IEE and CHP, the link has to be made to evaluate the facility as a whole and not let one standard goals drive to an end result that impedes another standards goals.
For example, it is important to consider all EE options within a facility before sizing a CHP system. This ensures that the EE reduction goals are included in the overall evaluation of how the CHP system will be utilized and how it will meet CEPS goals. The market responds well to these approaches if the states and the federal government can stabilize regulations, policies and incentives for IEE and CHP for substantial periods of time so that true systems approach can be evaluated and the right technology mix can be designed for the facility permitted and installed.

Table 3 provides a summary of goal mechanisms in the Region and shows how effective they currently are at supporting CHP and IEE. In this table, a full circle indicates that the policy is supported by the state, a half circle indicates that the policy is somewhat supported in the state and an empty circle indicates that the state does not currently support the policy.

Table 3. Status of Goal Setting in the Region

	MA	NY	VT	CT	RI	MD	NJ	NH	PA	ME	DE	DC
IEE												
EE program supports industrial EE	●	●	●	●	●	●	●	●	●	●	◐	●
CHP												
EE program integrates CHP	●	◐	●	◐	◐	●	○	○	◐	◐	○	○
CHP part of CEPS or (RPS, EEPS, or APS)	●	○	○	●	○	○	●	●	○	●	◐	○
CHP cost effectiveness includes energy, economic and environmental benefits	○	○	○	○	●	○	○	○	○	○	○	○

Source: ACEEE 2012 State Energy Efficiency Policy Scorecard.

In the Region, all states have specific goals with EEPS and/or EE programs that define goals for IEE. These programs set budgets and savings goals for energy efficiency. States in the region are starting to incorporate goals within EERS and EE programs that include CHP as an IEE resource. The strongest stated goals are in Massachusetts, Vermont and Maryland. While other states are beginning to explore the concept, there are still states that have not included CHP as an IEE goal, which can impede the systems approach for IEE and CHP. The area most lacking for goal setting in the region, is incorporating the energy, emissions and economic benefits into the cost effective evaluation criteria for IEE and CHP. IEE cost effectiveness is traditionally based on the energy saved compared to the baseline equipment. If other non-energy benefits such as economic benefits were included – job creation or increased productivity – this could lead to deeper investment in IEE. If CHP systems are defined as an energy efficiency measure, and all of the non-energy benefits are included in the cost benefit analysis, then a CHP system is more financially attractive to both utilities and industrial customers. This approach has been successful in a number of states, including Rhode Island, New York and Connecticut.

Policy Drivers

The alignment of robust policies to goals is of the keys to allowing stakeholders to meet the defined goals. There are a number of policies that can impact the ability to move IEE and CHP forward. These include

- Policy Integration
- Revenue Decoupling
- Standby/back up Rate Structures
- Interconnection Rules
- Incentive Structure
- Excess Power Sales
- Critical Infrastructure Development

Tables 4A and 4B provides a summary of these supporting policies in the Region and shows how effective they currently are at encouraging CHP and IEE. In these tables, a full circle indicates that the policy is supported by the state, a half circle indicates that the policy is somewhat supported in the state and an empty circle indicates that the state does not currently support the policy.

Table 4A. Status of IEE/CHP Policy Support in the Region

	MA	NY	VT	CT	RI	MD	NJ	NH	PA	ME	DE	DC
IEE/CHP												
Revenue Decoupling in place	●	●	◐	○	●	●	○	○	○	○	●	●
Performance Incentives in place	●	●	◐	◐	●	○	○	●	○	○	○	●
IEE												
EERS	●	●	●	○	●	●	○	○	◐	○	○	○

EERS

EERS policies aim for quantifiable energy savings by recognizing that energy efficiency is a utility system resource and should be considered by the utility at the same time that supply resources are evaluated.

Revenue Decoupling

Revenue decoupling is a regulatory tool that separates utilities revenues from the units of energy that are sold. This provides a mechanism for utilities to recover their fixed costs even if units of energy sold are decreased through investment in EE or installation of CHP. There are a number of different decoupling mechanisms that have been enabled in the United States. ACEEE provides a number of additional resources for exploring lost revenue mechanisms which include revenue decoupling, see http://aceee.org/sector/state-policy/toolkit/utility-programs/lost-margin-recovery. Not every state in our Region has gas or electric decoupling polices that are supportive to IEE and CHP.

Performance Incentives

Performance incentives can be part of EE programs and have been an effective driver in moving investment in IEE and CHP forward but to continue to be effective they have to be well defined and stable over a long period due to the development cycle of identifying and designing effective IEE and CHP in a systems approach.

The policies in Table 4B are those that can drive CHP installations rather than IEE. These policies tend to be less developed than IEE policy drivers predominately due to a lack of clear CHP policy mandates at the state level.

Table 4B. Status of IEE Policy Support in the Region

	MA	NY	VT	CT	RI	MD	NJ	NH	PA	ME	DE	DC
CHP												
Supportive Standby Rates	◐	●	○	◐	○	◐	◐	◐	◐	◐	◐	◐
Standardized Interconnection	●	○	●	●	○	○	◐	○	○	◐	◐	◐
Ability to Sell Excess Power	●	○	○	○	○	○	○	○	○	○	○	○
Output Based Emissions	●	●	●	●	○	●	●	●	●	●	●	●
State Critical Infrastructure Demonstrated through CHP	○	●	○	○	○	○	○	○	○	○	○	○
Utility Participation in CHP Market	○	○	○	○	○	●	●	○	●	○	○	○

Source: ACEEE 2012 State Energy Efficiency Policy Scorecard - Standby Rates

Standby rates are a tariff that is set by the utility to allow them to recover the costs they incur providing backup power to a CHP customers so that the fixed costs of maintaining the transmission system is not reallocated to existing non CHP customers. The design and level of these rates can have an impact on the costs savings of CHP systems and therefore are important policy drivers for CHP installations.

Interconnection Standards

Industrial clients that install CHP are still connected to the grid either for backup power or for supplemental loads. As a result, the process for connecting a CHP system to the grid has to be robust enough to ensure that the CHP system does not impact the overall reliability or operation of the grid. While these issues around interconnection can be complex, there are approved standards that can be deployed based on the size of the CHP system. Having an interconnection standard readily available and well understood by CHP customers helps to reduce the cost for CHP installation.

Ability to Sell Excess Power

Industrials consider CHP system sizing based on their thermal energy needs. If they match the thermal energy needs they may have excess electrical energy generated from the CHP. If the industrial does not have the ability to sell that power back to the utility, they have to decrease the size of the CHP installation to follow the thermal load which may result in electrical energy that is far below the energy consumption needs of the facility.

A properly sized and installed CHP system may have greater efficiency than the existing utility central generating facility; in addition transmission losses for delivery of the power to customer sites can be avoided. Therefore, it is beneficial to the energy savings in the Region to maximize the energy output of the CHP system. But if an industrial cannot sell that excess power to the utility, they will have to decrease the size of the system to only meet the existing electrical needs in the facility. This has two impacts: the more efficient CHP may not fully meet the facility electrical load and the industrial client is reluctant to install energy efficiency measures since it further decrease the CHP ability to generate thermal load as the reduced electrical load is met. Policies that allow an industrial to sell excess power avoid this type of scenario.

Output Based Emissions

Traditionally emissions from power generation facilities have been based on the fuel input driving the generation. This limits the emissions that can be produced based on a unit of fuel input. Output based emissions define emissions limits based on the amount of pollution produced per unit of useful output.[19] This means that CHP systems emissions are evaluated based on the useful electricity produced as well as the useful thermal energy produced. As a result, the efficiency of the CHP as well as the emissions benefits is recognized. This is a key supporting policy in helping to recognize CHP as an EE resources as well as part of a CPS or RPS and is well supported in the Region.

Critical Infrastructure

Utilities manage a large, complex network of generation facilities and transmission and distribution systems that is critical to serving customers energy usage needs. Both CHP and IEE can be utilized as a resource to increase grid stability and reliability. The state and federal government also have an interest in ensuring that the grid is stable and available and can help drive policies at a federal level to allow utilities to build, own and cooperation CHP facilities. [20]

There are a number of critical infrastructure facilities in the United States that utilize backup generators to ensure that operations can continue in the event of power supply interruption. Systems served by backup generators include hospitals, water and wastewater facilities, financial institutions, policy and security services, and places of refuge.[21] CHP can be a more effective means of backup power than a generator based backup since it can provide both the electric and thermal load for the facility.

[19] http://aceee.org/sector/state-policy/toolkit/chp/emissions

[20] SEE Action, US Department of Energy, US Environmental and Protection Agency. *Guide to the Successful Implementation of State Combined Heat and Power Policies.* March 2013. http://www1.eere.energy.gov/seeaction/pdfs/see_action_chp_policies_guide.pdf

[21] SEE Action, US Department of Energy, US Environmental and Protection Agency. *Guide to the Successful Implementation of State Combined Heat and Power Policies.* March 2013. http://www1.eere.energy.gov/seeaction/pdfs/see_action_chp_policies_guide.pdf

The addition of critical infrastructure to the evaluation of IEE and CHP is an emerging concept and addresses the fact New York, through NYSERDA, has successfully implemented CHP in critical infrastructure applications. This model has spurred additional interest in utilizing CHP to provide a level of resiliency in the case of grid outages due to storms like Superstorm Sandy[22].

Utility Participation in the CHP Market

Current regulations prohibit utilities from building, owning and, in some cases, providing maintenance services for CHP facilities.[23] While there are barriers that have to be addressed to ensure that utility participation would not limit third party participation in the CHP market and that utility CHP and non-CHP costs are adequately governed, having utilities play more of a role in CHP installations leverages the utilities knowledge of operating and maintaining power generation facilities and ensures that grid stability is maintained while minimizing the expense of distribution upgrades.

Implementation Toolbox

Even if there are goals and polices supporting and driving investment in IEE and CHP, there have to be complementary tools that educate, encourage and promote industrial customers to invest in IEE and CHP. These include:

- Comprehensive Industrial EE Program Support
- Continuous Energy Improvement Support (CEI)
- CHP Technical Assessment/Assistance
- Financing
- Grant Programs
- EM&V Process

Table 5 provides a summary of the services available in the implementation toolbox in our Region. While we have a number of tools that the industrials require, there could be more robust services available to move IEE and CHP forward. In this table, a full circle indicates that the policy is supported by the state, a half circle indicates that the policy is somewhat supported in the state and an empty circle indicates that the state does not currently support the policy.

[22] Ibid
[23] Ibid

Table 5. Status of Implementation Tools in the Region

	MA	NY	VT	CT	RI	MD	NJ	NH	PA	ME	DE	DC
CHP												
Objective CHP Technical Assistance	●	●	●	●	●	●	●	◐	●	●	◐	◐
CHP Financing	○	○	●	●	○	○	●	●	●	○	◐	◐
CHP Incentives	●	●	●	●	●	●	●	●	●	●	◐	○
IEE												
Industrial EE Financing	○	○	●	●	○	○	●	●	○	○	○	●
Industrial EE Technical Support	●	●	●	●	●	●	●	●	●	●	○	●
Industrial EE Program supports CEI	○	◐	◐	◐	○	○	◐	○	◐	○	○	◐
Industrial EE Incentives	●	●	●	●	●	●	●	●	●	●	○	●

Source: ACEEE 2012 State Energy Efficiency Policy Scorecard.

Comprehensive Industrial EE Program Support

EE programs have been successful in achieving EE goals in residential and commercial areas but IEE investment has been significantly slower and is harder to achieve. While there has been industrial investment in energy efficiency in plant building infrastructure such as lighting and HVAC, the investment in energy efficiency for manufacturing processes has lagged. This is driven by a number of issues:

- Technical expertise required for determining which energy efficiency technologies are appropriate for an industrial client and balancing energy efficiency practices against the operational and redundancy requirements for an industrial client.
- Solutions for industrial energy efficiency are very complex and customized to an individual client.
- Industrial clients are reluctant to broadly share complex processes that may be part of their competitive advantage in the marketplace.

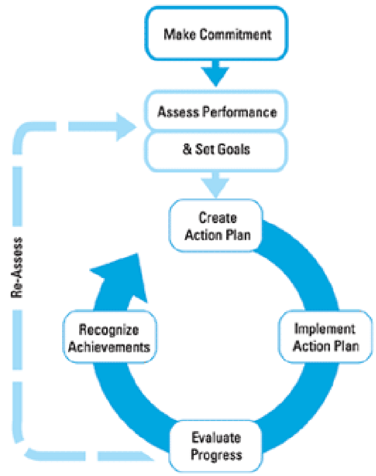
This has created a situation where an industrial client may not know if there is an opportunity to reduce their energy consumption since they cannot compare their energy consumption to other like industrials and they feel they are unable to have adequate technical assistance from existing energy efficiency programs.

There are a number of ways to address these issues to help encourage investment in IEE. These can include:

- Development of an overall energy management program for the facility.
- Utilization of ENERGY STAR Industrial Benchmarking services.
- Developing trusted partnerships with energy efficiency program providers

EE solutions for industrial clients have to be part of an overall energy management program for the facility to be truly effective. There are a number of resources for incorporating energy management into industrial facilities. ENERGY STAR provides a number of tools to help guide and industrial in the development of an energy plan using a seven step plan as illustrated in Figure 6.

Figure 6. ENERGY STAR Energy Plan Steps[24]



The ENERGY STAR industrial benchmarking tools have been successful in moving various industries in developing energy management plans and reducing energy consumption. In recognition of this process, ENERGY STAR has been recognizing industrial partners with Excellence and Sustainability awards since 2001. In 2013, ENERGY STAR awarded 15 industrial partners awards compared to the two awards in 2001. This is indicative of the success that has been achieved through the development and adoption of benchmarking tools over the last decade.

EE programs like Efficiency Vermont have created a strong IEE service by developing a key account management approach for industrial clients. The combination of a key account manager and strong technical support has created a trusted partnership that has increased investment in industrial efficiency in Vermont. That level of trust and strong technical support has led to 69 large businesses located in Vermont joining Efficiency Vermont's' Energy Leadership Challenge. These companies, with technical and financial assistance from Efficiency Vermont to create a comprehensive, long-term energy savings plan and is providing resources— are taking action to achieve 7.5 percent energy savings at their facilities.

[24] http://www.energystar.gov/index.cfm?c=guidelines.guidelines_index

Objective CHP Technical Assistance

The expertise of an industrial customer is in running their facility to provide their products of services. They are not CHP experts and require assistance in determining if CHP is the right solution for their facility. Objective assessment of CHP should address the following issues:

- Will the system be able to follow the existing thermal load?
- Have energy efficiency measures been considered in the existing electrical load?
- How much of the CHP electrical output is required?
- Is there a need for energy independence?
- How will this controlling energy costs?
- Does they system support of critical processes/systems within a facility or process?
- What would be the capital investment?
- What would be the payback?
- What will the system require operation and maintenance?
- Does the CHP system help in meeting corporate sustainability goals and/or energy management goals

Since the payback is so important, there has to be additional care taken to make sure the any energy management plan includes proper sizing of a CHP system for both the thermal and electric load. Reductions in energy use though efficiency measures should be performed first to avoid oversizing the CHP system and should be part of a comprehensive energy management plan for the facility. This combination of energy efficiency and CHP allows owners to take control over their energy costs and ensures that CHP systems can meet the return on investment targets set by the owner by providing energy cost stability. If the installation of a CHP system is undertaken as an integral element of a comprehensive industrial efficiency, the CHP system will be properly sized so that the energy savings can be maximized while improving the plant productivity, resiliency – reliable backup power during grid outages - and overall financial performance. Objective technical assistance will help an industrial customer honestly answer these questions.

Financing and Incentives

When an industrial evaluates IEE or CHP, they look at the overall economic picture of the investment to determine the viability of an IEE and/or CHP installation. The value of each of these issues can vary for each type of industrial and for each customer.

Industrials tend to expect a very short timeline for the energy efficiency improvement and/or CHP system to payback the initial investment. This may be driven by the lack of stability in the manufacturing environment, whereby an industrial may not know if their business will still be a viable entity at the end of the payback period. As a result, incentives can provide additional motivation for installing IEE and CHP in a facility by reducing the capital investment. But incentives alone will not drive the investment. Customers may not have the capital required to make the investment so having policies that support financing can provide the additional motivation to move a project forward.

Availability of natural gas is another strong economic driver for CHP. During the Dialogue the DOE Mid-Atlantic Clean Energy Application Center reported that the availability of low-cost and stable natural gas, especially if it is available on site such as in most of the region, is having a positive impact on CHP system economics. This is also having added the added benefit of brining additional industrial business to Pennsylvania. This is driven in part by the economics of CHP but also due to processing plants that utilizes natural gas as part of their manufacturing process and end products.

Summary

In summary, it is evident that while there are many successful policies in the Region that have driven and continue to drive CHP and EE in the industrial sector, but there is continued opportunity to achieve significant energy savings with systems approach to IEE and CHP if policy barriers can be successfully addressed.

The Regional Vision

As previously discussed, IEE and CHP in the Region has had mixed success to date. There is a significant opportunity to increase the amount of both IEE and CHP in the Region through action plans that can improve goal setting, supporting policies and the enhancement of an implementation toolbox to further encourage investment in IEE and CHP and move the Region closer to the goals set forth in the President's Executive Order.

The Regional Vision proposed here is to create an environment where a systems approach to IEE and CHP is well understood and supported by Regional policy and assistance is available through not only shared experiences and factual information, but by making it easy to find the resources needed to allow industrial clients to understand and evaluate – both technically and financially – how a systems approach to IEE and CHP is beneficial to their facilities. This approach can be used to help manage energy usage goals, create system resiliency, increase economic viability of the company and meet their own sustainability goals. As a result, the system approach to IEE and CHP can be a core element in sustaining and driving economic growth in the Region by making the region an attractive place for industrial clients to have competitive and profitable companies.

While there is opportunity to increase IEE and CHP installations by focusing on addressing gaps in all the states in the region; there is a level of focus that could more quickly allow access to the economic potential in the Region. Table 6 presents information for the states in the Region regarding the 2012 ACEEE Energy Efficiency and CHP Rankings[25] and existing economic potential for CHP. The results presented in Table 6 indicate that if targeted focus is applied to New Jersey, New York and Massachusetts, there can be even greater increases in installed IEE and CHP. Other states that have a large CHP potential are Pennsylvania and Connecticut. Pennsylvania is especially attractive for focus due to the large amounts of natural gas that are locally available and ensuring that any new facilities that are locating to the area evaluate IEE and CHP as a systems approach for their facilities.

[25] American Council for Energy Efficient Economy. The 2012 State Energy Efficiency Scorecard. October 2012.

Table 6. Regional Vision Opportunities

	ACEEE Energy Efficiency Ranking	Economic potential, High(MW)	2012 ACEEE CHP Score
Massachusetts	1	1,022	4.5
Connecticut	6	464	3.0
New Jersey	16	1,577	3.0
New York	3	2351	2.5
Rhode Island	7	198	2.5
Vermont	5	147	2.5
Delaware	27	105	2
Maine	25	250	2
Pennsylvania	20	3030	2
New Hampshire	18	105	1.5
Maryland	9	731	1
Washington DC	29	236	0.5

Focus on closing policy gaps to realize CHP potential and creating case studies (Massachusetts, Connecticut, New Jersey, New York)

Focus on creating policy to demonstrate economic benefits (Pennsylvania)

Action Plans

To achieve this Regional Vision, each of the areas in the policy framework require action from all the stakeholders – state governments, utilities and industrials – to ensure that goals, supporting policies and assistance are aligned and available to achieve this vision.

State Action Plan

Goals

A state action plan has to include components that increase the ability to define goals. These steps could include the following:

- Incorporate CHP into state's CEPS and EERS.
- Adopt regionally consistent guidelines for evaluation and eligibility of CHP as a clean energy asset.
- Incorporate CHP and IEE into state energy, economic and environmental goals.

Changing the way that CHP cost effectiveness is evaluated can result in increased CHP installations. During the Dialogue, Rhode Island stakeholders described the success they had in moving an industrial forward with a CHP system. While CHP is part of the state's EEPS, the CHP system cost effectiveness was evaluated based on a broader screening than just the energy benefits. R.I. approached the evaluation of the CHP system on a systems basis combining energy savings, economic benefits to the state in terms of jobs and gross domestic product and environmental benefits gained by replacing fuel based emissions generation with output based emissions generation. This type of process can be applied to other states in the region so that the merits of a CHP system can be judged on total resource costs and benefits. In addition, as highlighted in the SEE Action report, a method should be defined to determine the how to value the benefit of increased resiliency - either as increased grid stability or as uninterruptible power for critical infrastructure – in the evaluation of the cost effectiveness and total benefit of CHP installations.

A number of states have already included this concept in critical infrastructure policies. These states include Texas, Louisiana and New York.[26] Other successful examples of this type of critical infrastructure were highlighted during the regional dialogue:

- Sikorsky Aircraft in Connecticut, for example, was able to keep 9,000 people working through Superstorm Sandy which knocked out power across the state and much of the region for four days. Their CHP system not only kept people employed, but also provided employees who lost power in their own homes with a place for showers, hot

[26] SEE Action, US Department of Energy, US Environmental and Protection Agency. *Guide to the Successful Implementation of State Combined Heat and Power Policies.* March 2013. http://www1.eere.energy.gov/seeaction/pdfs/see_action_chp_policies_guide.pdf

meals, medical care and cell phone recharging. This experience, along with the financial return the system provided, led Sikorsky to commit to install CHP in all their facilities worldwide.

- Co-op City in New York, the world's largest cooperative housing development, also maintained service for its 60,000 residents during the storm. Similarly, Princeton University's CHP system enabled it to run its own "micro grid" to power the whole campus until the local utility power system was restored four days later. The University of Massachusetts Medical School campus (UMASS) is also served by a CHP system. In addition to protection against blackouts, a particular concern for a hospital, the CHP system allows the UMASS to take more control over their energy usage and costs.

CHP qualifying as part of EEPS and CEPS can increase the CHP installations. This was demonstrated successfully in a number of states:

- In 2012, Ohio passed legislation that stipulated CHP can qualify for the state's EEPS[27]
- Massachusetts qualifies CHP systems using renewable fuels and natural gas as eligible for APS credit for both thermal and electric loads[28]
- Connecticut added a new class to the RPS that must be fulfilled by CHP that recovers waste heat or pressure for C"&C processes.[29]

Supporting Policies

The next step in the action plan is to continue to develop state policies that support investment in IEE and CHP. These steps could include:

- Adopt/Implement Robust Policy Frameworks to close gaps and encourage industrial CHP
  - Standardized interconnection methods
  - Standby rates and backup charges that favor – or are at least neutral - to CHP installations
- Support innovative financial solutions
- Increase support for CHP as an efficiency resource as part of IEE programs

The analysis in this report further validates the concept that robust public polices can drive CHP installations. This is well demonstrated in Massachusetts where the main policy drivers that encourage CHP have been well addressed and as result there is 1,556 MW of installed CHP. Policies in CT and NJ have also led to 710 MW and 3,073 MW of installed CHP

---

[27] American Council for Energy Efficient Economy. *The 2012 State Energy Efficiency Scorecard.* October 2012.

[28] See Action, US Department of Energy, US Environmental and Protection Agency. *Guide to the Successful Implementation of State Combined Heat and Power Policies.* March 2013. http://www1.eere.energy.gov/seeaction/pdfs/see_action_chp_policies_guide.pdf

[29] Ibid

respectively. New York has benefited greatly from the policies enacted by NYSERDA and has 5,559 MW of installed CHP.

While Pennsylvania does not have strong policy support for CHP, the economic drivers are greatly influenced by the stable, low price natural gas which has resulting in 3,276 MW of installed CHP. Since natural gas will not be as readily available for other states in the region, robust public policy will have to drive an increase in CHP installations. These policies have to be crafted so that they provide a viable path to CHP for the industrial client, the utility and the ratepayer.

Utility Action Plan

Working within the state framework, utilities can further the installation of CHP and IEE through their own action plans.

Goals

A utility action plan has to include components that increase the ability to support the states defined goals. These steps include:

- Support incorporating CHP into CEPS and EEPS
- Consider business models to accelerate CHP as a grid resource (e.g., for transmission and distribution capacity and reliability planning)

Supporting Policies

The next step is to continue to support state policies that support investment in IEE and CHP. These steps include:

- Support policy reform to implement model policy framework
- Support innovative financial solutions
- Develop strong EM&V methodologies to measure IEE and CHP success

Implementation Toolbox

Finally it is important to ensure that there are robust tools that an industrial client can utilize to determine how and when to investment in IEE and CHP. Utilities can play a strong role in making these tools available. The can offer comprehensive technical services to both industrial EE and CHP programs that include the best practices defined in this paper. Objective technical assistance, at both the industrial level and at the state level, is one of the keys to successful IEE and CHP implementation.

Many states have ratepayer-funded energy efficiency plans that have specific IEE goals. However, attaining these goals tends to be hampered by the lack of well-developed technical assistance for specific type so industrial processes. This lack of technical support makes it difficult for EE programs to provide robust energy efficiency solution to industrial customers. The technical assistance for an industrial also has to reflect a systems approach to ensure that CHP systems are sized properly and include energy savings that result from energy efficiency measures. While third party developers bring a very high level of technical CHP expertise, they tend to focus on the size of the system that can be installed in the facility based on the facilities existing load profile. Objective technical assistance at the industrial level should include a review of the systems thermal and electric load profile to drive efficiency into the system before sizing the CHP system.

Industrial Action Plan

In the end, if industrials do not support the state and utility action plans, IEE and CHP goals cannot be achieved. As a result, there is an action plan for industrials in this area.

Goals and Policies

An industrial action plan has to include components that increase the ability to support the states and utilities defined goals. These steps include:

- Sign on to state and federal challenge goals
- Incorporate sustainability goals into business planning
- Support Policy Framework

Implementation Toolbox

An industrial action plan has to include utilizing the tools that have been developed to support IEE and CHP:

- Utilize technical resources for system planning approach to energy use
- Participate in efficiency programs
- Serve as public case study

The expertise of industrial facilities is in delivering their specific services or manufactured products, not in designing and maintaining an electrical and thermal power plant. The federal government is actively working to address this barrier and encourage CHP growth by funding regional Clean Energy Application Centers that provide technical assistance to customers considering CHP and un-biased information to state policy makers on successful policies.

In addition, in response to the Executive Order, federal agencies are working to align their policies and programs to encourage economic CHP investments. States that have CHP has part of an active EEPS system also offer technical assistance to industrials to determine if a CHP is a viable solution for the facility. These technical offerings also evaluate industrial efficiency measures as part of the solution which ensures that robust system is designed that meets the efficient energy needs of the facility.

Industrials can also participate in ENERGY STAR's Industrial Benchmarking to access additional tools and services for education and assistance on implementing IEE in their facilities.

NEEP's Role

The adoption of a Regional Vision requires leadership and the ability to move forward with the recommendations identified in the action plan. NEEP may be in a position to provide this type of leadership based on the role it currently plays in the regional regarding energy efficiency policies and programs[30].

NEEP's Mission

NEEP was founded in 1996 as a non-profit whose mission is to serve the Northeast and Mid-Atlantic to accelerate energy efficiency in the building sector through public policy, program strategies and education. We are the only regional organization that maximizes energy efficient solutions through regional partnerships that leverage knowledge, capability, learning and funding to increase the impacts of individual state efforts.

NEEP's Vision

Our vision is that the region will fully embrace energy efficiency as a cornerstone of sustainable energy policy to help achieve a cleaner environment and a more reliable and affordable energy system.

NEEP's Values

We strive to bring our three core values of collaboration, expertise, and advocacy to our work internally and with our partners regionally and nationally.

A systems approach to IEE and CHP can be a robust part of energy efficiency and sustainable energy policies and programs. To that end, incorporating support of a regional vision for a systems approach to IEE and CHP is within the bounds of NEEP's regional vision and mission. Based on the action plan presented in this report, there a number of areas where NEEP can potentially bring unique and substantial value to helping achieve the Regional vision outlined in this document.

NEEP's role in "maximizing energy efficient solutions through regional partnership sand the ability "leverage knowledge, capability, learning and funding to increase the impacts of individual state efforts" can provide a means to assist stakeholders in the action plan defined above so that the identified policy pyramid gaps for IEE and CHP can be successfully addressed.

This would be different from other relevant efforts in that NEEP would be able to leverage an existing network that has been developed through the NEEP's regional programs, policy support, EM&V forum and the NEEP summits to bring various stakeholder together so that

[30] http://neep.org/about-neep/mission

issues can be addressed in a collaborative manner where results of successful changes can be applied to other states and discussed for broader application.
Though NEEP's role in energy efficiency is well established, the roles that NEEP could play in moving IEE and CHP forward are very different. As a result, the following action plans are separately described for IEE and CHP.

IEE Action Plan

State Action Plan

In supporting the states action plan for goal development in the Region, NEEP could assist in number of roles that leverage NEEP's strengths. These roles could include:

- Support development of comprehensive cost effectiveness analysis which includes energy, environmental and economic benefits

Currently each state has different supporting policies for IEE but on the whole, these policies are well established in the Region.

Utility Action Plan

In supporting the utilities action plan for IEE in the Region, NEEP could assist in number of roles that leverage NEEP's strengths. These roles could include:

- Goal Setting and Policy Support: EM&V best practice identification and promotion
- Implementation Toolbox: There is a need for deeper industrial technical support as part of existing IEE programs. Utilities can work to incorporate existing regional based and DOE resources – such as US DOE Advanced Manufacturing Office (AMO) and EPA's Energy Star Portfolio Manager - into their programs.

Industrial Action Plan

In supporting the industrial action plans for IEE in the Region, NEEP can assist in increasing the number of implementation tools that are available to industrial clients and identifying those tools that are available. This could include:

- Research to identify sector specific expertise and related technical resources
- Regional meetings to share lessons learned best practices and case studies for IEE leading examples.
- Developing a regional web-based resource center specifically for IEE that would allow for dissemination of information and links to additional resources.

CHP Action Plan

State Action Plan

In supporting the states action plan for goal development in the Region, NEEP could assist in number of roles that leverage its historic strengths. These roles could include:

- Become an advocate for robust CHP policy within state energy efficiency portfolios

- Participate and coordinate advocacy discussions with other national and regional stakeholders
- Provide outreach and education on CHP issues to key policy makers
- Support state adoption and implementation of best practices for goal setting and CEPS definitions
- Support development of a resiliency value calculation
- Support development of robust cost effectiveness which includes energy, environmental and economic benefits

Currently each state has different supporting policies for CHP. The policy framework identified how the structure of these policies can drive CHP. Within NEEP's role in the Region, they can help states in evaluating current supporting policies to determine changes that may be needed. NEEP can do this by performing the following roles:

- Identify, promote and track best practices/ policies to reduce CHP barriers for customers
- Support state adoption and implementation of best practices policies and programs
- Provide regional and state specific policy analyses and related reports and fact sheets to gram the policy needs, opportunities and approaches in specific states.
- Inform federal policies based on state experience and policies
- Connect state and efficiency programs with other resources

Utility Action Plan

In supporting the utilities action plan for CHP development in the Region, NEEP could assist in number of roles that leverage NEEP's strengths. These roles could include:

- Goal Setting and Policy Support: EM&V best practice identification and promotion
- Implementation Toolbox: Support integration of EE programs with technical assistance through Clean Energy Application Centers and U.S. DOE Superior Energy Performance Program through relationship management

Industrial Action Plan

In supporting the industrials action plan for CHP development in the Region, NEEP can assist in increasing the number of implementation tools that are available to industrial clients and identifying those tools that are available. This would include:

- Increase visibility of CHP best practices and successes through case studies and media engagement
- Developing a regional web-based CHP resource center for dissemination of information and links to additional resources.
- Regional meetings to share lessons learned best practices and case studies for CHP leading examples.

Funding

As with any regional effort, the resources in terms of funding and partners are limited. However, as CHP is integrated into EEPSs, the funding path to further move these types of initiatives forward could be through EM&V best practices. EEPS programs would benefit from a robust cost effective definition of CHP and the ability to demonstrate that the true effectiveness of CHP as an EE resource. Examples of where this approach is successful, such as RI, can be leverage in other state programs.

If NEEP were to focus on states with the greatest economic potential and fewer gaps in CHP policy, New Jersey, New York and Massachusetts, this could advance the Presidents goal for CHP in the region and use those success stories to influence other states. Focus could also be applied to states that have a large CHP potential such as Pennsylvania and Connecticut, to help close policy gaps to increase IEE and CHP installations. As stated, Pennsylvania is especially attractive for focus due to the large amounts of natural gas that are locally available. This is enabling IEE and CHP to move forward based predominately on economic drivers that make large CHP attractive for existing and new manufacturing. By focusing on existing policy gaps that would enhance the economic drivers, there could be an increase in the current economic potential of the projects and expand the CHP economic potential in the state.

Stakeholder Input

The final question to answer is if stakeholders within the Region are interested in NEEP taking an active role in the assisting in the development of a regional vision for a systems approach to IEE and CHP. Phone calls to various stakeholders have provided a mixed response. Some stakeholders see a role for NEEP in increasing the visibility of CHP success stories and available technical resources, similar to the role NEEP currently plays for Regional energy efficiency. They also see NEEP being able to provide assistance in moving towards a common methodology for evaluating economic potential and moving the EM&V discussion forward to provide greater acceptance of utilizing a more robust cost effectiveness model for the evaluation of CHP.

However, a number of stakeholders feel that the evaluation of CHP systems, and the systems approach for IEE and CHP, is very specific to the site and that a regional approach will not be beneficial in terms of evaluating the technical merits of the system or in the development of regional standby rates and backup charges since those rates are utility specific. Coupling IEE with CHP in a systems approach is the right approach but since the industrial base in the Region is very diverse and industrial systems are very complex, it would likely be very difficult for NEEP to develop the expertise needed to support these diverse and technically demanding evaluations. Many stakeholders feel that the lack of strong technical assistance in IEE and CHP has been a key barrier in the promotion of IEE and CHP for industrial clients.

Summary

In summary, there appears to be a focused, targeted role that NEEP could play in moving forward a Regional Vision for a systems approach to IEE and CHP by being a focal point for best practices and a forum for further stakeholder collaboration. However, funding will remain an obstacle and will have to further evaluated in conjunctions with the ability of the NEEP staff to attain the needed IEE and CHP skills to address these issues with a strong, credible knowledge base and provide guidance to industrial clients.

Appendices

Appendix A: Dialogue Report
Appendix B: Dialogue Summary Points
Appendix C: Dialogue Agenda
Appendix D: Moderator and Speaker Biographies
Appendix E: Participant List
Appendix F: CHP Summary Status

Appendix A

DIALOGUE REPORT

Northeast / Mid-Atlantic Industrial Energy Efficiency and Combined Heat & Power Regional Dialogue

Held

March 13, 2013

Radisson Plaza Lord Baltimore Hotel, 20 West Baltimore Street, Baltimore, Maryland

SUMMARY REPORT

May 23, 2013

Prepared by NEEP and VEIC

EXECUTIVE SUMMARY

In response to President Obama's 2012 Executive Order *Accelerating Investment in Industrial Energy Efficiency* which calls for 40 GW of new Combined Heat and Power (CHP) capacity over the next decade, the U.S. Department of Energy (DOE) is holding a series of regional meetings to discuss Industrial Energy Efficiency (IEE) and CHP opportunities. The Northeast and Mid-Atlantic Regional Dialogue Meeting, co-sponsored by Northeast Energy Efficiency Partnerships (NEEP) and the State and Local Energy Efficiency Action Network (SEE Action), was held in Baltimore, Maryland and brought together policymakers, utilities, industrial customers, vendors and other stakeholders. The Dialogue meeting focused on fostering a regional discussion of state best practice policies and investment models to overcome the numerous barriers to industrial energy efficiency and CHP investments. The meeting focused on industrial energy efficiency and CHP successes, opportunities, and new approaches—all with an eye toward state and regional policy, including the role of ratepayer-funded energy efficiency programs. This report captures the key points of the dialogue.

The Northeast / Mid-Atlantic Region Has Significant CHP Potential: The Northeast and Mid-Atlantic states already have 16 gigawatts (GW) of installed CHP capacity, which is about 20 percent of the total U.S. installed capacity (See Appendix E). This figure includes 11 states and Washington, D.C. New York has the highest installed capacity of the group at 5.6 GW. Pennsylvania, New Jersey, and Massachusetts each have more than 1.5 GW of CHP installed. Recent state-level studies identified significant additional potential for CHP systems. However, because the methods used by states to quantify the technical and economic potential for CHP systems vary, the state data is generally not comparable across states. Despite this uncertainty, the studies agree that a large potential for additional CHP in the Northeast and Mid-Atlantic remains, and that this region could play a leading role in realizing the 40 GW goal.

Installed CHP Systems Reduce Energy Costs and Offer Reliable Back-up Power during Grid Outages: The dialogue highlighted a number of successful CHP installations across the region, demonstrating both reliability and energy savings. Sikorsky Aircraft in Connecticut, for example, was able to keep 9,000 people working through Superstorm Sandy which knocked out power across the state and much of the region for four days. Their CHP system not only kept people employed, but also provided employees who lost power in their own homes with a place for showers, hot meals, medical care and cell phone recharging. This experience, along with the financial return the system provided, led Sikorsky to commit to install CHP in all their facilities worldwide. Co-op City in New York, the world's largest cooperative housing development, also maintained service for its 60,000 residents during the storm. Similarly, Princeton University's CHP system enabled it to run its own "micro grid" to power the whole campus until the local utility power system was restored four days later. The University of Massachusetts Medical School campus (UMASS) is also served by a CHP system. In addition to protection against blackouts, a particular concern for a hospital, the CHP system allows the UMASS to take more control over their energy usage and costs. See Appendix B for links to videos about Sikorsky and UMASS that were played during the dialogue meeting. The DOE Mid-Atlantic Clean Energy Application Center reported that the availability of low-cost and stable natural gas, especially if it is available on-site such as in most of the region, is having a positive impact on CHP system economics.

Site-Specific Factors Drive the Economic Potential for Industrial CHP, Requiring a Flexible, Systems Approach to Project Development: The dialogue highlighted that the opportunity for CHP is very specific to each project and is especially dependent on thermal loads and fuel types. For any industrial customer to gain the full benefits from CHP, such systems should be evaluated as part of an overall system of process improvements that minimize energy and thermal loads and optimize system performance and productivity. Reductions in energy use though efficiency measures should be performed first to avoid oversizing the CHP system. Participants noted that efficiency program participation, including the installation of CHP, should remain voluntary. The value of resilience, providing uninterrupted power during times of grid power outages, can be a strong driver for CHP. However, quantifying the value of resilience poses challenges for state utility regulators needing to determine ratepayer-funded program cost-effectiveness, as well as for businesses that base investment decisions upon return on investment.

Cooperation and Public-Private Partnerships Can Unlock the Region's Industrial Energy Efficiency and CHP Potential: Participants noted that for the Executive Order CHP goals to be achieved, industrial customers, government and utilities should cooperate and work together to create conditions conducive to more industrial process efficiency projects and the installation of CHP systems. The discussion addressed a number of public policy, financial and technical barriers that each may inhibit progress. The dialogue suggested that all types of participants potentially have a role to play in overcoming those barriers. Much of the dialogue was devoted to identifying the barriers, from the various perspectives of the participants, and proposing solutions.

State and Federal Policy Support Are Critical to Advancing CHP: The federal government is actively working to encourage CHP growth by funding regional Clean Energy Application Centers that provide technical assistance to customers considering CHP and un-biased information to state policy makers on successful policies. In addition, in response to the Executive Order, federal agencies are working to align their policies and programs to encourage economic CHP investments.

Participants suggested that state policies encouraging the installation of CHP systems also play an important role. For example, some participants suggested that a Renewable Portfolio Standard type approach, also called a Clean Energy Standard, can encourage CHP and may or may not have to be accompanied by incentives. They noted that uncertainty with respect to regulations, the availability of funds, and the economy can all present barriers to moving forward with a CHP project. If states and the federal government can stabilize regulations, policies and incentives for CHP for substantial periods of time, the more likely it is that CHP projects will have the time it takes to be proposed, permitted and installed. Participants noted that states also have a role in defining the way in which CHP systems are treated. If CHP systems are defined as an energy efficiency measure, and all of the non-energy benefits are included in the cost benefit analysis, then a CHP system is more financially attractive to both utilities and industrial customers. This approach has been successful in a number of states including Rhode Island, New York and Connecticut.

Participants also noted that state policies are important to overcome two major obstacles to CHP: utility interconnection standards and standby rates, and determination of cost-effectiveness as a driver of available incentives. Rhode Island instituted public policies to address these issues including revenue and sales decoupling that enable the utility to sever their cost recovery from energy sales, and the establishment of standby rates attractive to customers seeking to install CHP as an element of comprehensive, systemic energy efficiency treatments. In addition, inclusion of a greater number of benefits, such as economic development benefits, energy supply costs, greenhouse gas emissions standards and air quality benefits, and system reliability benefits in the mandated cost-effectiveness testing allowed the utility to offer higher customer incentives.

Utilities Can Play a Key Role in Enabling CHP Installations. Potential barriers to CHP include: standby rates, demand ratchets, interconnection requirements, and other utility approval processes. Participants suggested that if utilities view industrial CHP as an opportunity to avoid new generation capacity and/or meet efficiency goals, then they may have an incentive to remove barriers and promote CHP. Utilities already have established relationships with their customers, so they are in a good position to promote solutions, such as CHP, that could meet their customer's needs. However, as regulated entities, utilities are limited in their flexibility to recover fixed cost recovery lost to the installation of a CHP system. Thus, state policymakers should seek ways to make CHP attractive to all parties, including utilities.

Appendix B

DIALOGUE SUMMARY POINTS

INDUSTRIAL ENERGY EFFICIENCY AND CHP BENEFITS/DRIVERS

From the Utility Perspective:

- Industrial customers can be large energy consumers and represent significant potential for energy efficiency.
- Industrial efficiency can serve as a utility customer retention and economic development strategy to stabilize loads.
- In some states CHP systems are categorized as an efficiency measure allowing CHP to be promoted with incentives through efficiency programs. Sometimes this enables utilities to be rewarded for meeting efficiency goals with CHP. In that context, large CHP projects can have a significant impact on achieving efficiency goals – making CHP an attractive business opportunity for utilities.
- CHP can be a cost-effective solution to meet generation capacity needs particularly in distribution constrained areas.

From the Customer Perspective:

- Energy efficiency projects can provide excellent returns on investment – boosting profitability.
- CHP preceded by comprehensive industrial energy efficiency supports properly sizing CHP systems – helping to meet customer payback requirements.
- The availability of low-cost and stable natural gas, particularly if it is already available on the site or close to the site, can make CHP very cost-effective.
- Manufacturers/customers that use both the thermal and electricity continuously (versus seasonal use) reap the most benefits from CHP.
- A CHP system can help a facility better manage and control energy use and costs. A multi-fuel CHP system can provide unique operational options and minimize costs.
- A CHP system can provide resilience when the grid fails by providing electricity and thermal (heat, chilled water and/or cooling) during a grid outage. This is especially important for facilities where continuous power is required such as manufacturing plants, hospitals, and retirement communities.
- New environmental regulations, such as the EPA's Boiler MACT rules, may drive customers to consider natural gas CHP as a compliance strategy.

From the Policymaker Perspective:

- Industrial energy efficiency – including CHP - can help meet energy and environmental policy goals.
- Industrial efficiency and CHP can be a driver of economic development: making industrial businesses more competitive globally while creating and maintaining local manufacturing jobs.
- Industrial CHP provides resiliency during power outages offering benefits in public safety, health and welfare. Such benefits should be considered in screening ratepayer-funded incentives or other measures to promote industrial CHP.

INDUSTRIAL ENERGY EFFICIENCY AND CHP BARRIERS

From the Utility Perspective:

- Industrial customers are reluctant to change their process systems or equipment core to their business – particularly those that run continuously.
- Industrial customers are concerned that utilities do not have the expertise to fully evaluate the efficiency opportunities in their systems and processes.
- Mechanisms (e.g., revenue decoupling) are needed to allow a utility to recover costs from lost revenue as the result of the installation of industrial efficiency and customer located CHP.
- Some utilities are interested in re-entering the generation business to offer CHP to their industrial customers, but deregulation bars them from owning generation - including customer-sited generation. A possible precedent is utility-owned, customer-sited solar PV systems.

From the Customer Perspective:

- Customers typically want a short payback investment, and CHP tends to have longer paybacks.
- The lack of a comprehensive industrial energy management plan can lead to a company making short-term, short-payback investments that can provide barriers to CHP systems. For example, a company that has made recent upgrades to an existing boiler may be reluctant to move forward with CHP.
- The cost of a district energy system with CHP, which is commonly used at a university or medical center campus, can be prohibitive, and may require either disruptive civil works or expensive horizontal boring.
- Regulations that prevent an industrial CHP owner from selling thermal energy outside the host CHP facility limits options to partner with another company or create a district energy system.
- Multiple industrial efficiency programs offered by different providers in the same service territory, such as in New York, are confusing to the customer and can impact the adoption of both industrial efficiency and CHP.
- National economic uncertainty and pending regulations can cause businesses to refrain from making industrial efficiency and/or CHP investments.
- The value of the resilience varies significantly by customer under different circumstances (e.g., during a natural disaster versus during normal times). Regardless, resilience is a significant value and regulators need to be able to quantify that value in determining program cost-effectiveness.
- Instability and uncertainty about program incentives and financing can discourage internal champions and obstruct CHP projects.

For Both Utilities and Customers:

- Cost-effective electric and gas efficiency measures should be implemented first to help ensure a good match between the sizing of the CHP system and the facility's energy usage. This is particularly important in matching thermal energy production from the CHP system with specific facility uses.
- Utility's goals and the customer's goals are not always aligned for industrial CHP installation.

- Bundling potential neighbors into a district energy co-op or partnership with a CHP system to aggregate thermal loads can be challenging in that businesses probably do not know their neighbors' energy consumption or thermal loads. To address this, utilities could help evaluate and aggregate energy and thermal loads of neighboring utility customers to support CHP systems.

INDUSTRIAL ENERGY EFFICIENCY AND CHP ENABLING POLICIES AND PRACTICES

From the Utility Perspective:

- It is important that the various groups within a utility, such as efficiency, planning, strategy, and distribution, communicate effectively in order to align policies and programs that affect industrial customer investments in industrial efficiency and CHP.
- A mechanism that allows a utility to recover lost revenue from electricity sales and to cover costs for maintenance of the electrical distribution system addresses a significant barrier to utility support for industrial efficiency and CHP.
- Including environmental and economic benefits in the cost-effectiveness and incentive calculations could help capture the full benefits of industrial efficiency and CHP, allowing more projects to pass the cost effectiveness test, and make them eligible for larger incentives.
- Special tariffs for natural gas delivery that encourage CHP could improve project economics for a customer considering installing a CHP system, thus resulting in more gas sales for the utility.
- Including industrial CHP as an eligible resource in meeting a utility's energy efficiency targets could shift their perspective toward new customer-sited CHP.

From the Customer Perspective:

- Cultivation of a business relationship between an industrial customer and the utility is important to establish the trust necessary to uncover and implement process efficiency opportunities. Traditional utility lighting and HVAC programs do not address the major energy uses at an industrial plant. NYSERDA, for example, has a dedicated program for addressing industrial process energy efficiency opportunities.
- Straight-forward, integrated and fast-track state and federal permitting for industrial efficiency projects and CHP can remove a key barrier to industrial efficiency and CHP investments.
- Standardized interconnection requirements make it easier to move forward CHP projects.
- Accurate CHP project assessments, such as those provided at no cost by the DOE regional Clean Energy Application Centers, can help identify promising projects.
- References, case studies and peer referrals can be persuasive and help customers move forward.
- CHP can be integrated with a number of energy and business management practices such as ISO 50001/Superior Energy Performance, Six Sigma, and Kaizen. A comprehensive energy management system can be strengthened with CHP. The LEED rating program provides points for buildings with CHP systems.
- Incentives for CHP systems improve the return on investment in a CHP system. New Jersey funds up to 30 or 40 percent of qualifying CHP costs, depending on the fuel and the size of the system. Fuel cell systems are eligible for incentives of up to 60% of the project cost.

- Financing options for a CHP project such as public-private partnerships or third-party surety "QBE" bonds can be helpful. Power Purchase Agreements (PPA) could be another method.

For Both Utilities and Customers:

- Utility participation in the development of industrial CHP should include a balance between incentives for the utility and benefits for the customer while not providing the utility with an unfair business advantage. This balance may be achievable through custom tariff rates.

Appendix C

SESSION DESCRIPTIONS

9:00-10:00 **Registration and Networking**

10:00-10:30 **Welcome and Introduction**

Jason Miller, Special Assistant to the President for Manufacturing Policy

Mike Carr, DOE Principal Deputy Assistant Secretary, Energy Efficiency and Renewable Energy

---

10:30-11:45 **Session 1: Industrial Energy Efficiency and Combined Heat & Power: Opportunities and Successes**

Marion Gold, Rhode Island Commissioner of Energy Resources

Robert Araujo, Sustainable Director, Manager Sustainability and EHS Programs at Sikorsky Aircraft

Tim Roughan, Director of Distributed Resources, National Grid

Jim Freihaut, Director, Mid-Atlantic Clean Energy Application Center

Moderator: Sue Coakley, Executive Director, Northeast Energy Efficiency Partnerships

- Moderator began with panel introductions followed by brief overview of the status of industrial efficiency and CHP across the region and case study video about Sikorsky Aircraft

See: http://www.neep.org/neep-supporters/business-leadership/case-studies/sikorsky

---

11:45-1:00 **Session 2: Current Barriers and Drivers for More Investment in Industrial EE and CHP**

Brian Platt, Program Manager, NYSERDA

John T. Baker, PE, Associate Vice Chancellor for Facilities Management

Steven Goldenberg, Chief Council to New Jersey Large Energy User Coalition, Fox Rothschild LLP

Mike Winka, Director Office of Clean Energy, New Jersey Board of Public Utilities

Moderator: Tom Bourgeois, Co-Director, Northeast Clean Energy Application Center

- Moderator began with panel introductions followed by brief case study video about UMass Medical School

See: http://www.neep.org/neep-supporters/business-leadership/case-studies/umms

---

1:00-1:45 **Lunch Speaker:**

Barbara Kates-Garnick, Massachusetts Undersecretary of Energy

---

1:45-3:00 **Session 3: Charting the Path to Greater Industrial EE and CHP**

Calvin Timmerman, Assistant Executive Director, Maryland Public Service Commission

Bob Pistor, Vice President, UGI Utilities
Ken Cooper, Senior Business Development Professional, United Illuminating Holdings
Ronald Araujo, Manager, Conservation and load management, Northeast Utilities
Moderator: Jonathan Schrag, Executive Board Member, Northeast Clean Heat and Power Initiative

- Moderator began with panel introductions

3:00-4:00 **Moderated Audience Discussion and Next Steps**

Moderator: Tim Woolf, Vice President, Synapse Energy Economics

Session moderators and keynote speaker participated in the audience discussion. Discussion questions included:

- What should be the top priority policy options for state utility regulatory commissions to adopt to promote industrial EE and CHP to help achieve the state's goals (energy, environmental, economic development)?
  - Address utility cost recovery and financial incentives?
  - Address standby rates and interconnection barriers?
  - Require EE program administrators to offer CHP as an energy efficiency program?
  - Promote utility partnerships with host customers? Is there a specific opportunity in grid-congested areas?
  - Others?
- What should be the top priority options for state legislatures to adopt to promote industrial EE and CHP?
- How can regional organizations (e.g., NEEP, Clean Energy Application Centers) do more to support CHP and industrial EE?
- Given the clear support for industrial EE and CHP from the federal government, what are the most important actions that Federal agencies can undertake to promote them?

4:00 **Adjourn**

Appendix D

MODERATOR/SPEAKER BIOGRAPHIES

Robert Araujo, Sustainable Director, Manager Sustainability and EHS Programs at Sikorsky Aircraft

Robert J. Araujo is the Manager of Sustainable Development and EHS Programs for Sikorsky Aircraft Corporation and responsible for developing a sustainable approach to manufacturing systems and programs, prior to which served as Manager of Environmental Engineering for Sikorsky. Prior to coming to Sikorsky, Bob managed chemical engineering and EHS programs for Risdon Corporation, Emhart Corporation, and Uniroyal. He has more than 30 years' experience in environmental, chemical engineering, hazardous materials management and Emergency Response. Bob has a B.S. degree in chemistry, an Executive Masters in Business Administration from the University of New Haven; he has also performed graduate studies in both chemistry and engineering at the University of Bridgeport and Boston University. He has a Masters from Rensselaer Polytechnic Institute in Environmental Policy and Management and is also an adjunct professor at Rensselear in environmental sustainability, industrial ecology and design for the environment.

John T. Baker, Associate Vice Chancellor for Facilities Management, University of Massachusetts Medical School

John Baker is currently the Associate Vice Chancellor of Facilities Management at the University of Massachusetts Medical School, Worcester, MA. UMass Medical School is nationally ranked for Primary Care medical education and continues to be nationally recognized as a leader in Biomedical Research. In addition to managing facilities for this academic medical institution, John also provides facility operational and maintenance support for the 400-bed Level 1 Trauma hospital. Prior to joining UMass Medical School, John retired as a Commander from the US Navy Civil Engineer Corps, where he served twenty years of active duty. John holds a BS in Civil Engineering from the University of New Hampshire and a MSCE in Construction Engineering and Management from Purdue University. He is a registered professional engineer in both Massachusetts and New Hampshire and an active member of ASHE, ASCE, NFPA, and NSPE. In addition, he is a Certified Facility Manager (CFM) and a Certified Healthcare Facility Manager (CHFM).

Tom Bourgeois, Co-Director, Northeast Clean Energy Application Center

Tom Bourgeois is Deputy Director of the Pace Energy and Climate Center, as well as Co-Director of the U.S. Department of Energy's Northeast Clean Energy Application Center, a position he has held since 2004. In October 2008, he was recipient of the CHP Champion Award, presented by the U.S. Combined Heat and Power Association (www.uschpa.org). Tom has served as the principal investigator or major contributor on more than a dozen research contracts sponsored by New York State Energy Research and Development Authority (NYSERDA), U.S. Department of Energy, Oak Ridge National Labs, Argonne National Labs, ASERTTI/NASEO, and other research foundations and government agencies. Tom has 18 years of work experience in utility markets in the Northeast United States. He is the Past President and Current Treasurer and Executive Board Member of the Northeast CHP Initiative (www.nechpi.org). He studied for a Ph.D. in Managerial Economics from Rensselaer

Polytechnic Institute (RPI) and holds a Master's Degree from the University of North Carolina – Chapel Hill with a concentration in Regional Economic Development.

Mike Carr, U.S. Department of Energy, Principal Deputy Assistant Secretary - Energy Efficiency and Renewable Energy
In his role as Principal Deputy Assistant Secretary for the Office of EERE, Mike provides leadership direction on cross-cutting activities in EERE's portfolio. In particular, he is using his experience in policy development to help ensure that EERE does its best to inform federal policy-making and legislative activities related to renewable energy and energy efficiency technologies. Since 1996, Mike has advised on law and policy both inside and outside of government, with a particular specialization in environment and natural resources law. Prior to taking on the Principal Deputy position, from 2004 to June 2012 Mike served as Senior Counsel to the Senate Committee on Energy and Natural Resources. In private practice, Carr specialized in litigation involving NEPA, the Clean Air Act, and the Clean Water Act. He managed environmental and appropriations issues for Rep. David Skaggs (D-CO) until 1998, then worked in the Solicitor's Office of the Department of the Interior through 2002. Mike holds a law degree from Lewis and Clark College and a Bachelor's from the University of Colorado – Boulder.

Sue Coakley, Executive Director, Northeast Energy Efficiency Partnerships
Since founding Northeast Energy Efficiency Partnerships (NEEP) in 1996, Sue Coakley has served as Executive Director and a member of the Board of Directors. She provides strategic direction for NEEP's development, management, and operations; manages relationships with NEEP's broad base of sponsors and funders; and contributes to national and regional strategies to accelerate energy efficiency as a clean, powerful and dependable energy resource. She has been advocating and collaborating for clean energy for over thirty years, including five years at the Massachusetts Department of Public Utilities and several years as an energy efficiency consultant/advocate before founding NEEP. She is also the Board Chair for TopTen USA and as Board Vice Chair for Vermont Energy Investment Corp. She holds a master's degree in natural resource management and administration from Antioch/New England University and a bachelor's degree in environmental science from Windham College.

Ken Cooper, Senior Business Development Professional, United Illuminating Holdings
Ken is a Strategic Business Development and New Products professional with solid experience in identifying, planning, and implementing new products and business ventures including energy-related products and services. Ken currently works for UIL as Senior Business Development Professional where he actively facilitates and promotes CHP development and other distributed generation projects. Prior to UIL, Ken held various positions in international Strategic Business Development, New Product Development and Marketing for myFC, a start-up fuel cell company based in Stockholm, Sweden, BIC Corporation and Avery Dennison.

Jim Freihaut, Director, Mid-Atlantic Clean Energy Application Center
James D. Freihaut is an Associate Professor in the Department of Architectural Engineering at Pennsylvania State University. He serves as Director of DOE's Mid-Atlantic Clean Energy Application

Center, the Ben Franklin Center for High Performance Building Systems Research and Technical Director of the DOE Energy Innovation Regional Center for Energy Efficient Buildings at the Philadelphia Navy Yard. Prior to joining Penn State University, Jim worked for 22 Years at United Technologies Research Center (UTRC) of United Technologies Corporation. Jim received his bachelor's degree in Philosophy/Chemistry from Christian Brothers College (1966). He earned his master's degree at Rensselaer Polytechnic Institute (1972) in Natural Science/Physical Chemistry. Jim achieved his Ph.D. in Fuel Science from the Pennsylvania State University (1980).

Marion Gold, Rhode Island Commissioner of Energy Resources
Marion Gold has served as Administrator of the Rhode Island Office of Energy Resources (OER) since August 2012 and was confirmed as Commissioner on March 5, 2013. As leader of the OER, Dr. Gold is dedicated to working with public and private sector partners to provide sustainable, secure, and cost-effective energy services to all sectors of the community. Prior to joining the OER, she was the Director of the Outreach Center at the University of Rhode of Island where she established the URI Partnership for Energy and directed extension programs for communities and the public in energy, environmental horticulture, and urban agriculture. She served on the URI President's Council for Sustainability and on the RI Energy Efficiency and Resource Management Council and continues to serve as an adjunct professor of Environmental and Resource Economics at URI. Dr. Gold holds a B.S. in Natural Resource Science and Policy from the University of Michigan, a M.S. in Environmental Economics from Michigan State University, and a Ph.D. in Environmental Sciences from the University of Rhode Island.

Steven Goldenberg, Fox Rothschild LLP, Chief Council to New Jersey Large Energy User Coalition
Steven Goldenberg is a Partner at Fox Rothschild, LLP, and he concentrates his practice in public utility law, with a particular emphasis on energy regulatory matters. He serves as co-chair of the firm's Energy and Public Utilities Practice Group. Steve founded the New Jersey Large Energy Users Coalition, which is comprised of pharmaceutical companies, major manufacturers and large commercial customers. He now serves as the group's counsel before the New Jersey Board of Public Utilities and New Jersey Legislature in connection with energy-related matters. His government affairs practice focuses primarily on energy and government procurement issues. Steve holds a law degree from Yeshiva University, Benjamin N. Cardozo School of Law, an M.P.A. from New York University, and a B.A. from The State University of New York.

Barbara Kates-Garnick, Massachusetts Undersecretary of Energy
Barbara Kates-Garnick was appointed by Governor Deval Patrick as the Energy Undersecretary after serving for several years as an independent consultant in academia and private business. Most recently, she advised the Polytechnic Institute of New York University on issues related to urban systems, clean technology, energy policy and entrepreneurship. At NYU, she created a successful proposal for the $1.5 million New York City Accelerator for Clean and Renewable Energy, a showcase for clean energy technology. Some of her previous energy positions include serving as a former Department of Public Utilities (DPU) commissioner and member of the Energy Facilities Siting Board, and as a DPU director responsible for developing Massachusetts' first natural gas deregulation policy. She is also a former assistant secretary in the Massachusetts Office of Consumer Affairs, where she

managed various aspects and budgets of the Public Utilities Division and the Department of Energy Resources. Kates-Garnick earned her PhD at Tufts University's Fletcher School of Law and Diplomacy, and an undergraduate degree in political science at Bryn Mawr College.

Jason Miller, Special Assistant to the President for Manufacturing Policy
Jason Miller is the Special Assistant to the President for Manufacturing Policy at the National Economic Council in the White House. Mr. Miller serves as the Director of the White House Office of Manufacturing Policy at the NEC, and in that role he serves as the White House point person on the President's manufacturing agenda, leading policy development efforts and coordinating implementation efforts across Federal agencies. Mr. Miller has played a key role in designing and launching key initiatives like the National Network for Manufacturing Innovation, the President's Advanced Manufacturing Partnership, and the completion of the light-duty fuel efficiency standards through 2025. Prior to joining the Administration, Mr. Miller advised global companies as a management consultant with The Boston Consulting Group in San Francisco. His focus included energy and technology manufacturing firms facing strategic and operational issues. Mr. Miller received a B.A. from the University of Pennsylvania, a M.B.A. from the Kellogg School of Management at Northwestern University, and a M.P.A. from Harvard's Kennedy School of Government.

Bob Pistor, Vice President, UGI Utilities
Bob Pistor is the Senior Operating Officer of UGI HVAC Enterprises, Inc., a 450-employee mechanical, electrical, and plumbing contracting company that operates in the Mid-Atlantic. Bob has been with UGI and its various subsidiary companies for 38 years, where he has held numerous executive positions. In his current role, his business unit is focused on energy utilization. His team completes design build HVAC, refrigeration and plumbing projects, combined heat and power applications, PV and thermal solar applications and all other end use applications with-in the customers' fence related to mechanical, electrical, HVAC, and plumbing applications around the energy space.

Brian Platt, Program Manager, NYSERDA
Brian Platt is the NYSERDA Program Manager for Process, Power, and FlexTech. He has worked for 20 years in the energy field for New York State. Previously, Brian worked for Shell Oil Company as a project manager for offshore process facilities and cogeneration plants. Brian is a New York State licensed professional engineer. He has a B.S. in Chemical Engineering from Cornell University.

Tim Roughan, Director of Distributed Resources, National Grid
Tim Roughan is the Director of Energy and Environmental Policy for the National Grid companies, which serve 6.8 million electric and gas customers in NE and NY. His prior positions include Director of Product Management, Business Services Vice President, and the Director of Distributed Resources. He has been with the company or its predecessors for 30 years. In his role, Tim works in the regulatory arena to promote balanced approaches to distributed generation issues, such as net metering, integration of renewables with the transmission and distribution (T&D) system, and interconnection. In addition, his work includes reviewing the applicability of the use of non-wires alternatives to standard T&D investments using various customer-side resources. He is a 1982 graduate of WPI.

Jonathan Schrag, Executive Board Member, Northeast Clean Heat and Power Initiative
Jonathan Schrag is a principal in the Resilient Energy Coalition, a consortium of clean energy companies organized to increase deployment of on-site distributed generation. In 2011 and 2012 Jonathan served as the Deputy Commissioner for Energy in the Connecticut Department of Energy and Environmental Protection where he assisted Commissioner Daniel C. Esty to develop a long-term strategy for energy resilience and to implement the new Clean Energy Finance Investment Authority. From 2008 to 2011, Jonathan administered the first cap-and-trade program in the U.S. as the Executive Director of Regional Greenhouse Gas Initiative. And from 2004 to 2007 he was an Assistant Director of the Earth Institute at Columbia University and the Executive Director of the Lenfest Center for Sustainable Energy. Jonathan received an AB degree with honors from Harvard University and was a Fulbright Scholar in Mexico.

Calvin Timmerman, Assistant Executive Director, Maryland Public Service Commission
Calvin Timmerman is an Assistant Executive Director on the Staff of the Maryland Public Service Commission (PSC). He joined the Maryland PSC in 1989, and he has managed the Staff's energy efficiency, peak demand reduction, and energy supply resource activities since 2001. He currently chairs the Smart Grid Implementation Working Group and the EmPower Maryland Working Groups. Mr. Timmerman has B.A. and M.A. degrees in History and a Specialist in Education degree from the University of Florida. He was a Graduate Exchange Fellow at Eberhard Karls University in Tuebingen, Germany, and he also received a M.A. degree in Economics from the University of Maryland, College Park.

Mike Winka, Director, Office of Clean Energy, New Jersey Board of Public Utilities
In 2003, Mike Winka was named the Director of the newly organized Office of Clean Energy in the New Jersey Board of Public Utilities. He managed the New Jersey Clean Energy Program and the State Energy Plan for Energy Efficiency and Renewable Energy through 2012. The Office is responsible for promoting energy efficiency, clean energy generation and renewable energy generation through the various regulatory and non-regulatory tools available to NJBPU. Mike is currently the Senior Policy Advisor to President Hanna on technical issues, including clean energy and smart grid. Before joining NJBPU, Mike worked for the New Jersey Department of Environmental Protection for 22 years

Tim Woolf, Vice President, Synapse Energy Economics
Tim Woolf is a vice president at Synapse Energy Economics. He has thirty years of experience working on a variety of electricity industry regulation and planning issues. The primary focus of his work includes energy efficiency program design and policy analysis; technical and economic analyses of electricity systems; renewable resource technologies and policies; clean air regulations and policies; and many aspects of consumer and environmental protection. Prior to working at Synapse, Mr. Woolf was a commissioner at the Massachusetts Department of Public Utilities and also served as the President of the New England Conference of Public Utility Commissioners from 2009-2010. Mr. Woolf holds an MBA from Boston University and a Diploma in Economics from the London School of Economics, as well as a B.S. in mechanical engineering and a B.A. in English from Tufts University.

Appendix E

PARTICIPANT LIST

NORTHEAST/MID-ATLANTIC DOE INDUSTRIAL ENERGY EFFICIENCY & COMBINED HEAT & POWER DIALOGUE MEETING			
First Name	**Last Name**	**Title**	**Organization**
Eric	Ackerman	Director, Alternative Regulation	Edison Electric Institute
Mariusz	Adamski	PhD	Technical University of Bialystok
Todd	Allen	Project Officer	Dept of Energy
Chas	Anders Hall	CEO	Trifecta Industries
Lee	Anderson	Senior Policy & Legislative Advocate	BlueGreen Alliance
Ronald	Araujo	Manager, Conservation & Load Management	Northeast Utilities
John	Baker	Associate Vice Chancellor for Facilities Management	University of Massachusetts Medical School
Felicia	Bellows	Managing Partner	New Alchemy Energy Partners
Jeff	Bentley	CEO	CellTech Power LLC
Zachary	Bley	Sr. Coordinator--Financial Planning	Johns Hopkins Health System Corp
Chrissy	Borskey	Director, Government Affairs & Policy	GE
Tom	Bourgeois	Co-Director	Northeast Clean Energy Application Center
James	Bradbury	Senior Associate	World Resources Institute
Geoff	Brown	Senior Officer	The Pew Charitable Trusts
Mark	Bryfogle	President	Anlage Research
Joe	Bryson	Senior Policy Analyst	US EPA

Ian	Burnes	Program Manager, Strategic Initiatives	Efficiency Maine Trust
James	Burns	Senior Sales Manager	GE Energy – Aero Energy
Steve	Capanna	PMF for Energy Efficiency	White House Council on Environmental Quality
George	Carlisle	Owner	Presciences
Mike	Carr	Principal Deputy Assistant Secretary, Energy Efficiency & Renewable Energy	U.S. Department of Energy
Erin	Carroll	Director, Consulting	VEIC
Mike	Casper	Senior Manager, Generation and Fuels	National Rural Electric Cooperative Association
Kevin	Chisholm	Consulting Energy Engineer	Engineering Consultant
Al	Clark	President	Penn Power Group
Kevin	Clark		SMECO
Susan	Coakley	Executive Director	Northeast Energy Efficiency Partnerships
Terry	Coldwell	VP Technical services	Ener-g Cogen LLC
Ken	Cooper	Business Development	UIL
Josh	Craft	Public Policy Analysis Manager	Northeast Energy Efficiency Partnerships (NEEP)
Michael	Cromer	Sr. Vice President	Dynamic Energy
Ed	Crowe	Engineering Scientist	West Virginia University
Todd	Currier	Assistant Director	WSU Energy Program
David	Danielson	Assistant Secretary	Energy Efficiency and Renewable Energy
Andre	de Fontaine	Project Manager--Better Buildings, Better Plants	U.S. Department of Energy
Gerard	Delisser	VP Development	Miller Bros
Jen	Derstine	Director of Policy	Capstone Turbine Corporation

Pete	Devlin	Market Transformation Manager	US DOE
David	Dewis	Sr VP of Power	ICRTec
Gregory	Dobbs	Director	Penn State University
Jordan	Doria	Manager, Stakeholder Engagement	Ingersoll Rand
Julia	Downing		Sentech/SRA International
Katie	Dykes	Deputy Commissioner for Energy	Connecticut Department of Energy & Environmental Protection
Dallas	Elgin	Research Analyst	BCS, Incorporated
Joseph	Eysie	Consultant	Tactical energy solutions
Seth	Federspiel	Policy Analysis Fellow	Department of Energy- EERE
Frank	Felder	Director	Rutgers University
Jim	Freihaut	Director	Mid-Atlantic Clean Energy Application Center
Julia	Friedman	Program Manager	NASEO
John	Fusco	Partner	New Alchemy Energy Partners
Patti	Garland	Program Manager	Oak Ridge National Laboratory
Robert	Gemmer	Technology Manager	US DEPARTMENT OF ENERGY
Donald	Gilligan	President	NAESCO
Sandy	Glatt	Project Officer	DOE AMO
Marion	Gold	Commissioner	Rhode Island Office of Energy Resources
Vignesh	Gowrishankar	Sustainable Energy Advocate	NRDC
Frank	Gundal	Manager	Nstar
Mark	Gundrum	Project Manager	NYSERDA

Bruce	Hedman	Vice President	ICF International
Chris	Hickling	Director, Government Relations	Edison Electric Institute
Natalie	Hildt	Public Policy Outreach Manager	Northeast Energy Efficiency Partnerships (NEEP)
Jeff	Hogan	Division Manager	Turtle & Hughes
Jennifer	Hunspeger	Sr. Energy Manager	Praxair, Inc.
Ravi	Jethra	Program Manager - Power & Energy	Endress+Hauser
Mike	Johnson	Director	Energy Experts Int'l
Scott	Johnstone	Executive Director	Vermont Energy Investment Corporation
Barbara	Kates-Garnick		Massachusetts Undersecretary of Energy
Jennifer	Kefer	Sr Program Manager	David Gardiner & Associates
Bob	Kettig	Section Chief Air Permitting	NJDEP
Sean	Keyman	Business Development	Trifecta Industries, Inc.
Jeff	King	Principal Environmental Planner	MWCOG
Catherine	Kunkel	President	Kunkel Energy Research
Chelsea	Lamar	Senior Program Associate	Midwest Energy Efficiency Alliance
Cara	Lampton	Energy Efficiency Program Planner	Delaware Department of Natural Resources and Environmental Control
George	Lawrence	Consultant	Vermont Energy Investment Corp
Scott	Layne	Regional Director	SourceOne
Paul	Lemar	President	Resource Dynamics Corporation
Bryan	Levy	CEO	XChanger Companies.com
Jim	Libertini	Product Manager	BGE

Emily	Linn	Environmental Protection Specialist	U.S. EPA Region 3
David	Logsdon	DG Specialist	Con Edison
Dale	Louda	Executive Director	US Combined Heat and Power Association
Chris	Lyons	Manager, Power Generation	Solar Turbines Incorporated
Thomas	Maheady	Engineer	Individual
Jason	Marcinkoski	Fuel Cell Technologies Program	U.S. Department of Energy
Rick	Martin	Region Manager, Northeast | Mid-Atlantic	GE Distributed Power
Eric	Matheson	Energy Advisor to PAPUC Comm. Cawley	PAPUC
Ronald	Maurer	Account Manager	Veolia Energy
Ruth	McCormick	Senior Policy Associate	BCSE
Jim	McDonnell	COO	Avalon Energy Services, LLC
Penni	McLean-Conner	Chief Customer Officer	Northeast Utilities
Gary	McNeil	Analyst	US EPA CHP Partnership
David	Meade	Assoc. Director, Energy Management	Praxair, Inc.
Jason	Miller		Special Assistant to the President for Manufacturing Policy
Meredith	Montalto	Pennsylvania representative	Pew Clean Energy Program
Gregory	Moreland	Contractor to U.S. Department of Energy	SRA International
Joel	Morrison	Director, West Penn Power Sustainable Energy Fund	Penn State University
Nandini	Mouli	Business Manager	Maryland Energy Administration
Colin	Mount	Manager, Federal Affairs	FirstEnergy
Richard	Murphy	Managing Director - Sustainable Growth	American Gas Association

Neeharika	Naik-Dhungel	CHP Program Manager	US EPA
Carrie-Anne	Nash	Strategic Marketing Manager	Northeast Energy Efficiency Partnerships
John	Nicol	Program Director	SAIC
Frank	Norcross	Vice President-Project Administrator	Green Campus Partners
Michael	Nowak	Senior Management Technical Advisor	National Energy Technology Laboratory
Jim	O'Reilly	Director of Public Policy	Northeast Energy Efficiency Partnerships (NEEP)
Kathryn	O'Rourke	Manager	ICF
Paul	Otis	Operations Research Analyst	Energy Information Administration
Stephen	Ours	Chief, Air Quality Permitting	District Department of the Environment
Michael	Overturf	General Manager	ZF Energy Development LLC
Marissa	Paslick	Commission Advisor	Maryland Public Service Commission
Ravi	Patraju	Research Scientist	NJ Department of Environmental Protection
Robert	Penn	Director	Bostonia Partners LLC
Katrina	Pielli	Senior Policy Advisor	U.S. Department of Energy
Bob	Pistor	Vice President	UGI Utilities
Shela	Plank	Program Engineer	Lockheed Martin
Brian	Platt	Program Manager - Process, Power and Flextech	NYSERDA
Larry	Plitch	Director, Government Affairs	Veolia Energy North America
Lori	Porreca	President	GenX Development
Carolyn	Porritt	Sustainable Building Underwriter	US Department of Housing & Urban Development
Charles	Pulay	East Region Projects Development	Burns & McDonnell

Jessica	Quinn	Energy Efficiency Planner III - EM&V	Delaware Division of Energy and Climate
Jennifer	Raley		SMECO
Irina	Rasputnis	Commercial Programs Associate	NEEP
Dan	Rastler	Sr. Mgr Strategic Initiatives	Electric Power Research Institute
John	Rathbun	Lead Technical Support	National Grid
Jim	Reeks	Director of Business Development	Bette & Cring Construction Group
Elias	Rivera	Air Quality Program Specialist	PADEP
Kurmit	Rockwell	FEMP	U.S. Department of Energy
Tim	Roughan	Director of Energy and Environmental Policy	National Grid
Philip	Rutkowski	North America Sales Manager	Elliott Group, Steam Turbine Generators
Sneha	Sachar	Program Strategy Lead	National Grid
Lynn	Schloesser	Executive Director	Manufacturers for Energy Efficiency Coalition Industrial Energy Consumers of America
Jonathan	Schrag	Principal	Resilient Energy Coalition
Jerry	Schwartz	Senior Director, Energy and Environmental Policy	American Forest & Paper Association
Roderick	Schwass	Program Manager - Energy & Power Solutions	Jacobs
Larissa	Shaaked	Regional Sales Manager	GE Energy – Aero Energy
Anna	Shipley	Manager, Industrial Programs	SRA International
Tom	Simchak	Policy Associate	Center for Clean Air Policy
Gregory	Simmons	Assistant People's Counsel	Maryland Office of People's Counsel
Jack	Sins	VP, Business Development	Unison Energy, LLC
Robert	Smith	Vice President	RMF Engineering, Inc

Richard	Sweetser	Sr. Advisor	Mid-Atlantic Clean Energy Application Center
Jim	Thoma	Managing Director	Green Campus Partners
Rob	Thornton	President & CEO	IDEA
Calvin	Timmerman	Assistant Executive Director	Maryland Public Service Commission
Daniel	Trombley	Senior Industrial Analyst	ACEEE
Walt	Tunnessen	Industrial Sector Manager	US EPA - ENERGY STAR
Michael	Uhl	Senior Consultant	PRIZIM Inc.
Ellen	Vancko	Senior Commission Advisor	Maryland Public Service Commission
Arunkumar	Vedhathiri	Senior Energy Consultant	SAIC
Fred	Ventresca	Director- Corporate and Business Development	Con Edison Solutions
Jeffrey	Wand	Project Developer	Gumamela LLC
Jay	Weist	Director, Business Development	WorleyParsons Group
Susan	Wickwire	Chief, Energy Supply & Industry Branch	US Environmental Protection Agency
Scott	Wilshire	Manager, Steam Turbine Generator Business	Elliott Group
Darrell	Wilson	Director, Marketing	Chesapeake Utilities Corp.
Mike	Winka	Director, Office of Clean Energy	New Jersey Board of Public Utilities
Eric	Winkler	Project Manager	ISO New England
Bill	Wolf	Manager - I&C Energy Efficiency Programs	BGE
Tim	Woolf	Vice President	Synapse Energy Economics
Zafer	Yakin	President	Opaxis
Khaled	Yousef	Senior Energy Engineer	SAIC

Johanna	Zetterberg	SEE Action Coordinator	U.S. Department of Energy
Jenn	ZiBerna		Sentech/SRA International

Appendix F

SUMMARY OF THE STATUS OF INSTALLED CHP AND POTENTIAL IN THE NORTHEAST AND MID-ATLANTIC STATES

Northeast Energy Efficiency Partnerships

Northeast and Mid-Atlantic States:
Combined Heat and Power Capacity and Potential

NEEP, with assistance from VEIC, has put together an overview of the CHP capacity and technical potential for states in our region. The data presented in the following table is from internal ICF estimates technical potential for CHP installations across all customer sectors. There are a variety of additional studies available that may reflect more or less technical potential. Identifying and achieving the economic potential for installations is highly dependent on spark spread, state regulatory and business environment, and other key factors that can vary across the sectors.

STATE	CHP CAPACITY & POTENTIAL
Connecticut	• Existing: 713 MW • Technical Potential (2012): 1400 MW
Delaware	• Existing: 52.5 MW • Technical Potential (2012): 400 MW
Maine	• Existing: 900 MW • Technical Potential (2012): 900 MW
Maryland	• Existing: 714 MW • Technical Potential (2012): 1,800 MW
Massachusetts	• Existing: 1,571 MW • Technical Potential (2012): 2,800 MW
New Hampshire	• Existing: 58.5 MW • Technical Potential (2012): 600 MW
New Jersey	• Existing: 3,055 MW • Technical Potential (2012): 3,800 MW
New York	• Existing: 5,585 MW • Technical Potential (2012): 9,500 MW

STATE	CHP CAPACITY & POTENTIAL
Pennsylvania	• Existing: 3,307 MW • Technical Potential (2012): 6,200 MW
Rhode Island	• Existing: 114 MW • Technical Potential (2012): 500 MW
Vermont	• Existing: 22 MW • Technical Potential (2012): 300 MW
Washington, D.C.	• Existing: 14.5 MW • Technical Potential (2012): 300 MW